

**BOOK 3 – VOLUME 1
TECHNICAL SPECIFICATIONS
DIVISIONS 00 - 12**

CONTRACT NO. CXXXX

**MALCOLM X COLLEGE
WEST SIDE LEARNING CENTER
ADDITION AND RENOVATION
4625 W. MADISON STREET
CHICAGO, IL 60644**

**NEW CONSTRUCTION/RENOVATIONS
PBC PROJECT #03720**

PUBLIC BUILDING COMMISSION OF CHICAGO



**Mayor Brandon Johnson
Chairman**

Carina E. Sánchez
Executive Director

Room 200
Richard J. Daley Center
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**75%CD Draft for CM Procurement – Not For Construction
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1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders and is referenced as an attachment to the Project Manual, including:
 - 1. Geotechnical report.
 - 2. Environmental Reports
 - 3. Etc....
- B. The Contractor is responsible for coordination of information within the Supplemental Project Information with the applicable scope of work for this Project.
- C. The Board and the Architect/Engineer of Record do not guarantee the accuracy or validity of the data, nor do they assume any responsibility for the Contractor's interpretation of the data.
- D. Verification of data and existing conditions is the Contractor's responsibilities. At Contractor's option, perform additional investigations at own expense.

1.02 GEOTECHNICAL REPORT(S)

- A. The following are the geotechnical reports prepared for the project site and are as follows:
 - 1. By ABC Consultants, Inc; dated January 01, 1881; titled "Subsurface Exploration and Geotechnical Analysis Report".
 - 2. Etc....

1.03 ENVIRONMENTAL REPORT(S)

- A. The following are the environmental reports prepared for the project and are as follows:
 - 1. By ABC Consultants, Inc; dated January 01, 1881; titled "Limited Hazardous Building Materials Survey".
 - 2. Etc....

PRODUCTS (NOT USED)

EXECUTION (NOT USED)

END OF SECTION 00 01 00

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Phased construction.
- 4. Work by Owner.
- 5. Work under separate contracts.
- 6. Purchase contracts.
- 7. Owner-furnished products. Contractor-furnished, Owner-installed products.
- 8. Access to site.
- 9. Coordination with occupants.
- 10. Work restrictions.
- 11. General Requirements.

- B. Related Requirements:

- 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: Malcolm X West Side Learning Center Addition and Renovations.

- 1. Project Location: 4624 W. Madison Ave. Chicago, Illinois 60644.

- B. Owner: Public Building Commission of Chicago (PBC)

- 1. Owner:
 - a. Commission Representative
Name TBD @ Time of Bid
50 W Washington Street, Suite 200
Chicago, IL 60602
312.744.3090

2. User Agency: City Colleges of Chicago (CCC)
 - a. Vice Chancellor Administrative and Procurement Services:
David Anthony
180 N. Wabash
Chicago, IL 60601
(773) COLLEGE
 - b. Director of Capital Planning & Construction
Lylyana Fowle
Insert Address
773.487.3754
 - c. Coordinating Architect II
Manuel Hernandez
Insert Address
773.297.4930
 - d. Chief Facilities Engineer
Franklin Smith
West Side Learning Center
4624 W. Madison Ave.
Chicago, IL
312.850.7433
- C. Architect of Record: Bailey Edward Design
 1. Project Manager
Zachary Clark
Bailey Edward
35 E. Wacker Dr.
Suite 2800
Chicago, IL 60601
312.789.4008
- D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
 1. Landscape Architect
Dave Frigo
Hitchcock Design Group
22 E. Chicago, Ave
Suite 200
Naperville, IL 60540
 2. Civil Engineer
Andy Wynn
Rubinos & Mesia Engineers, Inc.
200 S. Michigan Ave.

Suite 1500
Chicago, IL 60604

3. Structural Engineer
Alex Selsky
Rubinos & Mesia Engineers, Inc.
200 S. Michigan Ave.
Suite 1500
Chicago, IL 60604
4. Mechanical, Electrical, Plumbing and Fire Protection
Dan Sebastian
RTM Engineering, Inc
250 S. Wacker Dr.
Ste. 400
Chicago, IL 60606
5. Environmental ACM Engineer
Insert Name
Environmental Design International, Inc.
33 W Monroe Street, Suite 1825
Chicago, IL 60603
Insert Phone
6. Commissioning Agent
Procon Consulting
Insert Address & Phone
7. Surveyor
Environmental Design International, Inc.
Insert Name
Environmental Design International, Inc.
33 W Monroe Street, Suite 1825
Chicago, IL 60603
Insert Phone
8. LEED Consultant
Chyanne Husar
HUS Architecture
2202 S Halsted Street,
Chicago, IL 60608
312.224.8048

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

1. Environmental Engineering
Ala Sassila

GSG Consultants
735 Remington Road
Schaumburg, IL 60173
630.994.2600

F. Construction Manager: **<Insert name and contact information for Construction Manager>**.

1. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and Contractor, according to a separate contract between Owner and Construction Manager.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

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

1. The project is an Assembly Hall Addition and Existing Lobby renovation to the existing Malcolm X College West Side Learning Center. The addition is a single-story building, approximately 5,500 square feet. The occupancy use classification is A-1 large assembly. The construction type is Type IIB, non-combustible. Spaces included are a new assembly hall space, server, mechanical room, storage, and restrooms. The renovated lobby will include new vestibules, lobby finishes, and basement level lobby stair enclosure.
2. The Addition will include new mechanical, electrical and plumbing system. The HVAC will include new air handling unit, VRF and VAV systems. All new power and high efficiency lighting. Plumbing will include new sinks and grease trap at the new catering support space. New ADA compliant restrooms with high efficiency toilets. All new low voltage A/V system, power shades, security system.
3. The Addition is constructed of structural steel frame with light gauge metal stud frame walls with an exterior metal rainscreen system. The facade a rain screen exterior wall construction with masonry veneer, and curtain wall system. The Single-story building is a concrete slab on grade with perimeter concrete footing. The roof system is flat, tapered insulation with sheathing and metal decking over metal joists.
4. The existing lobby will be reclad and include structural roof framing and wall modifications.

B. Type of Contract:

1. Project will be constructed under a single prime contract.
 - a. Malcolm X College, West Side Learning Center Addition and Renovations.

1.5 PHASED CONSTRUCTION

A. The site will be occupied during construction. The Work shall be conducted per the phasing plan in the contract documents to be substantially complete as indicated:

The main entry to the West Side Learning Side will be protected and maintained for the duration of Phase 1, in order to allow for student and faculty access. Construction will consist of the assembly hall addition and include the lobby renovation. Includes renovation to the lobby space and temporary relocation of the main entry through assembly hall addition.

- B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement, and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

1.6 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
 - 1. Low voltage wiring installation at Contractor provided roughing conduit and junction box locations as indicated in the drawings.
 - 2. A/V equipment installations at Contractor provided support locations as indicated in the drawings.
 - a. Projection screens are to be supplied by the Owner and installed by the Contractor.
 - 3. Security system shall be installed at Contractor provided rough in locations as indicated in the construction drawings.
 - 4. Access Controls shall be installed at Contractor provided rough in location as indicated in the construction drawings and associated with door hardware locations and specifications. These items are to be coordinated with Security Systems.

1.7 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.8 PURCHASE CONTRACTS

- A. General: Owner has negotiated purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum, unless otherwise indicated.
 - 1. Contractor's responsibilities are same as if Contractor had negotiated purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.

B. Purchase Contracts Information:

1. Low Voltage Wiring
2. A/V system
3. Security System
4. Access Controls

1.9 OWNER-FURNISHED PRODUCTS

A. The Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products:

1. See specification section 01 64 00 Owner Furnished Items

1.10 ACCESS TO SITE

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

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to <Insert description of areas where work is permitted>.
2. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet (12.2 m) beyond building perimeter; 10 feet (3 m) beyond surface walkways, patios, surface parking, and utilities less than 12 inches (300 mm) in diameter; 15 feet (4.5 m) beyond primary roadway curbs and main utility branch trenches; and 25 feet (7.6 m) beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
3. Driveways, Walkways and Entrances: Keep north parking lot entrance, loading areas, 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. See contract drawings for staging area location. Refer to phasing as described in this section.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.11 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during the entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated. Coordinate access with Phasing as described in this section.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

C. Campus Coordination

2024/2025 ACADEMIC YEAR	
SCHOOL HOURS OF OPERATION	
Academic School Year	
Student regular hours	
Building Engineer regular hours	
Custodian regular hours	
Student before-school program start	
Student after-school programs end	
Weekend activities	
Summer Break	
Last day of school for students	
Last day of school for teachers	
Building Engineer hours during the summer	
Custodian hours during the summer	
Building Engineer vacation/time-off summer	
First day of school for clerks	
First day of school for teachers	
First day of school for students	
School staff over summer break	
Summer School	
Dates	
Hours	
Rooms	
Doors	
Outdoor areas	

Malcolm X College – West Side Learning Center
Addition and Renovations

Student registration during summer	
Dates	
Hours	
Rooms	
Doors	
Sports teams activities during summer	N/A
Dates	N/A
Hours	N/A
Rooms	N/A
Doors	N/A
Outdoor areas	N/A
School Winter Break:	
Last day of school for students	
Last day of school for teachers	
Building Engineer hours during the break	
Custodian hours during the break	
Building Engineer vacation/time-off	
First day of school for teachers	
First day of school for students	
School Spring Break:	
Last day of school for students	
Last day of school for teachers	
Building Engineer hours during the break	
Custodian hours during the break	
Building Engineer vacation/time-off	
First day of school for teachers	
First day of school for students	
Construction Black Out Dates	
Student Testing Dates:	
Graduation	
Orientation	
Other Important Dates	
Professional Development Days:	
Open House	
Driver's Education Schedule:	N/A
After-Hours and Break Community Activities	N/A
Heating Season (equipment must be fully operational)	
Election Day(s) If School is a Voting Center	N/A

D. SPECIAL REQUIREMENTS:

CRITICAL COORDINATION ITEMS	
Long Lead Items	
ComEd Coordination	Refer to the Utilities Coordination Log by the AOR for updates.
People's Gas Coordination	Refer to the Utilities Coordination Log by the AOR for updates.
CDOT Coordination	Refer to the Utilities Coordination Log by the AOR for updates.
OEMC Coordination	Refer to the Utilities Coordination Log by the AOR for updates.
Kitchen Inspection	Preliminary CDPH kitchen inspection is required for scheduling of CDPH final inspection for occupancy and use. Contractor to provide adequate notice for CCC Services once full kitchen scope and requisite elements are complete.
AV/IT Coordination	AV/IT to be copied on all relevant submittals. AV/IT is critical to getting internet and communications set up at the school once complete. Adequate time must be given in order to set up server necessary or completion of GC scope items.
Safety and Security Coordination	Camera and Intrusion Detection System scope included in project. Note that coordination with CCC Safety and Security will need to take place for camera programming upon completion of install.
New Keying System	Include details if scope requires or N/A if not applicable
Furniture	Furniture deliveries to be scheduled after PA and coordinated by CCC.
Moving	If moves are required to perform the work, Staff will be required to label and pack the material to be moved. CCC Operations will provide boxes and provide moving services to make moves out of and back into designated spaces. ITS will be responsible for moving computers. School is responsible for coordinating with ITS for reconnecting any computers that are required to be disconnected and relocated due to construction.
Cleaning	<p>CCC-approved post-construction clean of new building and any impacted areas of existing building is required prior to SC and turnover of responsibilities to CCC.</p> <p>Contractor responsible for Final Clean in all areas impacted by construction, including corridors used for access. Cleaning includes stripping and waxing of VCT flooring.</p> <p>See 01 70 00 Execution Requirements Specifications for requirements on cleaning.</p>
OTHER COORDINATION INFORMATION	
Assigned CCC cleaning vendor and contact information:	
Does campus have any staff or students with ADA needs?	

Any ongoing or other upcoming projects at the School:	None at this time.
Any leases impacting Work:	N/A
Does project scope require any material to be salvaged?	Refer to the documents for site demolition: CPD request for existing light poles to be salvaged and turned over
Staging area(s)	Refer to the Phasing Plan in the project documents for reference.
Chicago City College's Representative Office Location	

1.12 WORK RESTRICTIONS

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

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

B. On-Site Work Hours:

West Side Learning Center Normal business are 6:00 am - 10:00 pm Mon - Thurs. - Fri. 6:00 am - 5:00 pm and Sat. 7:00 am - 1:00 pm - Closed Sunday

1. Weekend Hours: 7:00 am – 12:00 noon weekend work.
2. Early Morning Hours: 6:00 am – 8:30 am.
3. Hours for Utility Shutdowns: Owner to be notified 7 to 10 days prior to shut down, owner will provide shutdown hours upon notice of which utilities are to be affected and length of time to be shut down.
4. Hours for Core Drilling, noisy activity or vibrations: Owner requires 7 to 10 days prior notice of type and length of time for loud work.
5. Note that MXC may not have classes on Friday, which may provide a better time for more noise or vibration type of work activities.

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

1. Notify Owner not less than 1 week in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

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

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

- E. Nonsmoking Building: Smoking is not permitted within the building or on the premises.
- F. Controlled Substances: Use of tobacco products and other controlled substances within the existing building and on Project site is not permitted.
- G. Employee Identification: Owner will provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.13 GENERAL REQUIREMENTS

- A. General Contractor shall review and be familiar with the site conditions.
- B. General Contractor shall provide all temporary and permanent driveway apron and alley permits for the duration of the construction if required. The General Contractor is to pay all fees required for processing permits and is to contact and comply with all authorities and jurisdiction required for permitting.
- C. General Contractor shall provide snow removal and generally maintain ingress and egress ensuring the site is clear and free of debris further maintaining accessibility that conforms with OSHA, Chicago Building Code, and emergency egress standards.
- D. General Contractor shall provide all required permits for street access for truck delivery from the local and state jurisdiction.
- E. General Contractor shall, at all times, provide access to the work for the Architect/Engineer of Record, Owner's Representative, and CPS, their employees or representatives and the representative of any other authority having jurisdiction. The General Contractor shall provide safe and proper facilities for access and inspection, including standby personnel as required.
- F. General Contractor shall be required to coordinate and complete the work within the contractual completion date(s) for the work as described within Section 00 73 00 - Supplemental Conditions and this section. The General Contractor shall be also held responsible for meeting all related provisions as described within this section.
- G. General Contractor shall coordinate access to the building at a mutually agreed upon location. Contractor may be required to remove CCC core from construction entry door and replace it with a construction core provided by the General Contractor for the duration of the project. At project conclusion, General Contractor shall reinstall original CCC core removed for construction.
- H. General Contractor shall survey the site and photograph the area of construction operations. Upon completion of the work the Contractor is to restore the area to the documented condition prior to the start of work or as otherwise indicated in the Contract Documents. The GC shall provide evidence of compliance.
- I. General Contractor is to replace all removed trees, bushes, ground covers and grass on the Chicago City Colleges' property disrupted, or otherwise damaged as a result of construction activities. Hard surfaces including but not limited

to concrete pavement walks and asphalt surfaces shall be restored to condition prior to construction. Restoration of hard surfaces may require cleaning, repair or replacement.

- J. General Contractor shall coordinate work with the school during Mandatory State Testing periods. Test dates should be verified with the school. No work shall be permitted in the facility or on the site during testing except as specifically approved by the Commission's Representative. General Contractor must minimize noise in all other areas during these time periods, and if requested by the School, stop work causing the noise until testing is completed. General Contractor shall bear all costs for any loss of time or production related to Mandatory State Testing.
- K. General Contractor shall coordinate and maintain all exit egress during construction as required by the City of Chicago code, other entities with jurisdiction, and as directed by the Commission's Representatives. The General Contractor shall provide and maintain all materials and labor including barricades, construction fence, doors, partitions, and fire rated walls as required for safe egress. All costs for this work shall be included in the Contract Base Bid regardless of whether it is indicated in the Contract Documents or not.
- L. No deliveries will be permitted to either the existing facility or the new addition between the hours of 8:30 to 9:30 AM and 2:30 to 4:30 PM during the academic year.
- M. During the academic year, no work may be performed during the hours of instruction.
- N. The Contractor is to set up and stage the entire project within the boundaries of the construction fence. The General Contractor is responsible for maintaining and modifying the fence as necessary and as approved in the Site Utilization Plan for the life of the project. Removal and disposal of the fence and project signage at the conclusion of the project is the responsibility of the General Contractor.
- O. Building Engineer or other CCC staff (including contract employees) will not be paid overtime by the Commission, in order to be present at times when work is in progress in the existing Building. The General Contractor shall be responsible for all overtime costs for the CCC staff member for work outside of normal working hours, if need is due to construction work. Overtime arrangements for CCC staff includes weekends, holidays, and generally hours beyond that listed in Site Restrictions above. Recognized Holidays are as follows with Saturday holidays observed on Friday, and Sunday holidays observed on Monday (contract employees may follow a different schedule):
 - 1. New Year's Day.
 - 2. Martin Luther King Jr.'s Birthday.
 - 3. Presidents Day.
 - 4. Memorial Day.
 - 5. Independence Day.
 - 6. Labor Day.
 - 7. Columbus Day.
 - 8. Veterans Day.
 - 9. Thanksgiving.

10. Friday after Thanksgiving.

11. Christmas Day.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SITE UTILIZATION PLAN

- A. Prior to Notice to Proceed, the Contractor shall prepare and submit to the Commission's Representative, the Building Engineer, and the Architect/Engineer of Record for approval a Site Utilization Plan based on the Construction Operations Parameters outlined in this section. Mobilization on-site is not to occur until approval of the Site Utilization Plan is obtained. A preliminary meeting to review site elements and Construction Operations with the Commission's Representative, Architect/Engineer of Record, and School staff prior to submission of the Site Utilization Plan shall be held.
- B. The Site Utilization Plan shall be provided in a full-size graphic drawing electronic format (same size as the Construction Document drawings), printable in 11x17 inch format. Provide a separate plan for the site and for each floor of the existing building where work is being performed. Modifications to the format and sheet size shall be permitted if pre-approved by the Commission's Representative and if proposed modifications shall facilitate preparation, presentation and review of the Site Utilization Plan. Electronic copies of the Contract Document drawings as appropriate shall be provided for this purpose upon request. The Site Utilization Plan shall at a minimum include the following elements:
 - 1. Title block information including Facility Name, Contract Number, General Contractor, Building floor/level information, and current plan date.
 - 2. Building footprint of both new (if applicable) and existing buildings, trees, landscaping, paving, drainage structures, existing and ornamental fencing and other important site features.
 - 3. Areas of staging for students and staff, student drop-off points, existing school entrances and exits, staff parking areas, and traffic patterns for both construction and non-construction vehicles.
 - 4. Limits of construction and required construction fencing including any existing fencing to remain.
 - 5. Required covered construction barricade walkways.
 - 6. Areas allowed for staging purposes: construction personnel parking, material storage, and construction trailer(s). Such activities are to only take place in areas designated.
 - 7. Any specific site conditions required to be observed such as keeping alleys clear next to adjacent properties, and any other issues listed on the Construction Operations Site Plan.
 - 8. Areas allowed for site access gates.

9. Areas of work within the existing building for the period of time covered by the Site Utilization Plan, coordinated with the Project Schedule. Each area should indicate planned beginning and end dates for work in that area. Areas where all work is completed are to be noted.
10. Construction worker ingress/egress, material staging areas in the existing building.
11. Proposed locations of temporary protection, barricades, and temporary walls within the existing building.
12. Location of all temporary exits and path of travel.
13. Indication of specific areas and their required contractual completion dates. If overtime work is required to meet the project dates it shall be at no additional cost to the Chicago Public Schools.
14. Locations of construction signage.
15. Indicate truck routes to nearest highway. Deliveries shall not deviate from this route.
16. Limits of phasing with associated sequencing and dates (if applicable).

3.2 SITE UTILIZATION PLAN UPDATES

- A. The General Contractor is required to submit for approval updated Site Utilization Plans whenever conditions in the current approved plan have changed. Approval is required prior to proceeding on any changed conditions not previously approved. Requirements for updating include the following:
 1. In coordination with the project schedule provide detailed information regarding work in the existing building including phasing, vacation of existing in-use areas, and any other information requested by the Commission's Representative.
 2. Revision to the site plan to reflect changing conditions regarding construction fencing, ingress and egress, student and staff staging, construction deliveries, areas of stored materials, parking, and any other construction facility revisions.

3.3 ATTACHMENTS

- A. GC Check List for NTP, (NOA for JOC & Various Trades)

END OF SECTION 01 10 00

SECTION 01 20 00 - PAYMENT AND CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

- A. Upon receipt of the Notice to Award, the Contractor shall commence preparation of a Schedule of Values for the Project. Schedule of Values shall be submitted no later than 14 days following the date established on the Notice to Award, but no later than 14 days prior to the date scheduled for submittal of initial Application for Payment.
- B. Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule and the Project Submittal Schedule.
- C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and bonds and insurance.
 - 1. Provide separate line items for costs that are not direct cost of actual work-in-place including, but not limited to, the following:
 - a. Required Bonds and insurance.
 - b. Permit fees.
 - c. Mobilization.
 - d. Temporary facilities and controls.
 - e. Testing of materials or equipment.
 - f. Closeout documentation, including Record Documents.
 - 2. Provide a breakdown of the Contract Sum in enough detail, as required by and acceptable to both the Architect/Engineer of Record and Board's Representative, to facilitate continued evaluation of Applications for Payment and progress reports.
 - 3. Break down principal subcontract amounts into separate labor and materials items. Breakdown of subcontractor's schedule of values must be true and accurate.
 - 4. Provide separate line items for each portion of the Work or subcontract with a scheduled value of \$50,000 or more, with information related to that portion of the Work broken down as required so the scheduled value in each line is less than \$50,000.
 - 5. Only when acceptable to the Board, in writing, in advance, include separate line items for materials, equipment, or products that have been purchased and stored but not yet installed. Differentiate between items stored on-site and items stored off-site. Include the following as separate lines:
 - a. Cost of materials, equipment, or products. Include only cost of material, delivery to storage facility, unloading at Site, and applicable sales tax.
 - b. Installation costs.
 - c. Other applicable items related to installation and completion.

- D. Content:
1. Identification: Include the following Project information on the Schedule of Values:
 - a. School name.
 - b. Board's Project number.
 - c. School address.
 - d. Name of Architect/Engineer of Record.
 - e. Contractor's name and address.
 - f. Date of submittal.
 2. The Schedule of Values shall be in tabular form with separate columns to indicate the following for each item listed:
 - a. Item Number.
 - b. Related Specification Section.
 - c. Name of subcontractor, manufacturer or fabricator, or supplier, as appropriate.
 - d. Description of the Work.
 - e. Original Contract Value for that portion of the Work.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar (scheduled) value, rounded to the nearest whole dollar, with the total equal to the total Contract amount.
 - h. Percentage of the Contract amount to nearest one-hundredth percent, adjusted to total 100 percent.
 - i. Value of that portion of the work, including value of work completed, both from previous and current periods.
 - j. Minority classification and ethnic code of subcontractor performing the work, as applicable.
- E. Review and acceptance of the Schedule of Values does not constitute either the Architect/Engineer of Record's or Board's agreement that the quantities or measurements shown are correct and accurate. The Contractor is responsible for providing all labor and materials, in sufficient quantities, required for full completion of the Work, even where the Schedule of Values may indicate lesser quantities.
- F. Revise schedule to list approved Change Orders as separate line items, with subsequent Applications For Payment. Include a narrative description for each approved Change Order, at the end of the Schedule of Values.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: As agreed to by the Architect/Engineer of Record, Contractor, and Board's Representative during the Preconstruction Conference.
- B. Form to be used: Use form "Payment Requisitions" within Board's contract management program (Primavera CM) for application for payment.
- C. Due Date: As agreed to by the Architect/Engineer of Record, Contractor, and Board's Representative during the Preconstruction Conference.
- D. Pencil Draw Reviews: Not less than ten (10) days prior to due date for Application for Payment, a meeting shall be held to review the pencil draw copy of the Application for Payment by the Architect/Engineer of Record, Board's Representative, and Contractor. Questions resulting from this review shall be answered by the Contractor and clarified prior to submittal of the related Application for Payment by the agreed to due date.

- E. Contractor's Second Application for Payment shall be withheld until a baseline construction schedule, acceptable to the Board, has been submitted and approved according to the requirements in Section 01 32 00 - Construction Progress Documentation.
- F. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect/Engineer of Record and Board's Representative and paid for by the Board.
- G. Initial Application for Payment, Application for Payment at time of Preliminary Acceptance, and Final Application for Payment involve additional requirements outlined below.
- H. In taking action on the Contractor's Application for Payment, the Architect/Engineer of Record will rely on the accuracy and completeness of the information furnished by the Contractor and will not be deemed to represent that he/she has made audits of the supporting data.
- I. Application Preparation: Complete every entry on form. Project Accountant will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders issued before last day of construction period covered by application.
- J. Stored Materials: Payment will not be made for stored materials and equipment, except at the Board's discretion with prior written approval. When approved in writing by the Board, include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide documentation itemizing and describing the item(s) being stored.
 - 2. Provide location of bonded warehouse(s) where materials or equipment is being stored.
 - 3. Provide certificate of insurance, evidence of transfer of title to Board, and consent of surety to payment, for stored materials.
 - a. Include statement certifying there will be no additional cost for transportation and delivery of the item(s) being stored to the Site.
 - 4. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
- K. Transmittal: Submit the Payment Application to the Project Accountant from within the Board's contract management program (Primavera CM). Each Application shall include waivers of lien and similar attachments.
- L. Waivers of Lien: With each Application for Payment, submit waivers of lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 - 1. With each Application for Payment a fully executed partial waiver of lien for the net amount requested on the application shall be submitted.
 - 2. Beginning with second Application for Payment, submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 3. Beginning with third Application for Payment, submit cumulative waivers of lien from all subcontractors for whom payment was requested on the first Application for Payment.
 - 4. When an application shows completion of an item, submit conditional final or full waivers.

5. Board, through the Board's Representative, reserves the right to designate which entities involved in the Work must submit waivers.
6. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
7. Waiver Forms: Submit executed waivers of lien on forms provided by the Board's Representative. All waivers must have original signatures and seals.

1.04 INITIAL APPLICATION FOR PAYMENT

- A. Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. Schedule of Values.
 2. List of subcontractors, including addresses.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Submittal schedule (preliminary if not final).
 5. Products list (preliminary if not final).
 6. List of Contractor's principal staff assigned to the Project.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference, including minutes.

1.05 MODIFICATION PROCEDURES

- A. For minor changes or clarifications not involving an adjustment to the Contract Sum or Contract Time, Architect/Engineer of Record will issue instructions directly to Contractor.
- B. For other changes, Proposal Requests are to be initiated as follows:
 1. Prior to issuance of a formal Request for Proposal (Bulletin) to the Contractor, the Board's Representative will secure from the Board conceptual approval for the Change via a Scope of Work modification form (SOW). SOW approval shall be necessary for all changes regardless of how the change was initiated or the reason for the change. SOW approval shall include an estimate of probable costs for the change. The Board's Representative will be responsible for preparation and presentation of the SOW.
 2. Board-Initiated Proposal Requests: The Architect/Engineer of Record, via the Board's Representative, will issue a Bulletin of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - a. Bulletins issued by the Architect/Engineer of Record via the Board's Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - b. As soon as practical but no later than 10 days after receipt of a Bulletin, submit a quotation detailing cost adjustments to the Contract Sum and the any adjustment to the Contract Time necessary to execute the change.
 - 1) Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities, include labor and materials breakdowns, including Contractor overhead and profit.

- a) Specific information regarding insurance rates included in the hourly rate including policy declarations page and applicable mod factors must be provided upon request.
- 2) Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
3. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to the Board's Representative and Architect/Engineer of Record. Contractor initiated proposals are to be submitted in the same format as Board Initiated Proposal Requests and are to include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change.
4. For Change Order proposals, use forms provided by the Board along with all supporting General Contractor, Subcontractor, and Material Supplier documentation.

1.06 APPLICATION FOR PAYMENT AT PRELIMINARY ACCEPTANCE

- A. Follow procedures for Progress Payments above, in addition to the following:
- B. After Architect/Engineer of Record issues the Certificate of Preliminary Acceptance, submit an Application for Payment showing 100-percent completion for portion of the Work claimed as sufficiently complete.
 1. Include documentation supporting claim that the Work is sufficiently complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Preliminary Acceptance issued previously for Board occupancy of designated portions of the Work.

1.07 APPLICATION FOR FINAL PAYMENT

- A. After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Certified copy of the Project punch list, indicating that each item has been completed.
 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 4. Updated final statement, accounting for final changes to the Contract Sum.
 5. Documentation, signed and notarized, that includes the following:
 - a. Certification that payments has been made for all known indebtedness and claims.
 - b. Waivers of liens from all parties legally entitled to file a lien against the Project, including the Contractor's conditional waivers of liens, and final waivers of liens from all subcontractors, suppliers, and other parties that provide materials or equipment to the Project.
 - c. Certification from the Surety that the Surety approves of the final payment to the Contractor, including a statement that final payment to the Contractor does not relieve the Surety of its obligations, signed by an authorized representative of the Surety.
 6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date established for Preliminary Acceptance or when Board took possession of and assumed responsibility for corresponding elements of the Work.
 7. Certification that all obligations to the authorities having jurisdiction and public utilities have been fulfilled.
 8. Record documents shall be updated and submitted to and approved by Board and the Architect/Engineer of Record for the Project.

Malcolm X College – West Side Learning Center
Addition and Renovations

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 20 00

SECTION 01 25 00 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability: The specified product or method of construction is no longer available.
 - b. Regulatory changes.
 - c. There is no condition under which the specified product or method of construction can be installed as shown on the Contract Documents.
 - d. There is no condition under which the specified product or method of construction can be provided within the time limits of the Contract.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project and to the Board.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. All Substitution Requests are to utilize the form 01 25 00.01 - Substitution Request Form.
- B. Refer to 01 60 00 - Product Requirements for additional requirements for product selection and substitution limitations.
- C. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Board.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.

- E. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms included in Section 00 25 01 - Substitution Request Form are adequate for this purpose and must be used.
 - 2. Attach applicable supporting documentation. Provide point-by-point side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item.
- F. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.
- G. There shall be no time extensions granted due to time required for completion of the Substitution process either successfully or unsuccessfully.

3.02 SUBSTITUTION PROCEDURES

- A. Submittal Form: Submit substitution requests by completing the form in Section 01 25 01 - Substitution Request Form. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect/Engineer of Record, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect/Engineer of Record, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Board through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
- D. The Architect/Engineer of Record shall consider requests for substitutions which are received within thirty (30) days after the Notice to Proceed. Any such requests which are received by the Architect/Engineer of Record more than thirty (30) days after the date of the Notice to Proceed may be considered or rejected in the sole and absolute discretion of the Architect/Engineer of Record.

3.03 RESOLUTION

- A. Architect/Engineer of Record may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner. Architect/Engineer of Record will request additional information or documentation for evaluation within one week of receipt of a request for substitution.
- B. Architect/Engineer of Record will notify Contractor in writing of decision to accept or reject request within 14 days of receipt of the request, or 7 days of receipt of additional information or documentation, whichever is later.
 - 1. Architect/Engineer of Record's decision following review of proposed substitution will be noted on the submitted form.

2. Use the product specified if the Architect/Engineer of Record cannot make a decision on the use of a proposed substitute within the time allocated.

END OF SECTION 01 25 00

SECTION 01 25 00.01 - SUBSTITUTION REQUEST FORM

FACILITY/PROJECT: _____

TO: ARCHITECT/ENGINEER OF RECORD: _____

CC: BOARD'S REPRESENTATIVE: _____

DATE SUBMITTED: _____

GENERAL CONTRACTOR: _____

SUBMITTING CONTRACTOR: _____

(if different from GC)

Address: _____

Contact Name: _____

Phone Number: _____

Email Address: _____

Referenced Specification Section: _____ **Paragraph:** _____

REQUESTED SUBSTITUTION:		In Lieu of Specified Manufacturer/Product:
Manufacturer Name		
Product/Model		
Manufacturer Address		
Contact Name		
Phone Number		

Reason For Substitution (select one of the following):

- ☐ The specified product or method of construction is no longer available.
- ☐ There is no condition under which the specified product or method of construction can be installed as shown on the Contract Documents.
- ☐ There is no condition under which the specified product or method of construction can be provided within the time limits of the Contract.
- ☐ Additional benefits (in cost, time, or performance) are available to the Board with the requested substitute product.

Additional Explanation: _____

Attach applicable supporting documentation including, but not limited to, the following (select all that are included with this request):

- ☐ Itemized Comparison of the requested substitution with product specified. **REQUIRED**
- ☐ Performance and Test Data, including performance against specified reference standards. **REQUIRED**
- ☐ Manufacturer's Qualifications: Evidence of manufacturer qualifications and reputation for prompt delivery and efficiency in servicing products. **REQUIRED**
- ☐ Previous Installations: Attach list of not less than 5 similar projects on which proposed substitution was used. List projects in the Chicago area. List name and address of project, date of installation, and name, address, and phone number of Architect. **REQUIRED**
- ☐ Color Chart, illustrating Manufacturer's full range. **IF APPLICABLE**
- ☐ Installation Instructions. **IF APPLICABLE**
- ☐ Maintenance Instructions. **IF APPLICABLE**
- ☐ Changes in Work: Attach data relating to changes required in other work to permit use of proposed substitution and changes required in construction schedule. **IF APPLICABLE**
- ☐ Cost Data: Attach accurate cost data on proposed substitution in comparison with product specified. **IF APPLICABLE**

In making this request for substitution, the Submitting Contractor and General Contractor represents that:

- a. Contractor has examined the Contract Documents and investigated the proposed product/system and has determined that the proposed substitution is appropriate for the use intended for this Project and shall meet or exceed the quality level of the specified product/system.
- b. Contractor shall provide the same warranties for the substituted product/system as required for the product/system specified.
- c. Contractor shall coordinate installation of accepted substitution into Work and make changes to other Work that may be required for the Work to be complete with no additional cost to the Board.
- d. Contractor waives all claims for additional costs related to accepted substitutions that may subsequently become apparent.
- e. Cost data is complete and includes all related costs for this Project.

Submitting Company Name:

Authorized Signature:

Printed Name:_____ ***Date:***_____

REVIEWED BY INSTALLER: (company name):_____

Signature:_____ ***Date:***_____

REVIEWED BY MANUFACTURER: (company name):_____

Signature:_____ ***Date:***_____

REVIEWED BY GENERAL CONTRACTOR: (company name):_____

Signature:_____ ***Date:***_____

Requests that are not complete will be returned by the AOR/EOR for additional information.

Requests that do not meet CPS requirements for acceptable substitutions will be rejected.

AOR/EOR REVIEW: The submitted information has been reviewed by the Architect/Engineer of Record and found to be complete and meets the Board requirements for acceptable substitution

Agreement By (Name):

AOR/EOR Firm Name:_____ ***Date:***_____

CPS REVIEW:

Substitution **Accepted** by CPS: _____ Date: _____ Submit substituted product for review

Substitution **Rejected** by CPS: _____ Date: _____ Submit specified product for review

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections, apply to this section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 01 32 00 – Construction Progress Documentation for requirements for CPM scheduling and reporting progress of work.

1.3 CHANGE IN MANAGEMENT

- A. It is the expectation of City Colleges of Chicago (CCC or Owner) that the Contractor and Architect of Record will resolve many (any) potential RFIs through early coordination and review. A preconstruction meeting and detailed technical review of the project documents shall occur prior to performing any work.
- B. Change Orders may increase or decrease the scope and/or value and/or duration of the contract and are carried out under the conditions of the original contract.
- C. All matters involving Potential Change Orders are to be brought to immediate attention of the Construction Management Advisor (CM), Architect, and Owner.
- D. Only the CCC Board has the authority to approve changes in the scope of work or the schedule of a project.
- E. Absolutely no additional work shall be performed by the Contractor without an approved Change Order, regardless of the nature of the change or magnitude of cost/schedule impact.

1.4 REQUESTS FOR INFORMATION

- A. In the event the Contractor or Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation, the Contractor shall submit a "Request for Information" (RFI) in writing to the CM, Architect and Owner. A RFI may only be submitted by the Contractor and shall only be submitted using the RFI form in the web-based project management system designated by CCC. The Contractor shall clearly and concisely set for the issue for which the clarification or interpretation is sought and why a response is needed. In the RFI, the Contractor

shall set forth an interpretation or understanding of the requirement along with reasons why such and understanding was reached.

- B. Responses to RFI shall be issued within five (5) work days of receipt of the Request from the Contractor unless the CM determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the CM, the CM will, within three (3) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contractor submits a RFI on a time sensitive activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the CM to respond to the request provided that the CM or Architect responds within the five (5) working days set forth above. However, the CM will assist the AOR and Owner in expediting responses to time sensitive RFIs.
- C. Responses from the CM will not change any requirements of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written notice to the CM requesting a Contract Change for the work. Failure to give such written notice within five (5) working days, shall waive the Contractor's right to seek additional time or cost. If a RFI response results in the changes to the work, the AOR through the CM shall issue a Field Directive. The Contractor shall then proceed in accordance with the provisions of the "Field Directive" paragraph of this specification.

1.5 MINOR CHANGES IN THE WORK

- A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on "Architect's Supplemental Instructions." (ASI)
- B. The Contractor shall examine the ASI and either confirm in writing that there will be no cost/schedule impact or notify the CM of potential cost/schedule impacts. The Contractor shall not proceed with work without an approved Change Order from the Owner.

1.6 BULLETINS

- A. The Architect or CM will issue a detailed description of the proposed Changes in the Work that may require adjustment to the Contract Amount or the Contract Time. The proposed Change Description will be issued through a Bulletin. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Bulletins issued by the Architect or CM are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within five (5) workdays of the receipt of a Bulletin, submit a Change Order Request with the required information necessary to execute the change to the CM for the Architect's/Owner's review.

1.7 FIELD DIRECTIVE

- A. The Architect through the CM may issue a Field Directive as authorized by the Owner. The Field Directive instructs the Contractor to Proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. The Field Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.

2. Prior to performing any work pertaining to the Field Directive, the Contractor shall provide a not-to-exceed estimate for cost and schedule impact.
 3. Contractor may proceed with the Work upon Owner approval of the not-to-exceed estimate.
- B. Documentation: The Contractor shall maintain detailed records on a time and material basis of work required by the Field Directive.
1. The change in the Contract Sum and Contract Time resulting from the issuance of a Field Directive will be based on a Change Order Request.
 2. After completion of the change, submit and itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
 3. The final value shall be negotiated based on the supporting data to determine the value of the work.

1.8 CHANGE ORDER REQUEST

- A. When either a RFI from the Contractor or a Bulletin from the Architect or CM results in conditions that may require modifications to the Contract, the Contractor may propose changes by submitting a Change Order Request (COR) to the CM.
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 Contract Sum and Contract Time.
 2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made.
 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" If the proposed change requires an equal or substitution of one product or system for a product or system specified.
 5. If the proposed change of Work will have an effect on the Contract Time, submit a Time Impact Analysis detailing the effect of the change on the Contract Time.
 6. 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.
- B. Change Order Request Forms: Use the Potential Change Order from in the Owner designated web-based project management system.
- C. Markups: Comply with the requirements of Specification 00300, Section 3.03.
- D. A COR cannot be submitted without either prior submission of a RFI from the Contractor or as a response to a Bulletin or Field Directive submitted by the Architect or Owner.
- E. CORs shall be submitted to the CM within five (5) workdays after receipt of RFI response, issuance of Bulletin, or completion of work resulting from a Field Directive.
- F. Responses to CORs shall be issued within five (5) workdays of receipt of the Request from the Contractor unless the CM or Owner determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the CM, the CM will, within three (3) workdays of receipt of the request, notify the Contractor of the anticipated response time.

1.9 CONTRACT CHANGE ORDERS

- A. An Owner's approval of a Change Order Request, the CM will issue a Change Order for signatures of Owner and Contractor.
- B. The project Schedule and Schedule of Values shall be updated to reflect the effects of executed Change Orders.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project Web site.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.
 - 4. Section 01 91 13 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.3 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 SUBMITTALS

- A. Contractor's Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

- c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
- 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 - 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 - 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 - 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 - 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 - 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 - 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 - 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are

otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

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

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.

1.5 REQUESTS FOR INFORMATION (RFIs)

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

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

- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect and Construction Manager.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

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

- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow 15 working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly in Software log with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT WEB SITE

- A. Use Owner's Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:
1. Project directory.
 2. Project correspondence.
 3. Meeting minutes.
 4. Contract modifications forms and logs.

5. RFI forms and logs.
 6. Task and issue management.
 7. Photo documentation.
 8. Schedule and calendar management.
 9. Submittals forms and logs.
 10. Payment application forms.
 11. Drawing and specification document hosting, viewing, and updating.
 12. Online document collaboration.
 13. Reminder and tracking functions.
 14. Archiving functions.
- B. Provide up to seven Project Web site user licenses for use of the Owner, Construction Manager, Architect, and Architect's consultants. Provide software training at Architect's office for Project Web site users.
- C. On completion of Project, provide one complete archive copy(ies) of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.

1.7 PROJECT MEETINGS

- A. General: Contractor Schedule and conduct meetings and conferences at Project site unless otherwise indicated. Conduct additional progress meetings as requested by the CM or Architect or as required by the progress of the Work and the status of M/WBE participation and workforce diversity.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after the "Notice to Proceed" letter date by the Construction Manager to be held at the project site.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.

- i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises and existing building.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.

- u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements to plan, for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Special reports.
- B. Related Requirements:
 - 1. 01 10 00 "Summary", for preparing and combined CPM Schedule.
 - 2. 01 33 00 "Submittal Procedures" for submitting schedules and reports.

1.3 DEFINITIONS

- A. Owner: The City Colleges of Chicago.
- B. CM: Construction Manager Advisor. Initial point of contact between the Owner, Architect, and Contractor.
- C. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- D. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- E. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

- F. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- G. Event: The starting or ending point of an activity.
- H. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.
- B. Startup construction schedule.
- C. CPM Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Procurement Report: List all procurement activities sorted in order of the item being procured.
 - 5. Narrative Report: The project scheduler shall describe the nature of the submission, interpretation of calculations, issues affecting progress and a milestone analysis comparing progress against the baseline and updated schedules.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Daily Construction Reports: Submit at weekly intervals.
- G. Material Location Reports: Submit at weekly intervals.
- H. Site Condition Reports: Submit at time of discovery of differing conditions.
- I. Special Reports: Submit at time of unusual event.
- J. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages, area separations, interim, and milestones.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review submittal requirements and procedures.
 - 7. Review time required for review of submittals and resubmittals.
 - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 - 10. Review and finalize list of construction activities to be included in schedule.
 - 11. Review procedures for updating schedule.

1.6 QUALITY ASSURANCE

- A. Prescheduling Conference: The Owner may, at its discretion, conduct a conference at the Project Site to review the methods and procedures related to the Baseline Schedule and the CPM Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss coordination, including phasing, work stages, area separations, interim milestones and Beneficial Occupancy.
 - 4. Review delivery dates for Owner-furnishes products.
 - 5. Review time required for review of submittals and resubmittals.
 - 6. Review requirements for tests and inspections by independent testing and inspection agencies.
 - 7. Review time required for completion and startup procedures.
 - 8. Review and finalize list of construction activities to be included in schedule.
 - 9. Review submittal requirements and procedures.
 - 10. Review procedures for updating schedule.

1.7 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts,] submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- B. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and commissioning.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 - 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 - 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

- a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- E. Changes in the Work: The Contractor shall furnish sufficient forces, construction plant and equipment to ensure the prosecution of the work in accordance with the approved progress schedule. If the Contractor falls behind the progress schedule, the Contractor shall take such steps as shall be necessary to improve his progress and to comply with the progress schedule and as will meet with the approval of the City Colleges of Chicago. Unless determined otherwise through the issuance of a Change Order, this re-sequencing shall be completed at Contractor's sole cost and expense.

The only means of changing the completion milestones of the Project is through the Change Order provisions set out in specification 01 26 00 – Contract Modification Procedures. The Contractor must identify, at the time that a change in the Work is identified, what, if any, activities are impacted by the change and/or what new activities are impacted by the change and/or what new activities that are required to sufficiently depict the change Work in the CPM schedule. All direct and indirect impacts from changed conditions must be indicated in the schedule and in accordance with the Contract Documents. For each proposed change and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall CPM schedule.

In the event of an approved time extension, the Contractor shall revise the Project Baseline Schedule as a necessary to

- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 - 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Main events of activity.
 - 4. Immediate preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float or slack time.
 - 9. Average size of workforce.
 - 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.2 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Work Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

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

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

3. Material stored following previous report and remaining in storage.

- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.3 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within [one] <Insert number> day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

- A. RELATED DOCUMENTS
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- C. Individual requirements for submittals are described in other pertinent Sections of the specifications.
- D. Air infiltration testing specification.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
 - 1. Submittal schedule.
 - 2. Shop Drawings.
 - 3. Product Data.
 - 4. Samples.
 - 5. Quality assurance submittals.
 - 6. Project closeout documents.
- B. Administrative Submittals: Refer to other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
 - 1. Permits.
 - 2. Application for Payment
 - 3. Performance and payment bonds.
 - 4. Insurance certificates.
 - 5. List of subcontractors.

1.3 DEFINITIONS

- A. Coordination Drawings: Drawings that show the relationship and integration of different construction elements that require careful coordination during fabrication and/or installation to fit in the space provided or to function as intended.
- B. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- C. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

- D. Field Samples: Full-size physical examples erected on-site to illustrate finishes, coating, or material finish materials. Field samples are used to establish the standard by which the Work will be judged.
- E. Mockups: Full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.
- F. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- G. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
- B. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 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.
 - 1. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 2. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's and Construction Manager's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
- a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Autodesk Revit 2021 and AutoCAD 2018.
 - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
 - d. Digital File will be made available using online digital transfer method via cloud based or file transfer protocol.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance 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.
 3. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 4. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of Work to permit processing.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 6. Information on the submittals shall conclusively specify how submitted product compares with that specified as to material, capacity, stages, finish, color, accessories, working pressures, dimensions, insulation, etc.
 7. Catalog cuts showing more than one model of a product shall be clearly marked indicating which model is being submitted on.

8. Capacity and performance data shall be given in the same form, units and completeness used on Contract Documents.
 9. Identifying symbols used on Drawings shall be clearly cross-referenced on the submittal.
 10. Identify room names and numbers in which various products will be installed.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
 4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively].
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittal with performance and 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 reserve the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
 3. Processing: To avoid the need to delay installation as a result of the time required to process submittals; allow sufficient time for submittal review, including time for resubmittals.
 - a. Allow 10 workdays 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 submittals.
 - c. If an intermediate submittal is necessary, process the same as the initial submittal.
 - d. Allow 10 workdays for reprocessing each submittal.
 - e. 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.
 4. Information on the submittals shall conclusively specify how submitted products compares with that specified as to material, capacity, stages, finish, color, accessories, working pressures, dimensions, insulation, etc.
 5. Catalogue cuts showing more than one model of a product shall be clearly marked indicating which model is being submitted on.

6. Capacity and performance data shall be given in the same form, units and completeness used on Contract Documents.
7. Identify room names and numbers in which various products will be installed

Post electronic submittals as PDF electronic files directly to [Project Web site] [Architect's FTP site] specifically established for Project.

 - a. Architect, through Construction Manager,] will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
8. Submit electronic submittals via email as PDF electronic files.
 - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
9. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

2.2 Submittal Register

- A. Contractor shall prepare a register of all required submittals and submit to the CM and Architect within fifteen days of Notice To Proceed date and before any materials, equipment, or fixtures are purchased. The Project Baseline Schedule shall also list all submittals. An updated submittal register that identifies the submittal for the next thirty (30) workdays shall be issued at each monthly progress and payment review meeting.
 1. Include all submittals required by the Contract Documents.
 2. Organize the schedule by the applicable Contract Document section number.
 3. Indicate the submittal date scheduled for each required submittal.
 4. Indicate the type of each submittal (i.e., schedule, shop drawing, product data, samples, etc.)
 5. Indicate which submittals required by separate provisions of the Contract Documents are to be submitted and reviewed simultaneously because they describe related work.
 6. For all work specified in Division 21 through Division 28, submittal to include manufacturer's name and product data. Additional submittal requirements are described in specific sections.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the 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.
- C. 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.

2.3 Product Data:

- A. Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable. 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.
 - g. Maintenance Manuals.
 3. Do not submit Product Data until compliance with requirements of Contract Documents has been confirmed.
 4. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
 5. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Rough-in diagrams and templates.
 - e. Statement of compliance with specified referenced standards.
 - f. Testing by recognized testing agency.
 - g. Application of testing agency labels and seals.
 - h. Notation of coordination requirements.
 - i. Availability and delivery time information.
 6. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 7. Submit Product Data before or concurrent with Samples.
 8. Submit Product Data in the following format:
 - a. PDF electronic file.
 9. 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 installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.

2.4 SHOP DRAWINGS

- A. Prepare Project-specific information, drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not base Shop Drawings on reproductions of the 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.
1. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates, and similar Drawings.
 2. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products and materials included by sheet and detail number.
 - c. Schedules.
 - d. Compliance with specified standards.
 - e. Notation of coordination requirements.
 - f. Notation of dimensions established by field measurement.
 - g. Relationship and attachment to adjoining construction clearly indicated.
 - h. Seal and signature of professional engineer if specified.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
 4. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 5. BIM File Incorporation: Contractor to Develop and incorporate Shop Drawing files into Building Information Model established for Project.
 - a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings, Autodesk Revit 2021.
 - b. Refer to Section 013100 "Project Management and Coordination" for requirements for coordination drawings.

2.5 SAMPLES

- A. Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed. Samples are 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 and pattern.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:

- a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit [three] sets of Samples. Architect and Construction Manager will retain [two] Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least [three] sets of paired units that show approximate limits of variations.

2.6 PRODUCT SCHEDULE

- A. As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:
 - a. PDF electronic file.

2.7 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 applicable Specification Sections.

2.8 PROJECT CLOSEOUT SUBMITTALS

- A. Refer to Section 01 77 00 for complete project closeout information.

Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- B. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- C. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- D. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- E. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- F. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- G. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- H. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- I. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- J. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- K. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- L. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- M. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- N. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- O. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- P. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- Q. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- R. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

- S. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.9 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM File Incorporation: Contractor to Incorporate delegated-design drawing and data files into Building Information Model established for Project.
 - 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings, Autodesk Revit 2021.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:
 - 1. Review for Record Only
 - 2. Revise and Resubmit
 - 3. Approved
 - 4. Approved as Noted
 - 5. Rejected
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals will be rejected.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01 33 29 - LEED SUSTAINABLE DESIGN REPORTING

PART 1 - GENERAL

1.01 PROJECT GOALS

- A. This project has been designed to achieve the LEED Silver (minimum 50 points) rating as defined in USGBC LEED v4-BD+C for Schools and is pursuing MR Building Product Disclosure and Optimization and EQ Low-Emitting Materials Credits.
- B. A copy of the LEED Project checklist is attached at the end of this Section for information only.
- C. Contractor to furnish and install the LEED plaque upon project certification. Location to be determined by AOR.
- D. Free-standing furniture and furnishings are not included in the Contract.
- E. Contractor is not responsible for the application for certification, nor for determination of methods of achieving sustainable design credits unless specifically so indicated.
- F. Many of the sustainable design credits can be achieved only through intelligent design of the project and are beyond the control of the Contractor. However, certain credits relate to the products and procedures used for construction. Therefore, the full cooperation of the Contractor and subcontractors is essential to achieving final certification.
- G. Contractor shall familiarize themselves with the relevant requirements and provide the necessary information and instruction to all subcontractors and installers.
- H. It is at the option of the AOR/ Design team to submit individual credits under the standards of USGBC BD+C LEED v4.1 for Building Design and Construction.

1.02 DEFINITIONS

- A. Refer to definitions provided in USGBC BD+C v4 and v4.1 - Reference Guide for Building Design and Construction.
- B. Product Reporting Scope: All products specified in Divisions 2 through 10, 31, and 32, and the following:
 - 1. All paints, coatings, adhesives, and sealants that are used but not specified.
 - 2. Composite wood that is permanently installed but not specified.
- C. Bio-Based Content: Of vegetable or animal origin, not including products made by killing the animal.
 - 1. Determine percentage of bio-based content in accordance with ASTM D6866.
 - 2. It is recommended that bio-based content must be sourced from a Sustainable Agriculture Network certified farm.
- D. Cradle-to-Cradle Certified: End use product certified or Cradle-to-Cradle v3 Bronze, minimum, as evidenced by C2C (DIR).

- E. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
 - 1. Good: Product-specific; compliant with ISO 14044.
 - 2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 - 3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 - 4. Where demonstration of impact reduction below industry average is required, submit a compliant embodied carbon optimization report or action plan separate from the LCA or EPD. Compliant products must conform to ISO 14025, ISO 14040, and EN 15804 or ISO 21930.
- F. GreenScreen Chemical Hazard Analysis: All ingredients of 100 parts-per-million or greater evaluated using GreenScreen (METH).
 - 1. Good: GreenScreen (LIST) evaluation to identify Benchmark 1 hazards; a Health Product Declaration includes this information.
 - 2. Better: GreenScreen Full Assessment.
 - 3. Best: GreenScreen Full Assessment by GreenScreen Licensed Profiler.
 - 4. Acceptable Evidence: GreenScreen report.
- G. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using HPDC (Tool); HPD's with "unknown" listed for any hazard will not be considered acceptable.
- H. Manufacturer's Inventory of Product Content: Publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CAS RN).
 - 1. For ingredients considered a trade secret or intellectual property, the name and CAS RN may be omitted, provided the ingredient's role, amount, and GreenScreen Benchmark are given.
- I. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
 - 1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
 - 2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
 - 3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of all material in the item.
 - 4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
 - 5. Post-consumer material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 6. Pre-consumer (post industrial) material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
 - 7. Acceptable Evidence:
 - a. For percentage of recycled content, information from manufacturer.
 - b. For cost, Contractor's cost data.

- J. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
 - 1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
 - 2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.
- K. Source Location: Location of harvest, extraction, recovery, or manufacture; where information about source location is required to be submitted, give the postal address:
 - 1. In all cases, indicate the location of final assembly.
 - 2. For harvested products, indicate location of harvest.
 - 3. For extracted (i.e. mined) products, indicate location of extraction.
 - 4. For recovered products, indicate location of recovery.
 - 5. For products involving multiple manufacturing steps, provide a description of the process at each step, with location.
 - 6. Acceptable Evidence:
 - a. Manufacturer's certification.
 - b. Life cycle analysis (LCA) performed by third-party.
- L. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by one of the following:
 - 1. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit <http://www.fsccanada.org>, for the USA visit <http://www.fscus.org>.
 - 2. Acceptable Evidence: Copies of invoices bearing the certifying organization's certification numbers.
- M. Extended producer responsibility (EPR) is an approach for products in which the producer or manufacturer's responsibility for the product is extended to the post-consumer stage of a product's life cycle, generally this entails a take-back or recycling program run by the manufacturer that includes the product under consideration.
 - 1. Acceptable Evidence: Documentation can be sought to confirm extended manufacturer responsibility or program run by third party affiliated with manufacturer in form of program brochures, specific product inclusion in program, recycling details, and contact information.

1.03 REFERENCE STANDARDS

- A. ASTM D6866 - Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis; 2016.
- B. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute; www.c2ccertified.org/products/registry.
- C. ISO 14044 - Environmental management -- Life cycle assessment -- Requirements and guidelines; 2006.
- D. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.
- E. ISO 14040 - Environmental management -- Life cycle assessment -- Principles and framework; 2006.
- F. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services; 2017.

- G. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products; 2013.
- H. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.
- I. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.
- J. HPDC (Tool) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; <http://www.hpd-collaborative.org/>.
- K. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.
- L. USGBC LEED v4-BD+C - LEED v4 for Building Design and Construction; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for additional submittal procedures.
- B. Sustainable Design Documentation: The scope of required documentation is primarily specified in this section. Some individual sections may provide additional information on required documentation. Contractor is responsible for submitting all documentation necessary to demonstrate compliance with credits indicated in the LEED Project Checklist.
- C. New Product Documentation: For each new product in the Product Reporting Scope, submit the Material Content Form per Section 01 33 29.04 - LEED Material Content Form, with evidence of compliance attached.
- D. Product Cost Statement: Submit the total cost of all products defined as in the Product Reporting Scope, above, including purchase price, taxes, and delivery to site, but not labor, tools, or equipment for installation; submit prior to or along with initial application for payment; update and re-submit whenever the total cost changes due to contract modifications. Note: costs apply to materials within the defined LEED boundary only.
- E. LEED specific submittal log identifying which material sections will include LEED submittals for review.
- F. Qualifications Statement: for LEED Coordinator indicating experience in accordance with the Qualifications requirements of this section.
- G. Sustainable Design Action Plans: Within fifteen days (unless otherwise indicated) of date established for the Notice to Proceed (NTP), provide preliminary submittals indicating how the following requirements will be met. Contractor to identify and confirm in the action plans which LEED version and which options are being pursued:
 - 1. SS Prerequisite Construction Activity Pollution Prevention: Provide sediment and erosion control plan, specific to the site, that complies with the erosion and sedimentation requirements of the 2012 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP) or local equivalent, whichever is more stringent. Provide written plan. Include sample logs and inspection report.
 - a. Include site plan identifying the following:

- 1) Construction boundary. If project will be phased, include multiple site plans addressing all phases of the construction boundary
 - 2) Construction boundary dust mitigation measures (ie: location of silt fencing)
 - 3) Location of inlets to be protected throughout duration of construction
 - 4) LEED boundary for reference
 - b. Reiterate Civil calculations which may include:
 - 1) Identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - 2) New improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - 3) Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - c. Include narrative describing the program and maintenance.
 - d. Product data of materials used within ESCP (ie: filter baskets, silt fencing, rock, etc)
 - e. Sample inspection report.
 - f. Implementation
 - 1) Maintain Erosion and Sediment control measures in good order throughout the project. Monthly Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished. Include date stamped photographs.
2. MR Prerequisite and Credit Construction and Demolition Waste Management: Waste management plan complying with Section 01 74 19 - LEED Construction Waste Management and Disposal.
3. MR Credit - Building Product Disclosure and Optimization (BPDO) Action Plan (v4.1)
 - a. Action Plan Requirements:
 - 1) Submit written Materials & Resources BPDO Action Plan that addresses project goals and how credits will be pursued in the following three credit sections: Environmental Product Declarations (EPD), Sourcing of Raw Materials and Material Ingredients.
 - 2) Include list of proposed products for each credit section, list of FSC-certified wood products, estimated costs of proposed products, and anticipated location valuation factor if pursuing locally manufactured materials.
 - 3) Include sample forms to be used to track materials and progress of credit achievement.
4. IEQ Credit Low-Emitting Materials: List of proposed low-emitting materials and VOC limit and/or certification path for each material. Identify which options will be pursued. Choose a minimum of three options. Submit plan within thirty days of NTP.
 - a. Submit written plan with summary of project requirements, compliance standards and goals for EQ Low Emitting Materials Credits.
 - b. Identify product categories being pursued to achieve credit and how each product category will comply with standards of LEED v4.1.
 - c. Provide sample of Low Emitting Material Calculator to be used to track low-emitting materials
5. IEQ Credit Construction Indoor Air Quality Management Plan: provide written plan. Submit plan within thirty days of NTP.
 - a. Submit a written Construction IAQ Management Plan describing IAQ control measures to be implemented during construction, complying with Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008, Chapter 3.
 - b. The plan must address the following five categories of IAQ control measures. See LEEDv4 standards and SMACNA guidelines for requirements.
 1. HVAC Protection

2. Source Control
3. Pathway Interruption
4. Housekeeping
5. Scheduling
- c. Documentation Requirements:
 - 1) Monthly field reports that include at least six photographs, for a total of at least 36 photos across six different times during the construction period, documenting implementation of IAQ control measures taken and including a brief description of the SMACNA approach shown. Applicable SMACNA approaches described in the IAQ plan must be documented. Photos are to have integral date stamp or be labeled with date taken. Dates of deficiencies and their respective correction actions are to be documented.
 - 2) Product data and photo documentation of temporary and permanent filtration media, MERV 8 minimum when tested in accordance with ASHRAE Std 52.2-2007.
 - 3) Photo documentation of filter change-outs.
 - 4) Documentation confirming smoking was not allowed inside the building or within 25 feet of building entrance during construction.
 - 5) Duct and Terminal Unit Inspection Report.
 - 6) Schedule of temporary use of building mechanical equipment (if applicable)
 - 7) Duct testing and cleaning reports (if applicable)
6. IEQ Credit Indoor Air Quality Assessment: provide written plan. Submit plan within thirty days of NTP.
 - a. Pursue LEED Option 2 - Air contaminant testing, building flush out as credit path is not allowed. Refer to LEED v4 for Air testing contaminant limits for compliance standards for air testing. Submit written plan to include the following:
 - 1) Air testing schedule including the following dates:
 - a) Substantial completion
 - b) Punch list completion (All paint and sealants done)
 - c) Furniture delivery
 - d) MEP system start up
 - e) Proposed Air testing Date
 - f) Back-up Air testing Date
 - g) Occupancy
 - 2) LEED v4.0 air testing thresholds
 - 3) Sample report
 - 4) Proposed Air testing locations
- H. Sustainable Design Progress Reports: Concurrent with each Application for Payment, or as otherwise directed by the Owner's Representative, submit reports comparing actual construction and purchasing activities with Sustainable Design Action Plans for materials within the LEED boundary. Use tracking tools similar to the Building Product Disclosure and Optimization Calculator and the Low-Emitting Materials Calculator, available in LEED On-Line Credit Resources, to document progress for the following:
 1. Track project completion dates and schedule
 2. SS Prerequisite Construction Activity Pollution Prevention: Construction Activity Pollution Prevention photos illustrating compliance. Provide date stamped photos, inspection logs and reports, and descriptions of corrective action.
 3. MR Credit Construction and Demolition Waste Management: Waste reduction progress reports complying with Section 01 74 19 - LEED Construction Waste Management and Disposal.
 4. MR Credit Building Product Disclosure and Optimization - Environmental Product Declarations
 5. MR Credit Building Product Disclosure and Optimization - Sourcing of Raw Materials
 6. MR Credit Building Product Disclosure and Optimization - Material Ingredients

7. IEQ Credit Low-Emitting Materials - Proposed/Used Products
 8. IEQ Credit Construction Indoor Air Quality Management Plan: Photographs and detailed photo log demonstrating compliance with Construction IAQ Management Plan
 9. Contractor shall use tracking tools similar to the Building Product Disclosure and Optimization Calculator and the Low-Emitting Materials Calculator, available in LEED On-Line Credit Resources, to document progress with respect to the respective credits.
 10. Commissioning Activities: Report in format approved by the Owner's Representative.
- I. Sustainable Design Documentation for LEED Rating Compliance:
1. SS Credit Heat Island Reduction: Product Data for roofing materials indicating emittance percentages, reflectance percentages, and Solar Reflectance Index value compliance for non-vegetated roof systems.
 2. SS Credit Heat Island Reduction: Product Data for interior and exterior lighting fixtures that stop excessive direct-beam illumination from leaving the building site.
 3. WE Credit Indoor Water Use Reduction: Product Data for plumbing fixtures indicating flow.
 4. EA Prerequisite Fundamental Refrigerant Management: Product data on HVAC equipment indicating absence of CFC refrigerants.
 5. EA Credit Enhanced Refrigerant Management: Product Data for new HVAC equipment indicating compliance with credit and use of refrigerants with low ozone depletion and global warming potential.
 6. EA Prerequisite Building-Level Water Metering: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of sub-systems.
 7. MR Credit Construction and Demolition Waste Management: Comply with Section 01 74 19 - LEED Construction Waste Management and Disposal.
 8. MR Credit Building Product Disclosure and Optimization - Environmental Product Declarations: Provide product Life-Cycle Assessment conforming to ISO 14044 with at least a cradle to gate scope, or Environmental Product Declaration conforming to ISO 14025, 14040, 14044 and EN 15804 or ISO 21930 with at least a cradle to gate scope.
 9. MR Credit Building Product Disclosure and Optimization - Sourcing of Raw Materials:
 - a. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating material costs for each product having recycled content.
 - b. Product data for regional materials indicating location and distance from Project and material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating material cost for each regional material and the fraction by weight that is considered regional.
 - c. Product data and chain-of-custody certificates for products containing certified wood, including for the forest, transport if required due to change in ownership of the material or product, supplier/manufacturer/millworker, and vendor. Include vendor invoices for all permanently installed wood products, indicating wood product, whether or not FSC certified, dollar value, and vendor's COC certificate number if applicable. Include statement indicating cost for each certified wood product. Include statement indicating total cost of wood products.
 - d. For all permanently-installed wood products, both FSC-certified and not, provide vendor invoices including prices for all wood products on a line-item basis. A vendor is defined as the company that sells wood products to building project contractors or subcontractors. Each vendor invoice must provide a line-item identification of each wood product, identify FSC products as FSC Pure or 100%, FSC Mixed Credit or FSC Mixed 70% minimum. The \$ value of each line item and the vendor's chain-of-custody number must be shown on any invoice that contains FSC products.

- e. For all applicable Bio-based materials, provide documentation showing that product is certified under the USDA BioPreferred Voluntary labeling initiative, or tested under ASTM Test Method D6866 or equivalent method. If further applicable, provide documentation that product is certified to the Sustainable Agriculture Network (SAN) Standard by the Rainforest Alliance.
 - f. For products included under extended producer responsibility programs, provide program brochures showing specific product inclusion in program, recycling details and contact information.
- 10. MR Credit Building Product Disclosure and Optimization - Material Ingredients: Provide documentation demonstrating the chemical inventory of the product to at least 0.1% (1000 ppm) using one of the USGBC approved programs
- 11. IEQ Credit Low-Emitting Materials
 - a. Adhesives & Sealants: Submit Certification demonstrating that all adhesives and sealants installed in the building interior (defined as inside of the weatherproofing system and applied on-site) shall meet the testing and product requirements of the with the testing and product requirements of the California Department of Public Health Services Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources using Environmental Chambers, v.1.2-2017 AND submit manufacturer's product data demonstrating that all adhesives, sealants, and sealant primers installed in the building interior comply with The VOC content of Adhesives, Sealants and Sealant Primers must be less than the current VOC content limits established by the South Coast Air Quality Management District (SCAQMD) Rule #1168 corresponding to an effective date of July 1, 2005 and rule amendment of January 7, 2005.
 - b. Paints & Coatings: Submit Certification Demonstrating that all paints and coatings installed in the building interior shall meet the testing and product requirements of the California Department of Public Health Services Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources using Environmental Chambers, v.1.2-2017 AND submit manufacturer's product data demonstrating that all architectural paints and coatings installed in the building interior do not exceed the VOC and chemical component limits established by the California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule #1113 corresponding to an effective date of June 3, 2011.
 - c. Flooring: Submit Certification demonstrating that all flooring elements installed in the building interior shall meet the testing and product requirements of the California Department of Public Health Services Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources using Environmental Chambers, v.1.2-2017.
 - d. Composite Wood: Submit Certification demonstrating that all composite wood and agrifiber products installed in the building interior shall meet the testing and product requirements of the California Air Resources Board ATCM for formaldehyde requirements for ultra-low - emitting formaldehyde (ULEF) resins or no added formaldehyde resins.
- 12. IEQ Credit Construction Indoor Air Quality Management Plan:
 - a. Construction indoor-air-quality management plan based on SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008, Chapter 3.
 - b. Product data for temporary filtration media.
 - c. Product data for filtration media used during occupancy.
 - d. Construction Documentation: At least six photographs at six different times during the construction period, for a total of at least 36 photos, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality

management measures, such as protection of ducts and on-site stored or installed absorptive materials. All applicable SMACNA approaches described in the IAQ plan must be documented.

- e. Provide documentation confirming that smoking was not allowed inside the building during construction.
- 13. IEQ Credit Indoor Air Quality Assessment:
 - a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was installed prior to and replaced after flush-out.
 - b. Product data for filtration media used during flush-out and during occupancy.
 - c. Monitor and record dates, occupancy, outdoor air delivery rates, internal temperature, and humidity, and outdoor temperature and humidity during flush-out period. Provide trend logs for indoor temperature and humidity.
 - d. If Option 2- Air Testing is pursued, provide documentation of testing for baseline, after construction ends and prior to occupancy. Testing protocols and documentation per LEED Requirements.
- 14. IEQ Credit Thermal Comfort: Product Data and Shop Drawings for sensors and control system used to provide individual airflow and temperature controls for minimum 50 percent of individual workstations and for all shared multi-occupant spaces.

1.05 QUALITY ASSURANCE

- A. LEED Coordinator (Employed by Contractor): experienced LEED-Accredited Professional complying with the following to coordinate and assist in planning, execution, and documentation of the LEED requirements.
 - 1. LEED-Accredited Professional
 - 2. Experience working on a minimum of five (5) LEED Certified Projects, including at least one (1) LEED V4 Certified Project.

1.06 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. Sustainable design documentation is to be in electronic (PDF) format and transmitted via the Owner's Internet-based submittal service per Section 01 30 00 - Administrative Requirements.
 - 1. It is the Contractor's responsibility to submit documents in PDF format.
 - 2. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
 - 3. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

PART 2 - PRODUCTS

2.01 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION: ENVIRONMENTAL PRODUCT DECLARATIONS

- A. Environmental Product Declaration (EPD): Use at least twenty products from five different manufacturers that provide declarations of conformance to the following: EPDs for ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 - and other listed criteria; or a USGBC approved program.

2.02 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION: SOURCING OF RAW MATERIALS

- A. Responsible Sourcing of Raw Materials: Use products that meet at least one of the following extraction criteria for at least 30%, by cost, of the total value of permanently installed building products in the project:

1. Wood Products: Provide wood-based material that are certified by the Forest Stewardship Council or USGBC-approved equivalent.
 - a. Recycled Content: Provide building materials with recycled content
 - 1) Cost of post-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 - 2) Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 - 3) Do not include mechanical and electrical components in the calculation. Include only Div 02 through 10 in the calculation.

2.03 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION: MATERIAL INGREDIENTS

- A. Option 1: Material Ingredient Reporting - 1 point. Use at least twenty products from five different manufacturers that use any of the following programs. Manufacturer Inventory (chemical content), Health Product Declaration, Cradle to Cradle v3, Declare (ingredient listed to 1000 parts per million), ANSI/BIFMA Furniture Sustainability Standard, Cradle to Cradle Material Health Certificate bronze level, or USGBC approved program.

2.04 LOW-EMITTING MATERIALS

- A. Adhesives & Sealants:
 1. All adhesives and sealants installed in the building interior (defined as inside of the weatherproofing system and applied on-site) shall meet the testing and product requirements of the California Department of Public Health Services Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources using Environmental Chambers, v.1.2-2017.
 2. Provide product data and MSDS for all adhesives and sealants used inside the weatherproofing system and applied on-site indicating VOC content of each product used. Adhesives, sealants and Sealant Primers shall meet the South Coast Air Quality Management District (SCAQMD) Rule #1168 corresponding to an effective date of July 1, 2005 and rule amendment of January 7, 2005.
- B. Paints & Coatings:
 1. All paints and coatings installed in the building interior shall meet the testing and product requirements of the California Department of Public Health Services Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources using Environmental Chambers, v.1.2-2017.
 2. Provide product data demonstrating that all architectural paints and coatings installed in the building interior do not exceed the VOC and chemical component limits established by the South Coast Air Quality Management District (SCAQMD) Rule #1113 corresponding to an effective date of June 3, 2011.
- C. Flooring: .
 1. All flooring elements installed in the building interior shall meet the testing and product requirements of the California Department of Public Health Services Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources using Environmental Chambers, v.1.2-2017.
- D. Composite Wood:

1. All composite wood and agrifiber products installed in the building interior shall meet the testing and product requirements of the California Air Resources Board ATCM for formaldehyde requirements for ultra-low -emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

PART 3 - EXECUTION

3.01 LEED COORDINATOR RESPONSIBILITIES

- A. Prepare and submit action plans as identified in 1.04.F.
- B. Prepare and submit with each application for payment a LEED progress report.
- C. Procure and submit LEED Documentation submittals.
- D. Procure and submit Building Product Disclosure and Optimization documentation submittals.
- E. Procure and submit Material Content Forms.
- F. Procure and submit Prohibited Content Installer Certifications.
- G. Coordinate the activities of the General Contractor's Superintendent, Waste Management Coordinator, Mechanical System's Coordinator, and Commissioning Agent, relative to complying with LEED requirements and achieving the LEED Rating.
- H. Provide any and all other documents required at any time by the U.S. Green Building Council to support the LEED application for this project.
- I. Prepare and submit the following credits to LEED online in coordination with the design team:
 1. SSsp1 Construction Activity Pollution Prevention
 2. MRp2/MRc5 Construction and Demolition Waste Management
 3. MRc2 Building Product Disclosure and Optimization – Environmental Product Declarations (BPDO EPD)
 4. MRc3 Building Product Disclosure and Optimization – Sourcing of Raw Materials
 5. MRc4 Building Product Disclosure and Optimization – Material Ingredients
 6. Eqc2 Low-Emitting Materials
 7. Eqc3 Construction Indoor Air Quality Management Plan
 8. Eqc4 Indoor Air Quality Assessment
 9. One Innovation Credit
 10. One Pilot Credit

3.02 PROCEDURES

- A. Submit sustainable design documentation using submittal procedures defined in Section 01 30 00 - Administrative Requirements.
- B. Submit sustainable design documentation in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.
- C. Where an item of sustainable design documentation is specified, provide specified information and, where indicated, fill out and submit the appropriate form.

1. Provide specified documentation for each different brand name product and each different manufacturer of a lot of commodity products.
- D. When completing forms, mark each blank with the appropriate information; use "ATT" for items attached; if any item is not relevant use the code "NR"; if any item is not available use the code "NA".
1. Each form must be signed by the entity capable of certifying the information.
 - a. Certification signatures must be made by an officer of the company.
 - b. For products, certification must be made by the manufacturer not the supplier.
 - c. For custom fabricated products, certification by the fabricator is acceptable.

END OF SECTION 01 33 29



LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

Project Name: Malcolm X Addition
Date: 12/5/2023

Y ? N

			1	Credit	Integrative Process	1
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9	7	0	Location and Transportation		16
			Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
	2		Credit	High Priority Site	2
4	1		Credit	Surrounding Density and Diverse Uses	5
4	1		Credit	Access to Quality Transit	5
	1		Credit	Bicycle Facilities	1
	1		Credit	Reduced Parking Footprint	1
	1		Credit	Green Vehicles	1

2	3	5	Sustainable Sites		10
Y			Prereq	Construction Activity Pollution Prevention	Required
		1	Credit	Site Assessment	1
	2		Credit	Site Development - Protect or Restore Habitat	2
	1		Credit	Open Space	1
		3	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1

3	1	7	Water Efficiency		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
1	1	4	Credit	Indoor Water Use Reduction	6
		2	Credit	Cooling Tower Water Use	2
		1	Credit	Water Metering	1

7	9	17	Energy and Atmosphere		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
		6	Credit	Enhanced Commissioning	6
6	6	6	Credit	Optimize Energy Performance	18
	1		Credit	Advanced Energy Metering	1
	2		Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
		2	Credit	Green Power and Carbon Offsets	2

8	0	5	Materials and Resources		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
		5	Credit	Building Life-Cycle Impact Reduction	5
2			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
2			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
2			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

8	8	0	Indoor Environmental Quality		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1	1		Credit	Enhanced Indoor Air Quality Strategies	2
3			Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
2			Credit	Indoor Air Quality Assessment	2
	1		Credit	Thermal Comfort	1
1	1		Credit	Interior Lighting	2
	3		Credit	Daylight	3
	1		Credit	Quality Views	1
	1		Credit	Acoustic Performance	1

6	0	0	Innovation		6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

0	3	1	Regional Priority		4
	1		Credit	Regional Priority: High Priority Site	1
	1		Credit	Regional Priority: Protect or Restore habitat - 2 pt threshold	1
	1		Credit	Regional Priority: Enhanced IAQ Strategies 2pt threshold	1
		1	Credit	Regional Priority: Building Life-cycle impact reduction 3pt threshold	1

43	31	36	TOTALS	Possible Points:	110
Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110					

Alt RP: Rainwater Management, Advanced Energy Metering

SECTION 01 33 29.04 - LEED MATERIAL CONTENT FORM

PROJECT NAME: _____; NO.: PROJECT NUMBER.

Applicable Specification Section Number(s) _____

Product Name: _____ (brand name, model number, etc.)

Manufacturer Name: _____ www. _____

Source Location: _____ (if processed at multiple locations, attach a description; see Section 01 60 00)

PRODUCT CONTENT

Total Weight: _____ pounds per _____ (unit).

Environmental Product Declaration (EPD) _____ is attached or _____ is not available.

_____ % Solid Wood, Wood Chip, and Wood Fiber Content, by weight.

_____ **Product is FSC-trademarked.**

_____ **FSC Chain-of-Custody certificate number is** _____

_____ **SFI Certified** _____ **ATFS Certified** _____ **SFM Certified.**

_____ % Other Bio-Based Content, by weight; sourced from a SAN-certified farm.

_____ % Steel Content, by weight.

_____ **Steel Mill Source is:** _____

_____ **Mill letter describing mill process and typical re-used steel content is attached.**

_____ % PRE-CONSUMER (POST-INDUSTRIAL) RECYCLED CONTENT, BY weight, OTHER THAN STEEL.

_____ % Post-Consumer Recycled Content, by weight, other than steel.

_____ Zero Lead Content.

_____ Zero Asbestos Content.

_____ Zero intentionally added methylene chloride or perchloroethylene (paints and coatings).

_____ Zero intentionally added cadmium (paints and coatings).

EMISSIONS AND HEALTH

Health Product Declaration (HPD) _____ is attached or _____ is not available.

_____ Formaldehyde: Complying with CARB Composite Wood Regulation for ULEF or no added formaldehyde resin.

_____ LOW-EMITTING MATERIAL MEETING REQUIREMENTS OF CAL (CDPH SM), PRIVATE OFFICE SCENARIO.

Wet-Applied Products:

_____ VOC content meeting SCAQMD Rule 1113.

_____ VOC Content: Meeting CARB 2007, SCM for Architectural Coatings.

_____ VOC content meets SCAQMD Rule 1168.

_____ OTHER VOC CONTENT TEST REPORT; SEE SECTION 01 33 29 - LEED Sustainable Design Reporting.

CERTIFIED BY: (MANUFACTURER)

_____ Documentation of all claims made above is attached.

Print Name: _____

Signature: _____

Title: _____ (officer of company), Date: _____

END OF SECTION 01 33 29.04

SECTION 01 33 29.07 - LEED PROHIBITED CONTENT INSTALLER CERTIFICATION

PROJECT NAME: _____; NO.: PROJECT NUMBER.

USE OF THIS FORM

Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.

Contractor is required to obtain and submit this form from each installer of work on this project.

For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].

If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.

VOC content restrictions are specified in Section 01 61 16.

PRODUCT CERTIFICATION

I certify that the installation work of my firm on this project:

[HAS] [HAS NOT] required the use of ADHESIVES.

[HAS] [HAS NOT] required the use of JOINT SEALANTS.

[HAS] [HAS NOT] required the use of PAINTS OR COATINGS.

[HAS] [HAS NOT] required the use of COMPOSITE WOOD or AGRIFIBER PRODUCTS.

___ List of products of these types that were used is attached, with manufacturer and brand name.

___ Product data and MSDS sheets for these products:

___ **Are attached.**

___ **Were submitted as normal submittals.**

___ **Were submitted as sustainable design submittals using the Material Content Form.**

CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

Firm Name: _____

Print Name: _____

Signature: _____

Title: _____ (officer of company)

Date: _____

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Cutting and Patching (for repair and restoration of construction disturbed by testing and inspecting activities): Section 01 73 29.
- C. Specific test and inspection requirements: Divisions 02 through 49 Sections.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are

not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
 2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
 3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most

stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data : For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10days of [Notice of Award] Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager, may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority].
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.

9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- 1.10 QUALITY ASSURANCE
- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, and mockups, do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and

inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Cover mock-ups to protect them from deterioration and weathering.
 7. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings, or in areas approved by Architect. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.11 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order].
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least [24] <Insert number> hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.

- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

- 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.12 REGULATORY REQUIREMENTS

- A. All work to conform to the City of Chicago Building Code.

- B. Electrical Work

- 1. Conform to requirements of ANSI/NFPA 70 and City of Chicago Building Code. Where conflicts arise follow the more stringent requirements.
 - 2. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified.
 - 3. Electrical systems and equipment shall be tested for continuity, proper phase rotation, short circuiting, improper grounding, and other defects, after all equipment, devices, raceways and conductors are installed. If defective condition is present, make all corrections and retest for compliance.
 - 4. Conformance with regulations of electric utility and telephone company is mandatory, and all costs for compliance shall be included in the contract EXCEPT optional/extra facility, reserve capacity charges for emergency 12 kv feeders and other charges which are directly paid by the Owner.
 - 5. Prepare shop drawings required for the submittal of exit and emergency lighting, and life safety and fire alarm systems to the Chicago Fire Prevention Bureau. Submit to agencies and utility companies all submittals required by these agencies for their approval.
 - 6. Notify the Architect of all material believed to be inadequate, unsuitable, in violation of law, ordinances, rules or regulations of authorities having PRODUCTS (Not Used)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

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- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION - 01 43 39 – INTEGRATED EXTERIOR MOCKUPS

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. General Contractor shall provide all labor, materials, equipment, and services necessary or incidental to the completion of all work of this section as shown, herein specified, or otherwise required
 - 1. Section Includes:
 - a. Integrated exterior mockups of exterior wall assembly.

1.2 RELATED WORK

- 1. Section 01 40 00 - Quality Requirements
- 2. Section 01 83 16 - Building Enclosure Field Testing
- 3. Section 01 91 14 - Building Enclosure Commissioning

1.3 DEFINITIONS

- A. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.
- B. Free standing mockups: Air barrier mockups for the purpose of testing water resistance of penetrations.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with CDB, UIS, Architect, testing and inspecting agency representative, and installers of major systems whose Work is included in integrated exterior mockups.
 - 2. Review locations and extent of mockups.
 - 3. Review testing procedures to be performed on mockups.
 - 4. Review and finalize schedule for mockups, and verify availability of materials, personnel, equipment, and facilities needed to complete mockups and testing and maintain schedule for the Work.

1.5 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups.
 - 1. Include plans, elevations, sections, and mounting, attachment and support details.
 - 2. Indicate manufacturer and model number of individual components, subassemblies, and assemblies.
 - 3. Include site location drawing indicating orientation of mockup.
 - 4. Revise and resubmit Shop Drawings to reflect approved modifications in details and component interfaces resulting from changes made during testing procedures.

- B. Delegated Design Submittal: For temporary structural supports for mockups not attached to building structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Preconstruction Test Reports: For integrated exterior mockups.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to CDB and Architect.
- B. Build mockups to do the following:
 - 1. Verify selections made under Sample submittals.
 - 2. Demonstrate aesthetic effects.
 - 3. Demonstrate the qualities of products and workmanship.
 - 4. Demonstrate acceptable coordination between components and systems.
 - 5. Perform preconstruction testing, such as window air- and water-leakage testing as outlined in Section 01 83 16.
 - 6. Test freestanding mockups of the air barrier, substrate and representative attachments for the purpose of testing water resistance of penetrations.
- C. Fabrication: Before fabricating or installing portions of the Work requiring mockups, build mockups for each form of construction and finish required. Use materials and installation methods as required for the Work.
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 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.
 - 7. Construct (3) 4' x 4' freestanding mockups of the air barrier on the specified substrate with all types of masonry anchors, metal girts, clips and attachments that will penetrate the exterior air barrier, for the purpose of testing water resistance of penetrations.
- D. Notifications:
 - 1. Notify Architect 14 days in advance of the dates and times when mockups will be constructed.
 - 2. Notify Architect 14 days in advance of the dates and times when mockups will be tested.
 - 3. Allow seven business days for initial review and each re-review of each mockup.

- E. Approval: Obtain Architect's approval of mockups before starting fabrication or construction of corresponding Work.
 - 1. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 COORDINATION

- A. Coordinate schedule for construction of mockups, so construction, testing, and review of mockups do not impact Project schedule.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance:
 - 1. Seismic Performance: Mockups and support structure to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
 - 2. Wind Loads: As indicated on Drawings.
- B. Mockup Testing Performance Requirements: Perform tests using design pressures and performance criteria indicated for assemblies and products that are specified in other Sections and incorporated into integrated exterior mockups.

2.2 INTEGRATED EXTERIOR MOCKUPS

- A. Construct integrated exterior mockups according to approved mockup Shop Drawings. Construct mockups to demonstrate constructability, coordination of trades, and sequencing of Work; and to ensure materials, components, subassemblies, assemblies, and interfaces integrate into a system complying with indicated performance and aesthetic requirements.
- B. Build integrated exterior mockups using installers and construction methods that will be used in completed construction.
- C. Use specified products that have been approved by Architect. Coordinate installation of materials and products specified in individual Specification Sections that include Work included in integrated exterior mockups.
- D. The Work of integrated exterior mockups includes the following:
 - 1. Masonry veneer.
 - 2. Cast Stone masonry.
 - 3. Cold-formed metal framing and sheathing.
 - 4. Air and weather barriers.

5. Thermal insulation.
 6. Through-wall flashing.
 7. Flashing and sheet metal trim.
 8. Joint sealants.
 9. Metal wall panels.
 10. Aluminum-framed entrances and storefront.
 11. Glazed curtain walls.
 12. Glazing.
- E. Prior to the integrated mock up for the metal wall panel assembly at the penthouse and typical masonry wall assemblies, provide three (3), 4'x4' panels of the typical wall assemblies for preliminary testing of water infiltration at fastener installations.
- F. Photographic Documentation: Document construction of integrated exterior mockups with photographs in accordance with Section 01 32 33 "Construction Photographs." Provide photographs showing details of interface of different materials and assemblies.
1. Document testing procedures, including water leakage and other deficiencies. Photograph modifications to component interfaces intended to correct deficiencies.
- G. Provide and document modifications to construction details and interfaces between components and systems required to properly sequence the Work, or to pass performance testing requirements. Obtain Architect's approval for modifications.
- H. Retain approved mockups constructed in place. Incorporate fully into the Work if practicable.

PART 3 - EXECUTION

3.1 TESTING OF INTEGRATED EXTERIOR MOCKUPS

- A. Mockups shall be scheduled such that required testing and review can occur at the appropriate stage of construction and prior to the assembly of the overall wall systems.
- B. Sequence mockups and testing requirements in Section 01 86 13 to correspond with the overall construction schedule and schedule for mockups required for the rest of the building.
- C. Integrated Exterior Mockup Testing Agency: Engage a qualified testing agency to perform tests and inspections.
1. Testing and inspecting agency will interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- D. Integrated Exterior Mockup Testing Services: Perform the following tests in the following order:
1. Water-Spray Test: Before installation of interior finishes has begun, test areas designated by Architect in accordance with AAMA 501.2 for evidence of water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.

2. Air Leakage: Test in accordance with ASTM E783 at 1.5 times the rate specified in "Mockup Testing Performance Requirements" Paragraph in "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - a. Perform a minimum of two tests in areas as directed by Architect.
 3. Water Penetration: Test in accordance with ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Mockup Testing Performance Requirements" Paragraph in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and verify no evidence of water penetration.
- E. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections, and also to observe testing for the following systems and assemblies.
1. Curtain wall specified in Section 08 44 13 "Glazed Aluminum Curtain Walls."
- F. Integrated exterior mockup will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

END OF SECTION 01 43 39

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
 - 3. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste handling procedures.
 - 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Provide and maintain each temporary construction facility and control when required for proper performance of the work. Terminate and remove when no longer needed or when permanent facilities, with proper authorization, are available for use.
- C. Obtain and pay for all required applications, fees, permits and inspections required for temporary construction facilities and controls.

- D. Install, operate, maintain and protect temporary construction facilities and controls in a manner and at locations which are safe, non-hazardous, sanitary and adequately protect project work, workmen and the public.

1.7 REQUIREMENTS OF REGULATORY AGENCIES

- A. Provide and maintain all temporary facilities in compliance with governing rules, regulations, codes, ordinances and laws of agencies and utility companies having jurisdiction over work involved in project.
- B. Be responsible for all temporary work provided and obtain any necessary permits and inspections for such work.
- C. Contractors shall confine equipment, storage of materials, and operation of workmen to the limits indicated or directed and shall abide by law, ordinances, conditions stated in permits and directions of the Architect.
- D. Do not interfere with normal use of roads in vicinity of project site except as indicated or as absolutely necessary to execute required work, and then only after proper arrangements have been made with authorities having jurisdiction, including traffic control as applicable.

1.8 SPECIAL PRECAUTIONS AND REQUIREMENTS

- A. Do not interfere with normal use of occupied areas in existing buildings, existing driveway access to existing building and existing building utility services, except as absolutely necessary to execute required work involving such facilities, and then only after proper arrangements have been made through the Owner with persons in charge of existing facilities.
- B. Do not block required exits from adjacent sites and buildings.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Enclosure Fence: Plywood, 8 feet (2.4 m) high, framed with four 4-by-4-inch (50-by-100-mm) rails, with preservative-treated wood posts spaced not more than 8 feet (2.4 m) apart.
- B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).
- D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

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

- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size can be utilized within the existing building and should be coordinated with onsite CCC staff.
 - 3. Coffee machine and supplies.
 - 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 - 5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.
- D. Copies of permits, approved shop drawings, plans and specifications marked up- to-date with all revisions and all addenda shall be kept at said offices areas ready for use at all times.
- E. All expenses in connection with Contractor's field offices, including the installation cost and use of telephones, shall be borne by the Contractor.
- F. Maintain field office areas until final acceptance and then remove, unless the Architect orders or approves earlier removal.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. Prior to permanent enclosure of the structure, provide temporary heat as necessary to complete the work.
 - a. Provide weather protection as required to carry on work during inclement weather and to protect work and materials from damage by weather.
 - b. Protection of work includes covering, temporary enclosures, heating materials and work under construction and for providing suitable working conditions.

- c. Furnish temporary heat by Owner approved types of units or equipment which is safe, will not affect surrounding areas of Contract Work and is properly supervised while in use.
2. "Permanently enclosed" shall mean that permanent walls and roofs are in place and weather tight, windows are in place and glazed and all entrance enclosures are either permanently in place or provided with suitable temporary enclosures.
 - a. Polyethylene sheet is not considered a suitable temporary enclosure. One- half inch thick plywood tightly fit, sealed and supported and maintained can be considered a temporary enclosure.
3. After the structure is permanently enclosed, provide, operate and maintain until substantial completion, approved temporary heating and ventilating units to maintain that portion of the structure at suitable temperature and humidity conditions to complete the work.
 - a. Arrange temporary units to bring in sufficient outdoor air to ventilate the structure and to prevent build-up of harmful dusts and fumes and to remove excess moisture. During warm weather, provide an adequate supply of fresh air, when necessary, to properly ventilate moisture, dust, fumes from paints, cements or adhesives in tightly-enclosed areas where natural ventilation will not be sufficient.
 - b. Provide temporary heating and ventilating as follows:
 - 1) During normal working hours, minimum 50° F.
 - 2) During placing, setting and curing of concrete, minimum 50° F.
 - 3) For 10 days prior to placing interior finish materials and throughout interior finishing, painting, etc., and until final acceptance of work and occupancy by Owner, minimum 70° F.
 - 4) Supply heat and ventilation in a manner which avoids rapid drying of material but permits material and building to dry so remaining moisture will not affect finish material.
 - 5) Operate temporary systems each day, including Saturdays, Sundays and holidays. Include necessary labor and approved operating personnel.
 - 6) Supply all fuel required for temporary heating and ventilating, including all material, labor and supervision to connect same.
4. When permanent systems are used for temporary construction use, Contractor shall assume full responsibility for maintaining such equipment during and after use. Included in maintenance are the following:
 - a. Proper operation and maintenance of the mechanical equipment until acceptance of the project by Owner.
 - b. Maintenance of temporary filters in all equipment to prevent accumulation of dust and dirt in coils, housings and ductwork.
 - c. Prior to final inspection; replacement of temporary filters with new filters, thorough cleaning of coils and other equipment, putting entire system into first class condition, cleaning traps and devices, adjustment and removal of any and all materials and equipment not functioning properly.
 - d. Owner and Architect must be given access to and opportunity to inspect equipment and maintenance procedures at all times. Owner involvement will not relieve the Contractor from the responsibilities specified herein.

5. Use of permanent heating or cooling and ventilating equipment for temporary construction use shall not affect warranty. Warranty shall take effect at time of project acceptance by Owner.
 6. Cost of Temporary Heat: Cost of all fuel consumed in conjunction with temporary heat or permanent system used for temporary heat shall be paid by the Contractor.
 7. During periods of extremely low temperatures when water pipes could possibly freeze or when such conditions are forecast, temporary heating must be monitored 24-hours a day, 7 days a week.
- G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- H. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- I. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- J. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Install electric power service overhead unless otherwise indicated.
 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- K. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 2. Install lighting for Project identification sign.

3. As interior partitions are erected, revise the temporary lighting arrangements so that not less than one lamp is provided in each space over 70 square feet in area. Lights shall also be installed, as directed by Architect, in smaller areas where required to provide adequate light for work being carried out in the space.

3.3 CONSTRUCTION AIDS

- A. Hoists and Cranes: Erect and maintain adequate hoisting facilities as required for the work.
- B. Shoring and Bracing: Provide all shoring and bracing required for safety and proper execution of their work. Remove these items when the work is completed.
- C. Temporary Partitions: Provide temporary dustproof, security partitions in corridors, door openings and wall openings separating new work from existing building. Construction methods and materials shall be approved by Architect prior to construction of partition. However, construction shall be similar to plywood sheathing over wood studs with 6 mil plastic film applied over sheathing sealing all joints. Seal partitions at floor, walls and ceilings.
 1. Provide doors through temporary partitions with self closing devices and locks.

3.4 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Streets and Traffic
 1. Cleaning and Repair
 - a. Contractors shall remove mud and spillage from public walks, streets and sewers without delay. Failure to clean areas promptly will result in areas being cleaned by the Owner at the responsible Contractor's expense.
 - b. Damage to roads or other facilities on the grounds, resulting from hauling, storage of materials, or other activities in connection with the work shall be repaired or replaced, at no expense to the Owner, by the Contractor causing the damage. Repairs or replacements shall be made to the satisfaction of the Architect.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
 3. Notify local law enforcement agency at least two weeks in advance of any anticipated work affecting traffic flow.

- a. To assure maintenance of flow and to safeguard all parties involved in planning to maintain flow, a field inspection should be made jointly by the Architect and Contractor personnel before performing any work which would interrupt normal traffic patterns.
 - b. Re-routing of traffic shall be planned, as to route and direction, in cooperation with the local law enforcement agency
- D. Parking: all parking shall be arranged by the Contractor and its subcontractor at their own expense. Parking on streets or in restricted areas is prohibited. Parking shall not interrupt or prevent access by CCC student or faculty. All parking should be coordinated with the Chief Facilities Engineer on site.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Project Sign
 - a. Provide project sign approximately 4 feet by 8 feet.
 - b. Painting by professional sign painter, with text, design, layout and colors as directed by Architect.
 - c. Materials: 3/4" APA-AB-EXT. Plywood for sign face with pine or fir trim. Provide 4 x 4 treated wood posts of sufficient length and quantity to securely brace and support sign against wind pressure.
 - d. Locate sign as directed by Architect. Maintain until completion of project, then remove. Erect sign a minimum of 8 feet from public right of way.
 3. Temporary Directional Signs: Provide as required to adequately direct traffic and personnel on site.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 4. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to

condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Security of building must be maintained during "non-standard" working hours (premium time). This includes, but is not necessarily limited to, verifying all entrance doors and windows are secured.
- B. Contractor shall be responsible for all infractions of rules and regulations by his workers.
- C. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- D. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 011000 "Summary."
- E. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.

4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- F. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- G. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
- H. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- I. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- J. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 1. Extent of Fence: As indicated on Drawings.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- K. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- L. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- M. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- N. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
 1. Construct covered walkways using scaffold or shoring framing.
 2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 3. Paint and maintain appearance of walkway for duration of the Work.
- O. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- P. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 2. Construct dustproof partitions with two layers of 6-mil (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.
 - a. 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.
 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 4. Insulate partitions to control noise transmission to occupied areas.
 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 6. Protect air-handling equipment.
 7. Provide walk-off mats at each entrance through temporary partition.
- Q. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with 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.

3.6 WEATHER PROTECTION

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.

5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 50 10 - COMMISSION REPRESENTATIVE FIELD OFFICE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings
- B. Book 1: Project Information, Instructions to Bidders, and Execution Documents
- C. Book 2: Standard Terms and Conditions for Construction Contracts

1.2 COMMISSION REPRESENTATIVE'S FIELD OFFICE

- A. Furnish, erect and maintain a clean, weather-tight office at the site of the Work for the duration of the Contract, through final completion, for the sole and exclusive use of the Commission. No on-site Work may commence until the Commission Representative's Field Office required by this Subsection is in place, fully functional and approved by the Commission. The proposed location of the Commission Representative's Field Office and the pedestrian gate for access to the fenced site is indicated on the Approved Site Utilization Plan.
- B. Provide the Commission Representative's Field Office with toilet facility entirely separate from, unconnected to, and not to be shared with the Contractor's Field Office.
- C. Provide the Commission Representative's Field Office not less than 400 square feet in area and with a ceiling not less than 7 feet high with a minimum of one private offices and one common area, and one toilet. The one private offices and common area shall be equipped with minimum of (4) 110-120v 20amp 3-prong grounded duplex receptacles each section, equally distributed across (2) power circuits each section. The field office shall be equipped with a minimum of 100-amp electrical service. The field office shall include an interior toilet facility, shall be painted, heated, air-conditioned, lighted, provided with lockable windows with blinds or shades that operate, and doors with cylinder locks and deadbolt locks. Provide appropriate signage on the outside of the trailer indicating PBC Field Office. Enclose the air space beneath the trailer with exterior grade plywood panel siding painted to match office exterior. Provide hinged access doors at utility connection area. Provide stair access with handrails per code requirements.
- D. Provide weekly janitorial service for the Commission Representative's Field Office and interior toilet facility.
- E. Pay all expenses in connection with the Commission Representative's Field Office, including but not limited to, the installation and high-speed internet service, heat, air-conditioning, light, water, sewerage, janitorial services, equipment, pest control, snow removal, set up and take down. HVAC filters shall be replaced every month.
- F. Furnish the following equipment and furniture:
 - 1. (2) - 60" x 30" desks with two (2) drawer (one file and one miscellaneous) pedestal file cabinets and 2 non folding chairs with upholstered seat and back.
 - 2. (2) - 2 drawer lateral file cabinets.

3. (1) - layout table with minimum top size of 42" x 60". An adjustable height drafting stool with upholstered seat and back shall be provided.
4. (2) - 8' x 3' folding conference tables and 20 folding chairs.
5. Provide (1) 48" x 72" (min) and (1) 48" x 96" wall mounted dry erase boards.
6. (1) - equipment cabinet with lock of minimum inside dimensions of 72" high x 48" wide x 24" deep with (5) shelves. The walls shall be of steel with a 3/32" minimum thickness with concealed hinges and enclosed lock constructed to prevent entry by force.
7. (1) 1200-watt Microwave oven.
8. (1) – Keurig Office Pro brewing system or approved equal.
9. (1) - first aid cabinet fully equipped and maintained on monthly basis.
10. (1) - 5 gallon hot and cold water dispenser with cup dispenser, cups and bottled drinking water supply service.
11. Central heating and air conditioning appropriate to trailer size and construction per ASHRAE 90.1 efficiency requirement.
12. (1) - 6 cubic feet refrigerator with freezer compartment.
13. (1) - plan rack with (12) 42" capacity hanging clamps.
14. (1) - fire extinguisher.
15. (1) – space heater
16. Printer: Provide a multifunction color printer (fax, copy, scan and print) the latest version with toner cartridges, paper, and a maintenance service contract for the duration of project.
 - a. Canon Image Runner Advance C3525i III Color Multifunction Printer or equal (Dual Tray - 8-1/2" x 11" and 11" x 17" format) with scanning capability (PDF format)
 - b. Provide required toner cartridges throughout duration of the project.
 - c. Provide 24lb 8 1/2" x 11" and 11" x 17" format paper throughout duration of project.
17. Network: Provide Local Area Network (LAN) and a Wireless Area Network (WAN) communication and Internet access for Commission computers with all associated equipment, drops, patch cords, power cords, etc., for the duration of the project. Network the printer/scanner to all Commission computers to enable direct printing and scanning to and from any computer.
18. Internet Access: Provide an unlimited Internet access account to achieve a minimum of 100MB per second download speed.

- G. The Commission Representative's field office and all furnishing and equipment will remain the property of the Contractor at the completion of the Project.
- H. Provide (2) on-site parking spaces adjacent to Commissions Trailer for duration of project.
- I. Submit two (2) copies of the site field office layout plan required for approval by the Commission Representative.

1.3 SUBMITTALS

- A. Unless provided for elsewhere in the contract documents, prior to any onsite work, the Contractor is to prepare and submit to the Architect for approval the Commission Representative's Site Field Office Location Plan showing field offices and related temporary support facilities. If requested by the Contractor, a preliminary meeting to review site elements and construction operations including trailer and gate locations with the Architect and Commission Representative, prior to submission of the Plan will be held.

PART 2 PRODUCTS

- 2.1 Provide new materials and equipment. Undamaged, previously used materials and equipment in serviceable condition may be used if approved by the Commission Representative. Provide materials suitable for use intended.

PART 3 EXECUTION

- 3.2 The proposed location of the Commission Representatives field office and the pedestrian gate for access to the fenced site is indicated on the approved Site Utilization Plan.
- 3.3 Locate and maintain the field office with temporary walkways providing easy and safe access.
- 3.4 Maintain support facilities until substantial completion or as directed by the Commission Representative.

END OF SECTION 01 50 10

SECTION 01 56 39 – TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction. Contractor shall perform work outlined in this Section under the direction of the CCC.
- B. Related Sections:
 - 1. Section 01 50 00 "Temporary Facilities and Controls" for temporary site fencing.

1.2 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches (150 mm) above the ground for trees up to, and including, 4-inch (100-mm) size; and 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified arborist and tree service firm.
- B. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.4 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- B. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

- a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
- b. Enforcing requirements for protection zones.
- c. Arborist's responsibilities.
- d. Field quality control.

1.5 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:
 1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by Architect.
 1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb/ft. (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet (2.4 m) apart.
 - a. Height: 4 feet (1.2 m).
 - b. Color: High-visibility orange, nonfading.
- B. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
 1. Size and Text: As shown on Drawings.
 2. Lettering: 3-inch- (75-mm-) high minimum, black characters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. For the record, prepare written report, endorsed by CCC

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Tie a 1-inch (25-mm) blue-vinyl tape around each tree trunk at 54 inches (1372 mm) above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 TREE- AND PLANT-PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
- B. Protection-Zone Signage: Install protection-zone signage as indicated on Drawings.
- C. Maintain protection zones free of weeds and trash.
- D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
- E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
 - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 - 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements indicated on drawings.
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main

lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.

- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING – TO BE PERFORMED BY CONTRACTOR'S ARBORIST

3.6 CROWN PRUNING – TO BE PERFORMED BY CONTRACTOR'S ARBORIST

- A. Chip removed branches and stockpile in areas approved by CCC Property Management.

3.7 GRADING

- A. Existing grade shall be maintained.

3.8 FIELD QUALITY CONTROL

- A. Inspections: Arborist employed by the Contractor shall direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain that are damaged by construction operations, in a manner approved by Construction Manager and Architect.
 - 1. Submit details of proposed root cutting and tree and shrub repairs.
 - 2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
 - 3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
 - 4. Perform repairs within 24 hours.
 - 5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Construction Manager and Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Provide new trees of same size and species as those being replaced for each tree that measures 6 inches (150 mm) or smaller in caliper size.
 - 2. Provide two new tree(s) of 4-inch (100-mm) caliper size for each tree being replaced that measures more than 6 inches (150 mm) in caliper size.
 - a. Species: Provided by CCC Property management.

- C. Soil Aeration: Aerate surface soil compacted during construction. Aerate 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch- (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augured soil and sand.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 01 56 39

SECTION 01 57 13 - LEED TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, and storm and sanitary sewers due to construction activities.

1.02 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).
- C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2016.
- F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017.
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.03 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Also comply with all more stringent requirements of City of Chicago and the State of Illinois.
- C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
- F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
 2. Prevent development of ruts due to equipment and vehicular traffic.
 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Board.
- G. Prevent polluting the air with dust and particulate matter from stored materials or construction debris.
- H. Sedimentation of Storm Sewer and Receiving Waterways: Prevent sedimentation of waterways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Board; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- I. Open Water: Prevent standing water that could become stagnant.
- J. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Sustainable Design Documentation: Submit all submittals required in this section in accordance with procedures specified in Section 01 33 29 - LEED Sustainable Design Reporting.
- C. Erosion and Sedimentation Control Plan:
1. Submit within 10 Days after Notice to Proceed.
 2. Refer to 01 33 29 1.04.G.1 for Erosion and Sedimentation Control Action Plan Requirements.
- D. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- E. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Bales: Air dry, rectangular straw bales.
1. Cross Section: 14 by 18 inches, minimum; containing 5 cu. ft. or more of material.
 2. Bindings: Wire or nylon string, around long dimension.
- B. Bale Stakes: One of the following, minimum 3 feet long:
1. Steel U-, C- or T-section, with minimum mass of 1.33 lb per linear foot.
 2. Wood, 2 by 2 inches, or 4 inches in diameter in cross section.
- C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 2. Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491.
 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 4. Tensile Strength: 90 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 5. Elongation: 50 percent maximum, when tested in accordance with ASTM D4632/D4632M.
 6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- D. Silt Fence Posts: One of the following, minimum 5 feet long:
1. Steel U-, C- or T-section, with minimum mass of 1.33 lb per linear foot.
 2. Hardwood, 2 by 2 inches, or 4 inches diameter in cross section.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Do not start operations until the erosion and sediment control plan has been submitted and features are in place.
- B. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Do not allow storm water to flow into excavations and disturbed areas.
- C. Do not discharge water into sanitary sewers, watercourses or offsite.
- D. Do not allow sediment to flow into vegetated areas.
- E. Do not discharge water-containing sediment in accordance with Performance Requirements and as presented in the erosion and sediment control plan submittal or a maximum retained as 30 milligrams of sediment per liter of water. Conduct continuous monitoring of sediment.
- F. Construction Entrances: Traffic-bearing aggregate surface.
1. Width: As required; 20 feet, minimum.
 2. Length: 50 feet, minimum.
 3. Provide at each construction entrance to prevent tracking of mud onto right-of-way.
- G. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet.
 - b. Slope Between 2 and 5 Percent: 75 feet.
 - c. Slope Between 5 and 10 Percent: 50 feet.
 - d. Slope Between 10 and 20 Percent: 25 feet.
 - e. Slope Over 20 Percent: 15 feet.
- H. Storm Drain Inlet Sediment Trap: Protect each inlet using one of the following measures:
1. For manholes, the filter fabric can be placed around the lid and secured by the lid weight
 2. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
- I. Soil Stockpiles: Mist or provide other means to keep dust from being scattered to the air.

3.04 INSTALLATION

- A. General: Control surface water runoff on-site and provide temporary soil stabilization measures as required to prevent erosion of soil by action of water. Protect storm sewers adjacent to work site from sedimentation by installation of erosion and sediment control measures. Provide, as a first step in construction operations, barriers, and other measures intended to deter erosion and transport of sediment associated with construction activities before construction starts or as it progresses.
- B. Traffic-Bearing Aggregate Surface:
1. Excavate minimum of 6 inches.
 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.
- C. Silt Fences:
1. Store and handle fabric in accordance with ASTM D4873/D4873M.
 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 5. Install with top of fabric at nominal height and embedment as specified.
 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
 7. Fasten fabric to wood posts using one of the following:
 - a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch shank diameter.
 - b. Five staples per post with at least 9 gauge wire, 3/4 inch crown width and 1 inch long legs.
 - c. Do not staple fabric to trees.
 8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.

9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

D. Straw Bale Rows:

1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 2. Remove silt deposits that exceed one-half of the height of the bales.
 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect/Engineer of Record.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION 01 57 13

SECTION 01 57 19 - LEED INDOOR AIR QUALITY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.

1.02 PROJECT GOALS

- A. See Section 01 33 29 - LEED Sustainable Design Reporting, for overall project goals relating to environment and energy.
- B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
- C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.
- B. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.04 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Sustainable Design Documentation: Submit all submittals required in this section in accordance with procedures specified in Section 01 33 29 - LEED Sustainable Design Reporting.

- C. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
 - 1. Submit not less than 60 days before enclosure of building.
 - 2. Identify potential sources of odor and dust.
 - 3. Identify construction activities likely to produce odor or dust.
 - 4. Identify areas of project potentially affected, especially occupied areas.
 - 5. Evaluate potential problems by severity and describe methods of control.
 - 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - 7. Describe cleaning and dust control procedures.
 - 8. Describe coordination with commissioning procedures.
- D. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- E. Duct and Terminal Unit Inspection Report.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE Std 52.2.

PART 3 - EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.
- C. HVAC equipment and supply air ductwork may be used for ventilation during construction:
 - 1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
 - 2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
 - 3. Do not use return air ductwork for ventilation unless absolutely necessary.
 - 4. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.
- D. Do not store construction materials or waste in mechanical or electrical rooms.
- E. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

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1. Inspect duct intakes, return air grilles, and terminal units for dust.
 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 3. Clean tops of doors and frames.
 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 5. Clean return plenums of air handling units.
 6. Remove intake filters last, after cleaning is complete.
- F. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- G. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

END OF SECTION 01 57 19

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 STANDARDS

- A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.
- B. "Governing Authority" means all federal, state and local laws and regulations.

- C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.
- D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.5 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.6 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
5. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

D. Exterior Storage

1. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious coverings. Provide adequate ventilation to avoid condensation.
2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign materials.
3. Store foam plastic away from exposure to sunlight, except to extent necessary for period of installation and concealment.

1.8 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will not** be considered
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:

- a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will not** be considered
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
- C. Basis of Design: Where specifications name a Basis of Design or refer to a Basis of Design product indicated on the drawings, the design is based on the product listed. Subject to compliance with requirements, provide the specified product or a product manufactured by one of the other manufacturers listed.
 1. The characteristics of the Basis-of-Design Product establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
 2. Equipment or materials from these manufacturers will be acceptable contingent upon their meeting the design, appearance and functional standards established by the specified items. If equipment or a material of an acceptable manufacturer requires changes; electrically, mechanically, structurally, from what is indicated on the drawings, it shall be the responsibility of the Contractor requiring such change, to pay all costs involved with no additional costs to the Owner.
 3. Submit evaluations as follows:
 - a. Submit proposed comparable products for evaluation by the Architect at least two weeks prior to awarding contract to the manufacturer of a comparable product.
 - b. Obtain samples of Basis-of-Design product.
 - c. Select comparable products that comply with the characteristics specified. Submit evidence demonstrating compliance.
- D. Submit samples of comparable products displayed side-by-side with samples of Basis-of-Design products. Architect will determine whether the proposed comparable product is acceptable. Architect is not obligated to prove non-equivalence of proposed comparable products.
- E. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- F. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- G. Where a performance is specified and no manufacturer is listed, submit through the Shop Drawing procedure the name of the manufacturer, the product proposed, and detailed information showing its characteristics. Such proposal shall meet or exceed the specification, line item by line item, or be rejected.

- H. Equivalent components (articles, devices, materials, forms of construction, fixtures, etc.) may be submitted to the Architect for approval prior to bidding regardless of listed manufacturers.
- I. Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - 5. Samples, if requested.

2.01 FABRICATION

- A. Fabricate all items in the shop insofar as practicable. Where items cannot be completely shop fabricated and assembled for shipment, assemble and fit in shop, disassemble and ship. Identify parts for field assembly.
- B. Fabricate items to be straight, square, in proper alignment, and with hairline joints where joints are necessary and permitted. Pre-plan field joints to be as inconspicuous as possible; coordinate locations with Architect.

2.02 SHOP PRIMING

- A. Shop prime or seal surfaces of all products to receive paint materials in accordance with the requirements of Section 09 91 00.
- B. Apply a primer or sealer compatible with the specified paint materials.
- C. In the event such a primer is determined to be incompatible with the specified finish paint system, provide a barrier coat or remove the primer and reprime as directed, at no additional cost to the Owner.

2.03 PROHIBITED MATERIALS AND METHODS

- A. The following items are expressly prohibited:

1. Attachment Related Items
 - a. Powder Fasteners: Powder fasteners are defined as anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas or any other propellant. Powder fasteners prohibited for the following conditions:
 - 1) Attachment of structural members.
 - 2) Where public may be endangered by misuse.
 - b. Plug anchorage by use of wood, lead or plastic.
 - c. Perforated steel strap iron for pipe or other support or anchorage.
 - d. Suspension systems that are not independently supported.
 - 1) Ceiling grid systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines, and vice versa.
 - 2) Each utility system and the ceiling system shall be a separate installation, each independently supported from the building structure.
 - 3) Where interference occurs, provide trapeze type hangers or other suitable supports for each system.
 - 4) Locate hangers and supports where they will not interfere with access to mixing boxes, fire dampers, valves, and other appurtenances requiring servicing.
2. Methods Related Items
 - a. The penetration of floors and walls by pipes, ducts, or other penetrations unless openings are appropriately fire stopped by fire doors or fire dampers, and voids around pipes, ducts, conduits, etc. are sealed with fireproof materials.
 - b. The use of ink marking pens on surfaces of any kind of materials receiving paint or other finish in exposed location.
3. Materials Related Items
 - a. Asbestos or asbestos containing materials.
 - b. Barbed wire in construction fencing.
 - c. Water soluble treatment of insulation jackets or facings, to impede or retard smoke or flames.
4. Masonry Related Items
 - a. Chicken wire type masonry reinforcing.
 - b. Cinder block.
 - c. Muriatic acid.
5. Door Related Items
 - a. Knock-down (KD) door frames.
 - b. Thresholds raised more than 1/2" at doors indicated as wheel chair accessible.
6. Roofing Related Items
 - a. Dead level roofs. All roofs must slope to drain.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 61 16 - LEED VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.
- C. Requirement for installer certification that they did not use any non-compliant products.
- D. Requirements in this section are in addition to any specified in 01 56 11 - General Dust, Fume, and Odor Controls. The more restrictive requirement prevails in the case of any conflicting information.

1.02 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
 - 7. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Wet-applied roofing and waterproofing.
 - 4. Other products when specifically stated in the specifications.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Concrete.
 - 2. Clay brick.
 - 3. Metals that are plated, anodized, or powder-coated.
 - 4. Glass.
 - 5. Ceramics.
 - 6. Solid wood flooring that is unfinished and untreated.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.
- D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board; current edition.
- E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.
- F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- G. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.
- H. SCS (CPD) - SCS Certified Products; Current Edition.
- I. UL (GGG) - GREENGUARD Gold Certified Products; current listings at <http://productguide.ulenvironment.com/QuickSearch.aspx>.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- C. Sustainable Design Reporting: Submit evidence of compliance along with Material Content Form.
- D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.05 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 - 1. Wet-Applied Products: State amount applied in mass per surface area.
 - 2. Paints and Coatings: Test tinted products, not just tinting bases.
 - 3. Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.
 - e. Current CRI (GLP) certification.
 - f. Test report showing compliance and stating exposure scenario used.

4. Product data submittal showing VOC content is NOT acceptable evidence.
 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scs-certified.com.
 - b. Report of laboratory testing performed in accordance with requirements.
 - c. Published product data showing compliance with requirements.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
 2. Inherently Non-Emitting Materials.
- C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
1. Aerosol Adhesives: GreenSeal GS-36.
 2. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Board reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Board.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 01 61 16

SECTION 01 64 00 - OWNER-FURNISHED PRODUCTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Owner and Contractor responsibilities for items furnished by the Owner.

1.02 OWNER'S RESPONSIBILITIES

- A. Where applicable, provide the following:
 - 1. Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
 - 2. Deliver supplier's bill of materials to Contractor.
- B. Arrange and pay for delivery to site in accordance with Contractor's progress schedule.
- C. Inspect deliveries jointly with Contractor.
- D. Submit claims for transportation damage.
- E. Arrange for replacement of damaged, defective, or missing items.
- F. Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Designate submittal and delivery dates for each product in a schedule of Owner furnished items. Submit this schedule concurrently with the first submission of the progress schedule.
- B. Where applicable, review shop drawings, product data, samples, and other submittals.
- C. Inspect deliveries jointly with Architect, record shortages, and damaged or defective items.
- D. Handle products at site, including uncrating and storage.
- E. Protect products from damage, and from exposure to element.
- F. Assemble, install, connect and adjust products.

Malcolm X College – West Side Learning Center
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G. Arrange for installation inspections required by public authorities.

H. Repair or replace items damaged or lost.

1.04 SCHEDULE OF OWNER FURNISHED, CONTRACTOR INSTALLED ITEMS

A. See items attached at the end of this section.

END OF SECTION 01 64 00

Malcolm X College West Side Learning Center - Community Room Addition			
FFE - AV-IT Equipment List			
75% IFC Submittal			
11.27.18			
	DEVICE	MODEL NO.	QTY
21	LEVEL 01		
22	PROJECTOR SCREENS COMMUNITY ROOM	Christie D4KLH60 high frame rate 3DLP 4K RGB laser projector head Part Number: 146-003104-XX	2
	7" SCHEDULING TOUCH PANEL COMMUNITY ROOM	Crestron TSS-752-B-S	1
	10" DESKTOP TOUCHPANEL COMMUNITY ROOM	CRESTRON TSW-1052 TSW-1050-TTK tabletop kit	2
	ULXD4 Single Wireless microphone receiver, (Perform onsite Freq scan to determine frequency bands to use) with: SBC200-US Dual wireless microphone docking charger, and SB900 Rechargeable Battery	SHURE: ULXD WIRELESS MIC SYSTEM	2
	Beltpack Transmitter	SHURE: ULXD1	2
	Omnidirectional lavalier microphone	SHURE: WL183	2
	Control System Processor (community center)	CRESTRON: PRO2	2
23	Custom AV Lectern (This is the lectern in our conference center)	MARSHALL FURNITURE INC. MFI #29121AH	2
	24" WIDE SCREEN ANNOTATION MONITOR, SMART PODIUM, W/ SMART NOTEBOOK SOFTWARE	SMART PODIUM 64	2
24	PTZ CAMERAS		2
25	VOIP CONFERENCE BRIDGE		2
26	DIGITAL SIGNAGE LARGE AT LOBBY		2
27	DIGITAL SIGNAGE SMALL AT COMMUNITY ROOM		1
28	8 DATA AND PROWER DROPS AT SECURITY DESKS		5
35			
36	Misc. CCTV Wiring		?
37	SUB-TOTAL		
38			
39			

Malcolm X College West Side Learning Center - Community Room Addition		
FFE - Security Equipment List		
75% IFC Submittal		
11.27.18		
	DEVICE	
	QTY.	
21	LEVEL 01	
22	Card reader	2
23	Door Contact Sensor	10
24	Request-to-Exit Sensor	0
25	Access Control Panel (base)	2
4	Request-to-Exit Sensor	0
26	Access Control Panel Modules	2
27	Panic Button	0
28	Local Door Alarm	5
29	Intercom Station	2
30	Power Supplies	11
31	Interface to Lock Hardware	4
32	ACS Wiring	1
33	Fixed Camera	1
34	PTZ Camera	4
35		
36	Misc. CCTV Wiring	?
37	SUB-TOTAL	
38		
39		

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
 - 5. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.

- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 5 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor.
- F. Final Property Survey: Submit 6 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Mechanical systems piping and ducts.
 - d. Control systems.
 - e. Communication systems.

- f. Fire-detection and -alarm systems.
 - g. Electrical wiring systems.
- 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence

and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner and Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect and Owner when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Owner.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect and Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Owner before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 73 29 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1. WORK INCLUDES

- A. Requirements and limitations for cutting and patching of work.
 - 1. Execute cutting, filling, or patching of work, required to:
 - a. Make several parts fit properly.
 - b. Uncover work to provide for installation of ill-timed work.
 - c. Remove and replace defective work.
 - d. Remove and replace work not conforming to contract requirements.
 - e. Install specified work in existing construction.
 - 2. In addition to contract requirements, upon written request of Architect:
 - a. Uncover work to provide for observation of covered work.
 - b. Remove samples of installed materials for testing.
 - c. Remove work to provide for alteration of existing work.
 - 3. Do not endanger work by cutting or altering work or any part thereof.
 - 4. Do not cut or alter work of another contractor without written consent of Architect.

1.2. RELATED WORK

- A. Specified Elsewhere:
 - 1. Section 01 10 00 – Project Summary
 - 2. Section 01 33 00 – Submittal Procedures
 - 3. Individual Product Specification Sections:
 - a. Cutting and patching incidental to work of the Sections.
 - b. Advance notification to other Sections of openings required in work of those Sections.
 - c. Limitations on cutting structural members.

1.3. SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alterations.
 - 4. Description of proposed work, and Products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Date and time that work will be executed.
- C. Prior to cutting and patching done on request of Architect, submit cost estimate.

- D. Should conditions of work, or schedule, indicate change of materials or methods, submit recommendation to Architect, including:
 - 1. Condition indicating change.
 - 2. Recommendation for alternative materials or methods.
 - 3. Submittals required for substitutions.
- E. Submit written notice to Architect designating time when work will be uncovered, to provide for observation.

1.4. PAYMENT FOR COSTS

- A. Costs caused by ill-timed or defective work, or work not conforming to contract documents, including costs for additional services of Architect: Party responsible for ill-timed, rejected, or non-conforming work.
- B. Work done on request of Architect, in addition to the contract requirements, other than defective or non-conforming work: Owner.
- C. Unless noted otherwise, cutting and patching of all major holes in existing materials in remodeling work for the penetration of any contractor's work shall be installed by the General Work Contractor. Cost of cutting and patching of these holes, as well as costs for lintels, sleeves, or other associated construction, shall be borne by the trade requiring the holes.
- D. Unless noted otherwise, cost of cutting of minor holes in existing materials in remodeling work, and cost of cutting of new materials installed in remodeling work shall be the responsibility of the trade requiring the cutting. Patching shall be done by the trade normally involved with that type of work at the cost of the trade requiring the cutting.
- E. Major holes shall be defined as any opening 8" x 8" or 8" in diameter, or larger, in surface area by depth as required. Minor holes shall be defined as any opening smaller than a major hole.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Primary Products: Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution under provisions of the Contract Documents.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, inspect conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.

3.3 CUTTING AND PATCHING

- A. Execute cutting, fitting, and patching including excavation and fill to complete work.
- B. Fit products together, to integrate with other work.
- C. Uncover work to install ill-timed work.
- D. Remove and replace defective or non-conforming work.
- E. Provide openings in the Work for penetration of mechanical and electrical work.

3.4 PERFORMANCE

- A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- B. Employ original installer to perform cutting and patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- C. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior acceptance.
- D. Restore work with new products in accordance with requirements of Contract Documents.
- E. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- F. At penetrations of fire-rated walls, refer to Section 07 84 13 – Penetration Firestopping.
- G. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION 01 73 29

SECTION 01 74 13 – CONSTRUCTION CLEANING

PART 1- GENERAL

1.1 WORK INCLUDES

- A. Construction cleaning for the duration of all project demolition and construction activities, and disposal of construction waste.
- B. General Contractor shall coordinate cleaning operations of all assigned Subcontractors.

1.2 RELATED REQUIREMENTS

- A. Specified Elsewhere:
 - 1. Section 01 74 23 – Final Cleaning
 - 2. Section 02 41 19 – Selective Demolition

1.3 SAFETY REQUIREMENTS

- A. Standards: Maintain project in accord with following safety and insurance standards:
 - 1. Federal and state regulations
 - 2. National Fire Protection Association (NFPA)
- B. Hazards Control:
 - 1. Store volatile wastes in covered metal containers and remove from premises daily.
 - 2. Prevent accumulation of wastes, which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- C. Conduct cleaning and disposal operations to comply with the Federal and State anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on the project site.
 - 2. Do not dispose of any volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

1.4 QUALITY ASSURANCE

- A. Employ people skilled in performing cleaning tasks.
- B. Inspections: Conduct daily inspections, and more often if necessary to verify that requirements of cleanliness are being met.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Select and use all cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.
- B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- C. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

2.2 EQUIPMENT

- A. Select and use all cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

- A. Contractor shall use means, methods, and products suitable to attain designated air quality using environmentally friendly products.
- B. Periodic, weekly cleaning shall occur throughout the project work areas so as to keep debris to a minimum. Wrapping boxes and cartons shall be removed from premises immediately upon installation of contents. Floor surfaces shall be swept broom clean.
- C. General:
 - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
 - 2. Do not allow the accumulation of scrap, debris, waste materials, and other items not required for construction.
 - 3. At least twice each week, and more often if necessary, completely remove all scrap debris and waste material from the job site.
 - 4. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.
- D. Site
 - 1. Daily inspect the site and pick up all scrap, debris and waste material. Keep all walk paths clear and clean then daily. Remove all such items to the place designate for their storage.
 - 2. Weekly and more often, if necessary, inspect all arrangements of materials stored on the site; restack, tidy or otherwise service all arrangements.
 - 3. Weekly and more often, if necessary, sweep paved areas to remove mud, dirt and scrap materials, such as nails or other fasteners.
 - 4. Maintain the site in a neat and orderly condition at all times acceptable to the Architect.
- E. Building
 - 1. Daily inspect the building and pick up all scrap, debris and waste material. Remove all

- such items to the place designated for their storage.
2. Weekly and more often if necessary, sweep all interior spaces clean. As required, in preparation for the installation of succeeding materials, clean the building or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required. The intent is to clear the floor of all foreign materials which could damage the finish floor materials.

3.2 DISPOSAL

- A. Maintain disposal units for sorting of debris for recycling and disposal.
- B. Dispose of all contents of dumpsters off-site in an environmentally friendly manner.
- C. No burning of debris or materials is acceptable on site.
- D. All hazardous materials not included in specifications elsewhere shall be disposed of off-site in an EPA approved facility.

END OF SECTION 01 74 13

SECTION 01 74 19 - LEED CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Board requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor shall submit bi-weekly Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- F. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, mastics, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Disposal: Removal off-site of waste and subsequent recycling, reuse, or deposit in a Subtitle D landfill, Clean Construction Demolition Debris site, or incinerator acceptable to authorities having jurisdiction.
- D. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- E. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- F. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

- H. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- I. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- J. Return: To give back reusable items or unused products to vendors for credit.
- K. Reuse: To reuse a construction waste material in some manner on the project site.
- L. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- M. Salvage and Reuse: Recovery of waste and subsequent incorporation into the Work.
- N. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- O. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- P. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- Q. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- R. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

- A. See Section 01 33 00 – Submittal Procedures.
- B. Sustainable Design Submittals: Submit Waste Management Plan and bi-weekly Waste Disposal Reports in accordance with procedures specified in Section 01 33 29 LEED Sustainable Design Reporting.
- C. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
 - 1. Submit to Architect/Engineer of Record for Board's review and approval.
 - 2. If Board wishes to implement any cost alternatives, the Contract Price will be adjusted as specified elsewhere.
 - 3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
 - 4. Describe as many alternatives to landfilling as possible:
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the proposed local market for each material.
 - c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
 - 5. Provide alternatives to landfilling for at least the following materials:
 - a. Aluminum and plastic beverage containers.
 - b. Corrugated cardboard.

- c. Wood pallets.
 - d. Clean dimensional wood.
 - e. Land clearing debris, including brush, branches, logs, and stumps.
 - f. Concrete.
 - g. Bricks.
 - h. Concrete masonry units.
 - i. Asphalt paving.
 - j. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - k. Glass.
 - l. Gypsum drywall and plaster.
 - m. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 - n. Plumbing fixtures.
 - o. Electrical equipment.
 - 1) Lighting fixtures: separate lamps by type and protect from breakage.
 - 2) Electrical Devices: separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
 - 3) Conduit: Reduce conduit to straight lengths and store by type and size.
- D. Once Board has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect/Engineer of Record.
- E. Waste Management Plan: Include the following information:
- 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - c. State the estimated net cost, versus landfill disposal.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
- F. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
- 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Board.

3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include signed manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include signed manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
 7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- G. Subtitle D Landfill and Incinerator Disposal Records: Submit record indicating receipt and acceptance of waste by the permitted Subtitle D landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices. Submit concurrently with waste reduction progress reports.
- H. Statement of Refrigerant Recovery (if applicable): Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

PART 2 - PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00 - Product Requirements:
 1. Relative amount of waste produced, compared to specified product.

2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
3. Proposed disposal method for waste product.
4. Markets for recycled waste product.

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 25 00 – Submittal Procedures for additional requirements for submittal procedures.
- B. See Section 01 31 00 - Project Management and Documentation for additional requirements for project meetings, reports, and project documentation.
- C. See Section 01 50 00 - Temporary Facilities and Controls for additional requirements related to trash/waste collection and removal facilities and services.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Board, and Architect/Engineer of Record.
- C. Instruction: 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. Meetings: Discuss trash/waste management goals and issues at project meetings.
 1. Pre-bid meeting.
 2. Pre-construction meeting.
 3. Regular job-site meetings.
- E. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- F. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 1. Provide containers as required.
 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- G. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- H. Recycling, General: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
 1. Recycle paper and beverage containers used by on-site workers in addition to construction waste.

2. Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor
 3. Waste may be co-mingled at the site and separated at a recycling facility.
 4. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 5. Inspect containers and bins for contamination and remove contaminated materials if found.
 6. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 7. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 8. Store components off the ground and protect from the weather.
- I. Recycling Demolition Waste:
1. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
 2. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - a. Pulverize concrete to maximum 1-1/2-inch (38-mm size).
 - b. Crush concrete and screen to comply with requirements in other Sections for use as satisfactory soil for fill or sub base.
 3. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - a. Clean and stack undamaged, whole masonry units on wood pallets.
 4. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
 5. Metals: Separate metals by type.
 - a. Structural Steel: Stack members according to size, type of member, and length.
 - b. Remove and dispose of bolts, nuts, washers, and other rough hardware.
 6. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
 7. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
 8. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
 - a. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
 9. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - a. Store clean, dry carpet[and pad] in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
 10. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
 11. Plumbing Fixtures: Separate by type and size.
 12. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
 13. Lighting Fixtures: Separate lamps by type and protect from breakage.
 14. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
 15. Conduit: Reduce conduit to straight lengths and store by type and size.
- J. Recycling Construction Waste:
1. Packaging:
 - a. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

- b. Polystyrene Packaging: Separate and bag materials.
 - c. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - d. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
 - 2. Site-Clearing Wastes: Chip brush, branches, and trees on-site.
 - a. Comply with requirements in Division 32 Sections for use of chipped organic waste as organic mulch.
 - 3. Wood Materials:
 - a. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - b. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - 4. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
 - a. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - K. Salvaged Items for Reuse in the Work:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
 - L. Salvaged Items for Sale and Donation: Not permitted on Project site.
 - M. Salvaged Items for Board's Use:
 - 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 Board.
 - 4. Transport items to Board's storage area designated by Board.
 - 5. Protect items from damage during transport and storage.
 - 6. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- 3.03 DISPOSAL OF WASTE
- A. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a permitted Subtitle D landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - B. Do not burn waste materials.

END OF SECTION 01 74 19

SECTION 01 74 23 – FINAL CLEANING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

- A. Coordinating Contractor: Provide all final cleaning including for the Work of assigned Contractors.
 - 1. At completion of work remove all waste, debris, rubbish, tools, equipment, machinery and surplus materials. Clean all sight exposed surfaces; leave work clean and ready for occupancy.

1.2 RELATED REQUIREMENTS

- A. Specified elsewhere:
 - 1. Section 01 74 13 – Construction Cleaning

1.3 SAFETY REQUIREMENTS

- A. Comply with the requirements of Authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
- B. Cleaning agents shall meet Green Seal GS-37 Standards.
- C. Disposable paper products, supplies and trash bags shall meet the minimum requirements of the US Environmental Protection Agency's Comprehensive Procurement Guidelines.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Do not conflict with related Project Sections. Resolve with AE should any conflicts arise.
- B. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- C. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Remove tools, construction equipment, machinery, and surplus material from Project site. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

- c. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - d. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - e. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - f. Remove labels that are not permanent.
 - g. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - h. Remove grease, dust, dirt, stains, labels, fingerprints, protection and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to specified finish.
 - 1) In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces to ensure performance.
 - i. Ventilating Contractor replace air handling (conditioning) filters if units were operated during construction. Clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - j. Each contractor maintains finally cleaned areas until project, or designated portion thereof, is accepted by the Using Agency.
 - k. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Replace parts subject to unusual operating conditions.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - o. Leave Project clean and ready for occupancy.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Using Agency's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 74 23

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for progress cleaning of Project site.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 - 6. Advise Owner of changeover in heat and other utilities.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.

8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or other form approved by Architect.

1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
4. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect, (through Construction Manager), will return annotated file.
 - b. PDF electronic file. Architect, (through Construction Manager), will return annotated file.
 - c. Three paper copies. Architect will return two copies.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

- a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Construction Manager, will return two.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 9. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

- a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

- E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one of file prints.
 - 3) Submit record digital data files and one set of plots.
 - 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit record digital data files and three set(s) of record digital data file plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.

- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.

- m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
- 1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 - 2. Format: DWG or RVT, Version Microsoft Windows operating system.
 - 3. Format: Annotated PDF electronic file with comment function enabled.
 - 4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 5. Refer instances of uncertainty to Architect through Construction Manager for resolution.
 - 6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
- 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 - 2. Consult Architect and Construction Manager for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - 4. Identification: As follows:

- a. Project name.
- b. Date.
- c. Designation "PROJECT RECORD DRAWINGS."
- d. Name of Architect and Construction Manager.
- e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 - 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file.
 - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For facilitator.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Construction Manager.

- e. Name of Contractor.
 - f. Date of video recording.
- 2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
 - 3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
 - 4. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.

- h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions, including web-based help.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner through Construction Manager, with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
 - 1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
 - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.

- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 - 1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
 - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.
- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

SECTION 01 81 09 - TESTING FOR INDOOR AIR QUALITY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, other Division 1 Specification Sections, and specifications of materials mentioned in this section, apply to this Section.

1.02 SUMMARY

- A. General: This section provides requirements for Baseline Indoor Air Quality (IAQ) Testing for maximum indoor pollutant concentrations for acceptance of the facility.

1.03 RELATED SECTIONS

- A. All work shall comply with Division 1 Section 01 33 29.
- B. Coordinate with Commissioning activities specified in Section 01 91 00.
- C. All work shall comply with Division 23, the section on "Testing, Adjusting and Balancing."

1.04 SUBMITTALS

- A. Baseline IAQ Testing: Submit a report for each test site specified for IAQ baseline testing as prescribed herein below and in Division 23, in the section on "Testing, Adjusting, and Balancing." Report on air concentrations of targeted pollutants identified in Subsection 3.1 of this section.

1.05 SEQUENCING AND SCHEDULING

- A. Identify, program, and schedule all IAQ testing well in advance of construction in a manner to prevent delays to the performance of the work of this Contract in order to perform and complete all testing after the completion of construction activities and prior to occupancy.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 BASELINE IAQ TESTING

- A. HVAC System Verification: To assure compliance with recognized standards for indoor air quality including ASHRAE Standard 62.1-2004, the Contractor's independent testing and balancing agency shall verify the performance of each HVAC system prior to Indoor Air Quality testing, 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 Contractor shall hire an independent contractor, subject to approval by the Contracting Officer's Representative, with a minimum of 5 years experience in performing the types of testing specified herein, to test levels of indoor air contaminants for compliance with specified requirements.
1. Conduct baseline IAQ testing using testing protocols consistent with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
 2. A test plan shall be submitted for the approval of the Contracting Officer's Representative. The plan shall specify procedures, times, instrumentation, and sampling methods that will be employed.
 3. Perform IAQ testing for at least the minimum number of required sampling locations, determined as follows: For each portion of the building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft., or for each contiguous floor area, whichever is larger, and include areas with the least ventilation as calculated by Ventilation Rate Procedure of ASHRAE Standard 62.1-2004 and greatest presumed source strength as identified by Owner. Collect air samples on three consecutive days and 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.
 - a. Verify areas to be tested with the Contracting Officer's Representative. Areas with 100% outside air ventilation rates such as laboratories are excluded from these testing requirements. The Contracting Officer's Representative is the sole judge of areas exempt from testing.
 4. Perform IAQ testing following the completion of all interior construction activities and prior to occupancy. The building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Perform testing prior to installation of furniture, workstation components, and casework.
 5. Perform IAQ testing within the breathing zone, between 3'-0" and 6'-0" above the finished floor and over a minimum 4-hour period.
 6. Collect air samples during normal occupied hours (prior to occupancy) with the building ventilation system starting at the daily normal start times and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
 7. Sample and record outside air levels of formaldehyde and TVOC contaminants at three outside air locations (as determined by Owner) simultaneously with indoor tests to establish basis of comparison for these contaminant levels by averaging the three outdoor readings for each contaminant.
 8. Perform airborne mold and mildew air sampling and speciation with simultaneous indoor and outdoor readings.
 - a. Samples are to be collected using a 12 liter-per-minute pump and a 0.45 micron polycarbonate filter, with a 4-hour duration for each sample.
 - b. Speciation shall be done with DNA detection using the quantitative polymerase chain reaction (QPCR) method. To ensure that filters are not precontaminated with mold, a field blank filter cartridge shall be tested after every eighth sample is tested.
 9. Acceptance of respective portions of the building by the Owner is subject to compliance with specified limits of indoor air quality contaminant levels.

- C. Indoor air quality shall conform to the following standards and limits:
 - 1. Formaldehyde: <20 microgram/m³ (16.3 ppb)
 - 2. Sum of VOCs: <200 microgram/m³
 - 3. Carbon Monoxide: Not to exceed 9 ppm
 - 4. Other compounds found on the California Office of Environmental Health Hazard Assessment's list of chronic inhalation Reference Exposure Levels (RELs) are not to exceed those levels, as published on: http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html
 - 5. Airborne Mold and Mildew: The species identified in indoor air cannot vary by more than 10% from those identified in the exterior samples
- D. Test Reports: Prepare test reports showing the results and location of each test, a summary of the HVAC operating conditions, and a listing of any discrepancies and recommendations for corrective actions, if required.
 - 1. Include certification of test equipment calibration with each test report.
- E. For each sampling point where the maximum concentration limits are exceeded, the Contractor is responsible for conducting additional flush-out with outside air and retesting the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test. Retesting shall be performed at no additional expense to the Government.
- F. For each sampling point where the airborne mold and mildew indoor species distribution varies by more than 10% from exterior sampling speciation, Contractor shall identify the source of the mold and/or mildew
- G. In the event that any non-compliant test results occur, Contractor must provide a written report to the Owner describing the source(s) of the non-compliant condition(s) and the corrective action(s) implemented.

3.02 INDEPENDENT MATERIALS TESTING:

- A. Materials That Must Be Tested: All materials listed below that are proposed for use on this project shall be tested for permanent, in-place indoor air quality performance in accordance with requirements of these specifications. Results shall be furnished to the Contracting Officer's Representative. 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 7 days).
 - 2. Carpet including manufacturer's recommended adhesive. The carpet will be applied to the appropriate flooring per manufacturer's instructions so that the testing is of the "carpet assembly."
 - 3. Ceiling tile
 - 4. Any fireproofing material that may be exposed to indoor air, directly or in a plenum, 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 are invalid.
- C. Materials Testing and Evaluation Protocol: California Department of Public Health Services Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources using Environmental Chambers, v.1.2-2017. available online: <http://www.dhs.ca.gov/ps/deodc/ehlb/iaq/VOCs/>

- D. Performance Thresholds: All compounds detected that have chronic reference exposure levels listed in the California DHS Standard Practice document shall be analyzed and compared to the allowable concentration levels.
- E. Materials Test Reports: Submit test reports to the Contracting Officer's Representative. The report shall include raw emission levels, as well as the calculated resulting concentrations and the assumptions (loading, volume of space, ventilation rates) used to determine those resulting concentrations.
- 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 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 81 09

SECTION 01 83 16 – BUILDING ENCLOSURE FIELD TESTING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. General Contractor shall coordinate the Work of employees, each relevant subcontractor, and Testing Agency (Agencies) to provide and facilitate field testing of the building enclosure within the parameters and sequence indicated herein.
2. Unless explicitly stated otherwise, General Contractor shall directly engage a third-party, Qualified Testing Agency (or multiple Agencies) to provide all testing indicated herein.
 - a. Field enclosure testing identified in this section includes:
 - 1) Integrated Exterior Mockups.
 - 2) Wall Systems.
 - 3) Fenestration Systems.
 - 4) Roofing and Waterproofing Systems.
3. General Contractor shall coordinate repairs to the building enclosure resulting from scheduled destructive testing.
4. In all cases, costs associated with remediation of nonconforming Work, in addition to required additional testing resulting from failed tests, shall be the responsibility of the General Contractor. Refer to Section 01 91 13.1, Building Systems commissioning Plan.

B. Alternate Bid: None

1.2 RELATED DOCUMENTS

- A. Provisions of the contract documents, including other requirements in Division 01 specification sections, apply to this Section.
- B. The general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.
- C. Requirements of Section 01 91 13.1, Building Systems commissioning Plan., apply to this Section.
- D. In the event of conflicting requirements between this specification and other project documents, the more thorough, conservative, or rigorous requirements shall apply.

1.3 RELATED SECTIONS

- A. Refer to these and other related sections of the specifications for more information:
 1. Section 01 40 00 – “Quality Requirements.”

2. 01 78 39 – "Project Record Documents."
3. 01 91 13 – "General Commissioning Requirements."
4. 01 91 13.1 – "Building Enclosure Commissioning Requirements."
5. 04 20 00 – "Unit Masonry."
6. 07 21 00 – "Thermal Insulation."
7. 07 26 00 – "Under-Slab Vapor Barrier."
8. 07 27 26 – "Fluid-Applied Membrane Air Barriers."
9. 07 42 13.16 – "Metal Plate Wall Panels."
10. 08 11 13 – "Hollow Metal Doors and Frames."
11. 08 41 13 – "Aluminum Framed Entrances and Storefronts."
12. 08 44 13 – "Glazed Aluminum Curtainwalls."
13. Other individual building enclosure trade sections, for additional requirements of specific components and systems.

1.4 DEFINITIONS AND ABBREVIATIONS

- A. Terms used in this section shall have the following meanings, which may differ from definitions established elsewhere, including within referenced standards:

1. "Adapted" – With reference to a specified test, the test being adopted is modified as described in this Section for broader applicability or a specific use.
2. "Building Enclosure" – Refer to Section 01 91 13.
3. "Building Enclosure Commissioning" (BECx) – Refer to Section 01 91 13.1.
4. "Building Enclosure Commissioning Authority" – See Building Enclosure Commissioning Provider.
5. "Building Enclosure Commissioning Provider" (BECxP) – Refer to Section 01 91 13.1.
6. "Controlled Water Leakage" – Water leakage that is entirely managed within the given system, with no water leakage permitted at the occupied interior of a structure.
7. "Grouping" – As it pertains to testing, a collective battery of tests specified for a specific system at a specific time. For example, multiple tests may be specified for multiple windows of a specific type at a specific time. These tests collectively comprise the test grouping.
8. "Qualified Testing Agency" – A approved, third-party testing agency, unaffiliated with the General Contractor, subcontractors, or product manufacturers, performing onsite testing. Refer to "Action Submittals" for submittal qualification requirements. Where individual test specifications direct, the installing contractor or Building Enclosure Commissioning Provider may serve as the Qualified Testing Agency.
9. "Uncontrolled Water" – Water that is present at or beyond the interior face(s) of a given system, or existing on surfaces that are not
10. "Unmanaged Water" – Refer to "Uncontrolled Water."

- B. The following is a list of abbreviations:

1. A/E: Architect and/or Engineer of record.
2. AAMA: American Architectural Manufacturers Association.
3. ABAA: Air Barrier Association of America.
4. AOR: Architect of Record.
5. ANSI: American National Standards Institute.
6. ASTM: American Society for Testing and Materials / ASTM International.
7. BECxP: Building Enclosure Commissioning Provider.
8. BECx: Building Enclosure Commissioning.

- 9. CSA: Canadian Standards Institute / CSA Group.
- 10. Cx: Commissioning.
- 11. EOR: Engineer of Record.
- 12. FGIA: Fenestration and Glazing Industry Alliance.
- 13. FM: Factory Mutual / FM Global.
- 14. GC: General Contractor.

1.5 GENERAL REQUIREMENTS

- A. This Section applies to Building Enclosure Field Testing services for multiple divisions.
- B. Testing shall be performed by accredited, third-party testing agency (agencies), unless specifically noted otherwise. Testing agencies shall be engaged by, and report directly to, the General Contractor unless specified otherwise.
- C. Where testing is specified to be performed by the BECxP, the General Contractor shall provide site access, jobsite safety orientation, general coordination, access to utilities (working electricity, water, and drainage, as appropriate), and adequate access to the test location for the BECxP and its affiliates. Access provisions to the test location(s), capable of supporting the test method(s), personnel, and equipment, shall be available from both the interior and exterior, including lift equipment as required.
- D. Field Testing shall strictly adhere to the standards referenced herein, except in the case of deliberate exceptions or modifications specified. Some specified parameters may be more restrictive than those included in the testing standard by default.
- E. The specified acceptance criteria indicated herein for Building Enclosure Field Testing shall be considered performance requirements of each referenced system.
- F. The General Contractor shall include all performance requirements indicated by Field Testing in its agreements with Subcontractors, and shall generally ensure Subcontractors are aware of the required performance metrics, testing frequency, acceptance criteria, and testing parameters.
- G. General Contractor shall allocate appropriate time for notification, planning, deployment, physical testing, reporting, review, and possible remediation / retesting directly into the project schedule. Where testing is specified at specific milestones or percentages of system completion, the schedule shall fully integrate each group of testing.
- H. The installing subcontractor(s) shall provide witnesses to all scheduled Building Enclosure Field Testing.
- I. The General Contractor shall coordinate with the Architect of Record (AOR) and Building Enclosure Commissioning Provider (BECxP) to provide required notice of upcoming testing. Testing shall be conducted in the presence of witnesses from both AOR and BECxP, unless a specific party waives this requirement. Refer to Section 01 91 14, Building Enclosure Commissioning Requirements, for additional information.
- J. Any additional enclosure testing, either in-laboratory or in-field, as may be required by applicable codes, individual Section requirements, manufacturers, warranties, compliance programs, or certification requirements specified elsewhere, shall be conducted in addition to the requirements stated herein. Such testing shall not be considered in satisfaction of the requirements of this Section.

- K. The requirements of this section shall not preclude the General Contractor or its subcontractors from conducting additional enclosure testing and field verification at their own discretion. Supplementary testing provided outside the scope or at variance with the specific parameters of this Specification shall not be considered in satisfaction of requirements of this Section.
- L. The PBC reserves the right to conduct additional testing not indicated herein, solely at its own discretion, either for evaluation of performance or in a diagnostic capacity.
- M. Sealants shall be allowed to fully cure before any testing is conducted. Typically, the curing period is not less than seven (7) days, but shall be confirmed in writing by the manufacturer for each sealant involved.
- N. Retesting of remediated specimens on the same deployment of the Testing Agency is permissible, provided that sealants have fully cured and test specimens are in a final state. Successful same-deployment retesting of a remediated specimen shall be logged as a passing test, but shall not obviate any requirements for the testing of additional specimens as a result of the initial test's failure. Each test attempt shall be fully logged by the testing agency.
- O. Testing shall not occur in cases where adjacent or subsequent construction has obscured the Work to be tested, or would influence the outcome of the testing to be conducted.
- P. Unless directly specified in advance, only general locations for testing will be indicated until the day that testing commences. The AOR or BECxP will provide final direction concerning exact specimens or locations to test on the day of testing.
- Q. On the day of testing and subsequent days thereafter, until such time as a planned grouping of tests of a specific system has completed, no further Work shall be performed on the system(s) being tested. Work proceeding in violation of this clause shall cause the entire grouping of testing to be nullified. Remediation work undertaken on a previously tested, failed specimen is an exception to this requirement.
- R. Testing and test setup shall be planned and executed so as to not adversely affect the system being tested, nor surrounding systems, nor components thereof. Any adverse effects resulting from testing shall be fully remediated.
- S. All materials and equipment associated with the testing shall be fully removed from the Work, unless previously identified in the approved Field Testing Action Plan.
- T. Work advancing prior to successful testing shall be at the General Contractors' risk. Work exhibiting deficient installation technique equal to failed test specimens, or having known defects, shall be subject to remediation.

1.6 ACTION SUBMITTALS

- A. Testing Agency Qualifications, All Agencies: For each testing agency and each specified test, submit agency qualifications demonstrating compliance with "QUALITY ASSURANCE" article. Include general company information, past testing history, equipment to be used, all relevant industry certifications, and a signature page endorsed by a company principal. Provide qualifications for personnel conducting testing and responsible for signing test reports, including facsimiles of membership or certification cards.
- B. Testing Agency's Field Testing Action Plans: Field Testing Action Plans shall be developed by the same Qualified Testing Agency engaged to complete onsite testing, with review and contributions from the

General Contractor, as required. For each unique test method to be performed during each testing agency deployment, submit a Field Testing Action Plan including at minimum the following information:

1. Provide an anticipated timeline of site activity, including the time for deployment, safety orientation, erection, setup, review of testing setup, and testing per the standard(s) referenced. Testing Agency and General Contractor shall attempt to consolidate actual testing within a specific timeframe, to facilitate the witnessing of testing by others.
 - a. Allow time in the schedule for field review of test setup(s) and commentary by the AOR, BECxP, PBC, and / or Using Agency.
 2. For each type of testing, indicate the quantity of tests to be conducted, a summary of test procedures to be utilized, locations to be tested (when predetermined), pass / fail criteria per standard and per this specification, equipment to be used, and any parameters specific to the test.
 3. Clearly indicate test locations in plan and elevation, and the extents of areas to be tested.
 4. Provide a description of required provisions, such as site access, availability of required utilities and distances from the testing location(s), safety precautions, occupant and site-adjacent party notifications, protection of adjacent work, and other precautions necessary to properly conduct the testing.
 5. For complex testing configurations or custom installations, provide shop drawings showing test setup.
 6. Fully describe any site-built components or site-built means of access, and responsible party (parties).
 7. Include General Contractor acknowledgement and acceptance of the Field Testing Action Plan.
 8. A single Field Testing Action Plan shall be considered for repeating material testing, such as sealant pull testing and roof weld strength verification.
- C. Product Data: Together with Field Testing Action Plan, submit product data for all supplemental materials to be used during testing that may have potential long-term impact on the building enclosure. Indicate means of removal and for any cleaning agents, include product data for same. Provide substrate material manufacturer's statements of compatibility for all potentially impacted areas, such as weather-resistive membranes, coatings, and roofing. Examples of products to be submitted include the following:
1. Permanent markings, including ink and paint.
 2. Spray foams.
 3. Sealants.
 4. Tapes and adhered gaskets.
 5. Testing fluids.
 6. Solvents and cleaning agents.
- D. Field Performance Testing Reports: Within five (5) business days of the completion of each test, submit a formal result report(s) authored by the Qualified Testing Agency responsible for testing. Test Reports shall document test procedures, and in full compliance with the requirements of this Section.
1. Provide clear, graphical documentation of each test location.
 2. Document time, date, and ambient weather conditions (including wind speed, wind direction, barometric pressure, and other relevant information) for each test.
 3. Clearly indicate the outcome of each test.
 4. For failed or inconclusive tests, clearly indicate the cause of failure or uncertainty.
 5. Indicate the margin of error present in each test result.

6. Special Requirements:

- a. For tests involving structural capacity, including fastener pullout tests, submit test results within 24 hours of test completion.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications, All Agencies:

1. Testing Agency shall be an independent entity, not affiliated with the General Contactor, its Subcontractors, or the manufacturers of the products and systems being evaluated.
2. A company with not less than five (5) years of demonstrable experience in similar testing, having local proficiency in the testing standards and practices specified.
3. Testing Agency shall be capable of providing qualified personnel to conduct the specified testing at the jobsite location. Testing Agency shall not outsource its work to others.
4. Testing firm must be capable of coordinating test procedures, analysis, deployment, logistics, and reporting. Agency must be able to participate in project planning meetings and to provide recommendations in advance of and following reporting.

B. Infrared Thermography Testing Agency Qualifications: For each testing agency performing infrared thermography, comply with the following qualifications:

1. Testing Agency shall have a minimum of two (2) years' experience in thermographic testing and analysis, and a minimum of three (3) successful projects of similar type and scope, using the standards specified.
2. Thermography Test Technicians: Minimum Level 1 Certified Infrared Thermographer with two (2) years' experience using the specified equipment and testing standards.

C. Whole-Building Air Tightness Testing Agency Qualifications: For each testing agency performing whole-building air tightness testing, comply with the following qualifications:

1. Testing Agency shall have a minimum of two (2) years' experience in thermographic testing and analysis, and a minimum of three (3) successful projects of similar type, size and scope, using the standards specified.
2. Agency shall employ technicians on the project with a minimum of two (2) years' experience.

1.8 TEST NAMES AND PROCEDURES

- A. This article identifies specific testing standards and parameters to be utilized.
- B. Quantities, locations, and the party to perform the test are specified in Part 3. Refer to "Schedule of Tests" article.
- C. Unless noted otherwise, all standards indicated shall refer to the most current edition.

- D. In addition to the test parameters specified in this article, certain parameters or other details may be indicated in conjunction with the testing required for a particular system or location. Consult test requirements for each product, area, and system.
- E. In the event that test parameters identified in this listing conflict with test parameters specified elsewhere for a specific system, including those requirements established by any sustainability certifications being sought by the project, the more restrictive shall apply. General Contractor shall clearly indicate a deviation from this specification in the Field Testing Action Plan.
- F. When specific parameters are indicated herein, Field Testing Action Plans shall be written using the default values established in the relevant testing standard(s), and shall clearly indicate that the default value has been adopted. In the event that there are no default values, the AOR and BECxP shall be consulted to obtain the appropriate values prior to developing the Field Testing Action Plan. Testing shall not commence without approved Field Testing Action Plan(s), nor without full approval of all test parameters.
- G. Test Names and Associated Standards:
 - 1. Air Barrier Air Leakage, Verification with "Bubble Gun"
 - a. Testing Standard: ASTM E1186, "Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems."
 - b. Test Method: Method 4.1.7, "Chamber Depressurization and Leak Detection Liquids."
 - c. Air Leakage Test Pressure: 500 Pa (~0.0725 psi).
 - d. Additional Parameters:
 - 1) Leak detection fluid shall be nonreactive and removable from all substrates without damage.
 - e. Acceptance Criteria:
 - 1) Visual Leakage: No visible bubble formation within the testing fluid resulting from gaseous bypass through tested air barrier components.
 - 2. Air Barrier Air Leakage, Verification with Pressurized Chamber
 - a. Testing Standard: ASTM E783 (ADAPTED), "Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors."
 - b. Air Leakage Test Pressure: 75 Pa (~1.57 psf).
 - c. Size of Test Specimens: No less than six (6) feet wide by ten (10) feet high.
 - d. Acceptance Criteria:
 - 1) Assembly air tightness shall be no greater than 0.035 cfm / sf, correlated at 75 Pa (~1.57 psf).
 - 3. Air Barrier Air Leakage, Verification with Smoke Tracers
 - a. Testing Standard: ASTM E1186, "Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems."
 - b. Test Method: Method 4.1.6, "Chamber Depressurization (or Pressurization) and Smoke Tracers or Theatrical Fog."
 - c. Air Leakage Test Pressure: 75 Pa (~1.57 psf).
 - d. Size of Test Specimens: No less than six (6) feet wide by ten (10) feet high.

- e. Additional Parameters:
 - 1) Colored, high-visibility smoke tracers or theatrical fog shall be utilized. Fogging agents shall be non-toxic, inert, and fully dissipating without leaving residue or contamination.
 - f. Acceptance Criteria:
 - 1) Air Leakage: Not to exceed values stated, per system.
 - 2) Visual Leakage: Unanticipated visible evidence of smoke bypassing air barrier components or materials shall be utilized by the General Contractor as a diagnostic for improved quality assurance processes and field quality control.
4. Air Barrier Adhesion, “Puck Test”
- a. Testing Standard: ABAA T0002, “Standard Test Method for Pull-Off Strength of Adhered Air and Water Resistive Barriers Using an Adhesion Tester.”
 - b. Repair Methodology: Repairs following testing shall be anticipated and performed by the General Contractor, regardless of the party providing testing, in strict accordance with the methods approved for use on the project.
 - c. Test Parameters:
 - 1) Adhesion Tester Disc Material: Metal.
 - 2) Surface Abrasion Prior to Testing: Not permitted. Areas of bulges, puckers, blisters, and drips may be mechanically planed to a flat surface for the purpose of inspection and puck adhesion.
 - 3) Test results involving to any extent substrates C or D shall be reported, but shall be considered invalid. Testing shall be considered incomplete until additional pucks are placed and satisfactorily evaluated.
 - d. Acceptance Criteria:
 - 1) Failure mode shall reflect consistent cohesive failure within the substrate (failure mode A/A); or,
 - 2) The test pressure applied to each puck shall exceed 40 psf; or,
 - 3) For fluid-applied membranes: When failure type is either (A/B) or (B/B), none of the three required test specimens shall exhibit adhesive strength less than the manufacturer’s stated material adhesion strength. Average strength shall be reported but not used for acceptance; or,
 - 4) For sheet-applied membranes: When failure type is either (A/B) or (B/B), the reported average strength shall be no less than the manufacturer’s stated adhesion strength. When the adhesion strength of any puck is greater than fifteen percent (15%) less than the manufacturer’s stated adhesion strength, for results to be accepted, the product’s stated cohesive tensile strength shall additionally be evaluated for acceptable capacity, based on a mechanical analysis with respect to expected stresses developed from project loadings.
5. Diagnostic Water Nozzle Field Verification, General Fenestration
- a. Testing Standard: AAMA 501.2, “Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.”
 - b. Length of Each Test Specimen: Five (5) feet.

- c. Rate of Testing: One foot per minute.
 - d. Acceptance Criteria:
 - 1) Water Leakage: No observed interior water leakage.
- 6. Diagnostic Water Nozzle Field Verification, Opaque Areas
 - a. Testing Standard: AAMA 501.2 (ADAPTED), "Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems."
 - b. Length of Each Test Specimen: Five (5) feet.
 - c. Rate of Testing: One foot per minute.
 - d. Access Requirements: General Contractor-provided access shall allow the test operators to safely observe and evaluate the test from the interior at close range, as well as to apply a water jet using hose and spray nozzle positioned one (1) foot away from the object being tested, measured perpendicularly from the object's surface.
 - e. Acceptance Criteria:
 - 1) Water Leakage: No observed interior water leakage.
- 7. Electronic Leak Detection
 - a. Testing Standard: ASTM D7877, "Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes."
 - b. Testing Type: High-voltage ELD, as deemed suitable for the membrane type and substrate.
 - c. Coverage: All horizontal and vertical surfaces.
 - d. Scheduling: Following completion of membrane, but prior to installation of any overburden.
 - e. Required Submittal Data: Field Testing Action Plan to Include the Following in addition to general requirements:
 - Test procedure.
 - f. Acceptance Criteria:
 - 1) Fully documented test report with drawings to-scale.
 - 2) No leaks detected.
 - g. Remediation Requirements:
 - 1) General contractor shall obtain core samples and perform laboratory gravimetric analysis of all roofing materials in the vicinity of leaks identified during ELD testing.
 - 2) Any insulation or other roofing material confirmed to have an elevated moisture content based on gravimetric analysis shall be replaced in kind.
 - 3) General Contractor shall provide repairs to the roofing membrane as required, resulting from coring and other probes, material replacement, and as required to remediate any sources of leaks.
 - 4) Following repairs, General Contractor shall provide repeat ELD scanning, in compliance with this article, to confirm that the reworked conditions have been fully remediated.
- 8. Fastener Pullout Resistance, Roofing
 - a. Testing Standard: ANSI / SPRI FX-1, "Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners."
 - b. Installation Requirements: Fasteners to be tested shall be installed identically to those intended for use on the project, including fastener length, penetration depth, and substrate(s).

- c. Acceptance Criteria:
 - 1) Fastener pullout resistance shall meet or exceed required values based on approved roofing shop drawings and ASCE 7 structural loadings for each roof and pressure zone. The factor of safety employed shall be as utilized in the approved roofing uplift evaluation, but no less than 2.0.
 - d. Remediation Requirements:
 - 1) In the event that uplift resistance is insufficient based on the above, the General Contractor shall increase the number of fasteners utilized and / or change the type of fastener to provide acceptable uplift resistance for each roofing assembly and pressure zone applicable to said assembly.
 - 2) Changes to mechanical fasteners shall require retesting as specified in this article.
9. Fenestration, Air Leakage, Verification with Pressurized Chamber
- a. Testing Standard: ASTM E783, "Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors."
 - b. Size of Test Specimens: Full size, including perimeter interfaces with outside walls.
 - c. Acceptance Criteria:
 - 1) Air Leakage: Not to exceed values specified, per system, at the specified test pressure. Refer to "Schedule of Tests" article.
10. Fenestration, Static Air and Water Penetration Field Test, Curtainwall
- a. Testing Standard: AAMA 503, "Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls, and Sloped Glazing Systems."
 - b. Air Leakage Test Pressure: 300 Pa (~6.27 psf).
 - c. Water Penetration Test Pressure: 580 Pa (~12.11 psf).
 - d. Additional Parameters:
 - 1) Air Leakage testing shall only be required on mockups.
 - 2) Interior seals shall not be present during testing.
 - 3) Interior wall finishes shall not be installed prior to testing.
 - 4) Exterior or interior pressure chambers are acceptable and shall be determined by the Testing Agency, as needed to fulfill testing requirements.
 - 5) Leak detection paper shall be utilized consistently to check for leakage in concealed areas, including system perimeters.
 - 6) Reductions in field test pressures based on reported laboratory test pressures shall not be accepted.
 - 7) Test chambers at edge(s) of the system shall be constructed to capture and test the interface of the curtainwall to the adjacent construction. Testing shall not commence until the system has been properly and completely interconnected with adjacent drainage plane(s), per approved details.
 - e. Acceptance Criteria:
 - 1) Air Leakage: 0.06 cfm / sf.
 - 2) Water Penetration: No uncontrolled water penetration on any part of the system, including interior mullions and other system components.
 - 3) At system perimeters: Following testing, no water shall be present beyond the outermost exterior seal.
11. Fenestration, Static Air and Water Penetration Field Test, General

- a. Testing Standard: AAMA 502, “Voluntary Specification for Field Testing of Newly Installed Fenestration Products.”
- b. Air Leakage Test Pressure: 300 Pa (~6.27 psf).
- c. Water Penetration Test Pressure: 580 Pa (~12.11 psf).
- d. Additional Parameters:
 - 1) Brick masonry or other surrounding cavity wall cladding shall not be present at the time of testing.
 - 2) Exterior insulation shall not be present at the time of testing.
 - 3) Interior seals shall not be present during testing.
 - 4) Interior wall finishes shall not be installed prior to testing.
 - 5) Exterior or interior pressure chambers are acceptable and shall be determined by the Testing Agency, as needed to fulfill testing requirements.
 - 6) Leak detection paper shall be utilized consistently to check for leakage in concealed areas, including system perimeters.
 - 7) Reductions in field test pressures based on reported laboratory test pressures shall not be accepted.
 - 8) Test chambers at edge(s) of the system shall be constructed to capture and test the interface of the fenestration system to the adjacent construction. Testing shall not commence until the system has been properly and completely interconnected with adjacent drainage plane(s), per approved details.
- e. Acceptance Criteria:
 - 1) Air Leakage: Not to exceed values specified, per system, at the specified pressure. Refer to “Schedule of Tests” article.
 - 2) Water Penetration: No uncontrolled water penetration on any part of the system, including interior mullions and other system components.
 - 3) At system perimeters: Following testing, no water shall be present beyond the outermost exterior seal.

12. Infrared Scan and Report, General

- a. Testing Standard: ASTM C1060 (ADAPTED), “Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings.”
- b. Schedule of Testing: For opaque walls, testing shall be provided following completion of the wall assemblies.
- c. Environmental Conditions: Testing shall be conducted only on dry surfaces. There shall be a temperature differential of no less than 18 degrees F between the interior of the building and the exterior at the time of testing.
- d. Acceptance Criteria:
 - 1) No extraneous air leakage detected.
 - 2) No unexpected thermal anomalies resulting from installation technique or variance from approved details.

13. Infrared Scan and Report, Roofing Insulation

- a. Testing Standard: ASTM C1153, “Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging.”
- b. Time of Testing: Testing shall be conducted after nightfall, following a sunny day.
- c. Environmental Conditions: Testing shall be conducted only on dry surfaces.
- d. Acceptance Criteria:
 - 1) Fully documented and annotated testing report, referenced to approved roof shop drawings.

- 2) No documented areas of roofing showing probable elevated moisture content.
- e. Additional Parameters:
 - 1) Ground-based, walk-over type.
- f. Remediation Requirements:
 - 1) General contractor shall obtain core samples and perform laboratory gravimetric analysis of all roofing materials indicated in infrared scanning report to have a high probability of elevated moisture.
 - 2) Any insulation or other roofing material confirmed to have an elevated moisture content based on gravimetric analysis shall be replaced in kind.
 - 3) General Contractor shall provide repairs to the roofing membrane as required, resulting from coring and other probes, material replacement, and as required to remediate any sources of leaks.
 - 4) Following repairs, General Contractor shall provide repeat infrared scanning in compliance with this article, to confirm that the reworked conditions have been fully remediated.

14. Roof Membranes, Single-Ply Weld Delamination Test

- a. Testing Standard: Proprietary.
- b. Test Method: Using membrane handled and prepared identically to that present in-field, and equipment identical to that being used in the field, conduct the following procedure:
 - 1) Obtain two pieces of sample membrane 18" long and no less than 3" wide, of identical age, condition, and exposure to the field membrane that will be welded.
 - 2) Clean and otherwise prepare the sample, if required, following a process identical to that which will be used on the field membrane.
 - 3) With samples positioned atop one another, provide a test weld using the same settings as being used in the field. Start at one end and weld along the length between 6" and 8".
 - 4) Following cooling, write the date, time, and representative roof location on the test specimen.
 - 5) Grasp the welded membrane on each side and separate the two halves by hand until rupture.
- c. Reporting Data:
 - 1) Photographic documentation of both the original (prior to testing) and separated membrane (following testing).
 - 2) Measured width of weld.
- d. Acceptance Criteria:
 - 1) Membrane shall separate at the reinforcement scrim (interlayer).
 - 2) No separation at the membrane-to-membrane weld interface.
 - 3) Weld width shall be between 1" and 1.5".
 - 4) No visible bleed-out at welds (TPO membranes only).

15. Sealants, Adhesion to Substrates

- a. Testing Standard: ASTM C1193, Appendix X1, Method A, "Standard Guide for Use of Joint Sealants."
- b. Acceptance Criteria:
 - 1) No adhesive failures.
- c. Repair Requirements:

- 1) Repair sealants damaged by testing by completely removing the impaired material, then replacing in kind. Follow the original installation procedures, but observe manufacturer's requirements for joint preparation in the presence of residual sealant. Ensure that original sealant surfaces are clean, and that new sealant fully contacts the original.
16. Whole-Building Air Tightness Testing
- a. Testing Standard: ASTM E1827, "Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door" or ASTM E779, "Standard Test Method for Determining Air Leakage Rate by Fan Pressurization".
 - b. Air Leakage Test Pressure: Results shall be reported at 75 Pa (~1.57 psf). Pressure targets during testing shall be determined by the Testing Agency, based on project conditions.
 - c. Preparation for Testing:
 - 1) General Contractor shall disable all mechanical equipment prior to testing.
 - 2) General Contractor shall ensure all outdoor intake and exhaust dampers are in their fully closed positions.
 - 3) General Contractor shall ensure that gravity dampers are fully functional and in their standard operating conditions.
 - 4) Interior doors shall be left in the open position before and during testing.
 - 5) Operable exterior fenestration shall be in their closed and locked positions.
 - d. Test Parameters:
 - 1) Testing shall be completed with both inward and outward pressure.
 - 2) The product of the building height and temperature difference shall be less than 1180 ft-°F. Building height shall be taken as the difference in elevation between average grade and the top of the conditioned building envelope.
 - 3) The outdoor temperature shall be between 45 degrees F and 95 degrees F during the full duration of testing.
 - 4) Five or more pressure targets shall be utilized between 10 and 60 Pa (~0.209 to ~1.256 psf).
 - 5) Baseline values shall be determined over a period of no less than ten (10) seconds each.
 - 6) Target pressures shall be taken over a period of no less than ten (10) seconds each.
 - 7) The slope of the results curve shall be between 0.5 and 1.0 (\log_{10} flow in CFM / \log_{10} pressure in Pa).
 - 8) Reported correlation of results from regression analysis of results curves shall be no less than 98% (i.e. the coefficient of determination, R^2 , shall be greater than or equal to 0.98).
 - e. Acceptance Criteria:
 - 1) Whole-building air tightness shall be no greater than 0.35 cfm / sf, correlated at 75 Pa (~1.57 psf).

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. Provide means, including lifts and lift operators, for those witnessing the testing, including the AOR and BECxP, to access, observe, touch, measure, and visually review the test setup and outcome. These means shall be in compliance with all OSHA and jobsite safety regulations and shall be of a type reasonable for the work being performed.
- B. Provide access to functional utilities, as is required to properly conduct the testing. For tests involving water, ensure that proper pressures and flow rates are achievable before testing is to commence.
- C. Provide all equipment required to properly conduct scheduled testing.
 - 1. All equipment shall be calibrated according to the equipment manufacturer's required schedule, but not less than on an annual basis. Documentation of calibration shall be provided upon request.
 - 2. Equipment used shall be appropriate for the environmental conditions, materials, logistics, and general parameters of testing being performed.
 - 3. Where custom tools and equipment are employed, documentation and verification data shall be submitted. Refer to Action Submittals article above.

2.2 TESTING ACCESS EQUIPMENT

- A. Provide means, including lifts and lift operators, for those witnessing the testing, including the AOR and BECxP, to access, observe, touch, measure, and visually review the test setup and specimen from interior and exterior, both before and after testing.

2.3 TESTING ACCESSORIES

- A. Provide approved supplemental accessories, as required, compatible with substrates and completely neutral or reversable in nature. Testing accessories, in whole or in part, shall not remain on the project following completion of testing.
- B. Do not use markings of a permanent nature to identify test locations, measurements, or other data, unless directed by the AOR.

PART 3 - EXECUTION

3.1 GENERAL EXECUTION

- A. Field Testing shall follow the applicable, approved Field Testing Action Plan(s).
- B. Tests involving application of water shall not be conducted during precipitation events.

- C. The Testing Agency shall be responsive to comments or concerns raised by the AOR, BECxP, PBC, or Using Agency during the submittal process and in the field. The AOR shall be the final authority at all times to provide approval to Field Testing Action Plans, observed field procedures, and Test Reports.
- D. Drying of Specimens Being Tested for Water Penetration:
 - 1. Prior to the start of testing, it shall be permissible to dry the specimen of any residual moisture that may be retained during transport or construction, using methods acceptable to the installer.
 - 2. Following the start of testing, only drying of the system by means of gravity over a 15-minute period shall be permissible. Drying via other methods is not permitted. This provision applies to failed specimens requiring retesting, and repeat testing of the same specimen.
 - 3. The above provisions shall not apply to materials being tested for installed moisture content.
- E. Protection of the Work: Prior to starting testing, General Contractor shall communicate directly with the Qualified Testing Agency and shall review current jobsite conditions, safety considerations, and any risks to the work associated with testing.
 - 1. When conducting field tests involving water, it should be assumed that water may penetrate the interior of the structure.
 - 2. When conducting field tests involving water, large volumes may accumulate on horizontal surfaces. Test areas shall be reviewed to understand the means of drainage and to ensure protection of the surrounding Work. Ensure that any potentially ponded water will not result in structural overload.

3.2 SCHEDULE OF TESTS

- A. Responsible Parties: Unless specifically noted with each test, testing shall be provided by the General Contractor via direct engagement of a Qualified Testing Agency.
- B. Named tests identified in this article, capitalized, refer to test standards and parameters specified in Part 1. Refer to "Tests Names and Procedures" article.
- C. Field Quality Control Testing of Weather-Resistive Barriers and Air Barriers:
 - 1. AIR BARRIER AIR LEAKAGE, VERIFICATION WITH "BUBBLE GUN":
 - a. Locations:
 - 1) Integrated Exterior Mockups, at Brick Veneer Anchors.
 - 2) As determined by the BECxP.
 - b. Reference Sections: 07 27 26.
 - c. Quantities:
 - 1) Integrated Exterior Mockups: No less than 5.
 - 2) Remaining Building: As determined by the BECxP.
 - d. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.
 - e. Required Schedule:
 - 1) Integrated Exterior Mockups: Testing shall occur following completion and complete curing of air barrier system, and following the installation of penetrations such as

brick veneer anchors, girts, or other materials anchored through the air barrier. Insulation and cladding shall not be present during the testing, which may require the removal of insulation installed in conjunction with brick veneer anchors.

- 2) Remaining Building: Testing shall occur on an as-needed basis, at the discretion of the of the BECxP.

2. AIR BARRIER AIR LEAKAGE, VERIFICATION WITH SMOKE TRACERS:

- a. Location: Integrated Exterior Mockups, as directed by the AOR.
- b. Reference Sections: 07 27 26.
- c. Quantity: Two (2) tests.
- d. Required Schedule:
 - 1) Integrated Exterior Mockups: Testing shall occur following completion and complete curing of air barrier system, and following the installation of penetrations such as brick veneer anchors, girts, or other materials anchored through the air barrier. Insulation and cladding shall not be present during the testing, which may require the removal of insulation installed in conjunction with brick veneer anchors.

3. AIR BARRIER AIR LEAKAGE, VERIFICATION WITH SMOKE TRACERS:

- a. Location: Integrated Exterior Mockups, in the same locations as “Air Barrier Air Leakage, Verification with Pressurized Chamber” testing.
- b. Reference Sections: 07 27 26.
- c. Quantity: Two (2) tests.
- d. Required Schedule: Testing shall occur following “Air Barrier Air Leakage, Verification with Pressurized Chamber” testing.

4. AIR BARRIER ADHESION, “PUCK TEST”:

- a. Locations:
 - 1) Integrated Exterior Mockups.
 - 2) Other locations shall be determined at the discretion of the BECxP.
- b. Reference Sections: 04 20 00, 07 27 26.
- c. Quantity:
 - 1) One (1) test shall be conducted on the initial Integrated Exterior Mockup.
 - 2) Other testing shall be at the discretion of the BECxP for field verification. Not to exceed 20 tests of three pucks each over the course of the project.
- d. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.
- e. Required Schedule: Testing will occur on an as-needed basis, at the sole determination of the BECxP.
- f. Additional Information: This test, when performed by the BECxP, is not provided to satisfy any ABAA QAP requirements. ABAA QAP compliance shall be the sole responsibility of the General Contractor.

5. WHOLE-BUILDING AIR TIGHTNESS TESTING:

- a. Location: Entire Building, blower arrangement to be coordinated.
- b. Quantity: One (1).
- c. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.

- d. Required Schedule: Testing to occur as soon as the building's air barrier system, inclusive of opaque walls, penetrations, and all fenestration, is airtight, without temporary provisions. Testing must be completed prior to occupancy.

D. Field Quality Control Testing of Fenestration Systems:

1. DIAGNOSTIC WATER NOZZLE FIELD VERIFICATION, GENERAL FENESTRATION:

- a. Locations:
 - 1) Integrated Exterior Mockups.
 - 2) Sills and jambs of exterior punched openings, as indicated on "Window Schedule," sheet A901.
 - 3) Other fenestration locations as determined by the BECxP in response to field observations.
- b. Reference Sections: 07 92 00, 08 11 13, , 08 41 13, 08 44 13.
- c. Quantity:
 - 1) One (1) test shall be conducted on the initial Integrated Exterior Mockup at a sloped sill condition.
 - 2) Three (3) sill conditions of punched openings with sloped sills shall be tested following complete installation of the window and its seals.
 - 3) Six (6) jamb conditions of punched openings shall be tested following complete installation of the window and its seals.
 - 4) Other testing shall be at the discretion of the BECxP for field verification.
- d. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.

2. FENESTRATION, AIR LEAKAGE, VERIFICATION WITH PRESSURIZED CHAMBER:

- a. Components To Be Tested:
 - 1) Exterior overhead coiling doors.
 - 2) Interior vestibule fixed components and vestibule entry doors of Aluminum Framed Entrances and Storefront systems.
- b. Referenced Sections: 07 92 00,
- c. Locations: Locations shall be determined by AOR and BECxP on the date of testing.
- d. Quantities:
 - 1) Exterior overhead coiling doors: One (1) door.
 - 2) Interior vestibules: Three (3) locations, fixed glazing or swinging doors, as directed by AOR.
- e. Required Schedule:
 - 1) Following installation. Doors of similar type shall be coordinated for testing in one test grouping.
- f. Acceptance Criteria
 - 1) Exterior Overhead Coiling Doors:
 - a) Air Leakage Test Pressure: 75 Pa (~1.57 psf).
 - b) Maximum Air Leakage: 1.00 cfm / sf.
 - 2) Interior Vestibule Fixed Glazing:
 - a) Air Leakage Test Pressure: 300 Pa (~6.27 psf).
 - b) Maximum Air Leakage: 0.06 cfm / sf.
 - 3) Interior Vestibule Swinging Doors:
 - a) Air Leakage Test Pressure: 75 Pa (~1.57 psf).

b) Maximum Air Leakage: 0.30 cfm / sf.

3. FENESTRATION, STATIC AIR AND WATER PENETRATION FIELD TEST, CURTAINWALL:

- a. Locations:
 - 1) Integrated Exterior Mockups.
 - 2) Other installed locations within the curtainwall elevations shown on sheets A905 and A906, as directed by the AOR and BECxP. It should be assumed that the test locations may include any or all of the following:
 - a) Curtainwall splice and stack joints.
 - b) Glazed Corners.
 - c) Sill and Head details.
 - d) Sloped or angled glazing.
 - e) Unusual or irregular details.
- b. Referenced Sections: 07 92 00, 08 44 13.
- c. Quantities:
 - 1) Integrated Exterior Mockups: 1 Test.
 - 2) Other installed locations: Three (3) groupings of three (3) tests each.
- d. Required Schedule:
 - 1) Integrated Exterior Mockups: Testing shall be scheduled as soon as the mock-up specimen and its associated weather seals have been completed and fully cured.
 - 2) Other installed locations: Test groupings shall be conducted at 10% of total installation, 35% of total installation, and 75% of total installation.
- e. Integrated Exterior Mockups: Testing shall be scheduled as soon as Other Parameters: Integrated exterior mockup shall be installed and configured to allow representative air tightness testing. This requirement may introduce a need for temporary air sealing at perimeters of the mockup. Curtainwall installation shall not proceed beyond the mockup stage until testing results are accepted. Consult with BECxP following approval of the curtainwall system specified in 08 44 13.

4. FENESTRATION, STATIC AIR AND WATER PENETRATION FIELD TEST, GENERAL:

- a. Components To Be Tested:
 - 1) Integrated Exterior Mockups.
 - 2) Exterior punched openings, as indicated on "Window Schedule," sheet A901.
 - 3) Exterior hollow metal doors and frames.
 - 4) Exterior swinging doors integrated into curtainwall systems.
- b. Referenced Sections: 07 92 00, 08 11 13, 08 41 13, 08 44 13.
- c. Locations: Locations shall be determined by AOR and BECxP on the date of testing.
- d. Quantities:
 - 1) Integrated Exterior Mockups: 2 Tests of punched openings. AOR to coordinate with General Contractor to select locations. Testing shall occur on windows with sloped sill conditions.
 - 2) Exterior punched openings: Three (3) groupings of three (3) tests each.
 - 3) Exterior hollow metal doors and frames: Three (3) tests, including one double door.
 - 4) Exterior swinging doors integrated into curtainwall systems: Three (3) tests.
- e. Required Schedule:

- 1) Integrated Exterior Mockups: Testing shall be scheduled as soon as the mock-up specimen and its associated weather seals have been completed and fully cured.
 - 2) Other installed locations:
 - a) Windows: Test groupings shall be conducted at 10% of total installation, 35% of total installation, and 75% of total installation.
 - b) Doors: Following installation. Doors of similar type shall be coordinated for testing in one test grouping.
 - f. Acceptance Criteria:
 - 1) Exterior punched Openings
 - a) Air Leakage Test Pressure: 300 Pa (~6.27 psf).
 - b) Maximum Air Leakage: 0.06 cfm / sf.
 - c) Water Penetration Test Pressure: 580 Pa (~12.11 psf).
 - 2) Opaque Exterior Swinging Doors:
 - a) Air Leakage Test Pressure: 75 Pa (~1.57 psf).
 - b) Maximum Air Leakage: 0.20 cfm / sf.
 - c) Water Penetration Test Pressure: 260 Pa (~5.43 psf).
 - 3) Glazed Exterior Swinging Doors:
 - a) Air Leakage Test Pressure: 75 Pa (~1.57 psf).
 - b) Maximum Air Leakage: 0.30 cfm / sf.
 - c) Water Penetration Test Pressure: 260 Pa (~5.43 psf).
- E. Field Quality Control Testing of Miscellaneous Components:
1. DIAGNOSTIC WATER NOZZLE FIELD VERIFICATION, OPAQUE AREAS: Standing Seam Underlayment:
 - a. Components To Be Tested: Underlayment of Standing Seam Roofing, Including Transitions and Terminations.
 - b. Reference Sections: 07 27 26,
 - c. Locations: Testing to occur at transitions to air barrier (top and bottom), field laps, and penetrations. Exact locations shall be chosen by the AOR and BECxP.
 - d. Quantity: Ten (10).
 - e. Required Schedule: Provide testing as soon as self-adhered underlayment system is completed, prior to installation of Standing Seam Roofing.
 2. DIAGNOSTIC WATER NOZZLE FIELD VERIFICATION, OPAQUE AREAS: Metal Panel System Girts and Anchors:
 - a. Components To Be Tested:
 - 1) Integrated Exterior Mockups, Freestanding Panel.
 - 2) Girts and anchors of Metal Panel System at the Penthouse Level.
 - b. Reference Sections: 07 27 26,
 - c. Locations: Testing to occur on both sides of girts of metal panel system, in addition to heads of anchors, following completion of anchor installation and prior to attachment of metal panels.
 - d. Quantities:
 - 1) Integrated Exterior Mockups: Three (3) tests.
 - 2) Girts and anchors of Metal Panel System at the Penthouse Level: Two (2) test groupings of four (4) tests each.
 - e. Required Schedule:

- 1) Integrated Exterior Mockups: Provide testing following completion of metal panel girts.
 - 2) Penthouse: Test groupings shall be conducted at 10% of total installation and 60% of total girt installation, with exact locations selected by the AOR and BECxP.
3. DIAGNOSTIC WATER NOZZLE FIELD VERIFICATION, OPAQUE AREAS: Weather-Resistive Barrier Detailing at Sloped Sills of Framed Openings:
 - a. Locations:
 - 1) Integrated Exterior Mockups.
 - 2) Exterior punched openings, as indicated on "Window Schedule," sheet A901.
 - b. Reference Sections: 07 92 00, 08 11 13, 08 41 13, 08 44 13.
 - c. Quantity:
 - 1) One (1) test shall be conducted on the initial Integrated Exterior Mockup at a sloped sill condition.
 - 2) Three (3) sill conditions of punched openings with sloped sills shall be tested.
 - d. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.
 - e. Test Parameters:
 - 1) Testing shall occur following detailing of the air barrier, wrapping into the punched opening, but prior to the installation of metal flashings or window components.
 - 2) The General Contractor shall provide a provisional, sealed, watertight closure to the entirety of the window opening prior to testing, positioned at the interior side. This closure is intended to prevent overspray from entering the building, and to ensure that any leaks identified originate from the system being tested.
4. DIAGNOSTIC WATER NOZZLE FIELD VERIFICATION, OPAQUE AREAS: Geometrically Complex Air Barrier and Waterproofing Transitions:
 - a. Components To Be Tested:
 - 1) Waterproofing transitions to Weather-Resistive Barrier (Air Barrier).
 - 2) Air Barrier detailing.
 - b. Reference Sections: 07 27 26, , , , 07 72 00.
 - c. Locations: Testing to occur at complex transitions between various components of the drainage and air barrier.
 - 1) Standing Seam-to-Roof Coping transition, as shown on detail 7/ A754.
 - 2) Metal panel-to-Standing Seam transition, as shown on detail 4/ A754.
 - d. Quantities:
 - 1) As required to fully evaluate the transitions described.
 - e. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.
 - f. Required Schedule:
 - 1) Prior to installation of cladding, including copings, standing seam roofing, and metal panels, but following the installation of any support framing that may be required for these systems.

F. Field Quality Control Testing of Roofing and Waterproofing Systems:

1. ELECTRONIC LEAK DETECTION, Single-ply Roofing Membranes:
 - a. Location: 100% of roofed areas.
 - b. Reference Section:
 - c. Quantity: One (1).
 - d. Required Schedule: Provide ELD testing following completion of the roofing membrane.
2. ELECTRONIC LEAK DETECTION, Hot Fluid-Applied Waterproofing:
 - a. Location: 100% of waterproofed areas.
 - b. Reference Section:
 - c. Quantity: One (1).
 - d. Required Schedule: Testing to occur as soon as the waterproofing system is completed, and prior to the installation of any overburden.
3. FASTENER PULLOUT RESISTANCE, ROOFING:
 - a. Location: 100% of roofed areas utilizing mechanical fastening. 50% of tests shall be performed in corner and perimeter zones.
 - b. Reference Section:
 - c. Quantity: For each deck type, variation in roof system assembly, type or length of fastener, and / or change of elevation, provide a minimum of ten (10) tests for areas up to 50,000 square feet, and five (5) additional tests for each 50,000 square feet thereafter.
 - 1) Provide additional tests if required by the manufacturer's installation or warranty requirements.
 - d. Required Schedule: Testing to occur in advance of fastener installation for any given roof type and elevation.
4. ROOF MEMBRANES, SINGLE-PLY WELD DELAMINATION TEST
 - a. Location: 100% of areas roofed with welded single-ply membrane.
 - b. Reference Section:
 - c. Required Schedule: Provide at minimum testing according to the following schedule:
 - 1) Provide one (1) test each morning before commencing welding, and one (1) test in the early afternoon for each day that roof welding is taking place.
 - 2) Provide additional samples following precipitation events or following any significant changes in prevailing outdoor conditions, including but not limited to cloudiness, temperature, or humidity.
5. DIAGNOSTIC WATER NOZZLE FIELD VERIFICATION, OPAQUE AREAS: Roofing, Miscellaneous Transitions and Terminations:
 - a. Components To Be Tested:
 - 1) Roofing Terminations, Flashings, Seams, and other Components, including Vapor Barrier and transitions to Air Barrier.
 - b. Reference Sections: 07 27 26, 07 62 00, 07 72 00.
 - c. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.
 - d. Locations: Testing shall occur at the discretion of the BECxP.
 - e. Quantities: As determined by the BECxP.

- f. Required Schedule: General Contractor to coordinate with the BECxP. The BECxP will identify areas where testing is requested during field observations.

G. Field Quality Control Testing of Utilizing Thermographic Scanning

1. INFRARED SCAN AND REPORT, GENERAL:

- a. Location: 100% of exterior wall surfaces.
- b. Quantity: Not to exceed four (4) scans, as required per coordination with the General Contractor.
- c. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.
- d. Required Schedule: Testing to occur following completion of exterior walls. Refer to test description in Part 1.

2. INFRARED SCAN AND REPORT, ROOFING INSULATION:

- a. Location: 100% of single-ply roofed areas.
- b. Reference Section:
- c. Quantity: One (1).
- d. Providing Party: PBC has engaged the BECxP to provide this testing. General Contractor to coordinate as required.
- e. Required Schedule: Testing to occur following roof completion.

H. Field Quality Control Testing of Sealants:

1. SEALANTS, ADHESION TO SUBSTRATES:

- a. Locations:
 - 1) Integrated Exterior Mock-ups: For each sealant-substrate combination.
 - 2) 100% of sealant joints, including but not limited to primary and secondary seals.
- b. Reference Section: 07 92 00.
- c. Quantity:
 - 1) In-situ Mock-ups: Conduct three (3) field tests for each sealant-substrate combination.
 - 2) For each distinct combination of sealant and substrate present on the project: Perform ten (10) tests for the first 1,000 feet of joint length, and one (1) test for each 1,000 feet of joint length thereafter, but not less than one additional test per elevation per floor, and not less than that required by the sealant manufacturer or manufacturer's warranty.
- d. Providing Party: It shall be acceptable for trained and experienced personnel of the General Contractor or its subcontractors to self-perform this test, provided that full required reporting is provided.
- e. Required Schedule:
 - 1) Integrated Exterior Mock-ups: Notify AOR and BECxP not less than seven (7) days in advance of the installation of trial joints.

- 2) Following Mock-up Approval: Testing shall occur concurrently with sealant application, following acceptable curing. Tests shall be distributed evenly over the application area.
- f. Reporting: 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 material, sealant configuration, and sealant dimensions. Provide at least one photograph of testing demonstrating testing of each sealant and substrate combination.

END OF SECTION 01 83 16

SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Owner's Project Requirements and Basis-of-Design documentation are included by reference for information only.

1.2 SUMMARY

- A. Section Includes:
 - 1. General requirements for coordinating and scheduling commissioning.
 - 2. Commissioning meetings.
 - 3. Commissioning reports.
 - 4. Use of test equipment, instrumentation, and tools for commissioning.
 - 5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
 - 6. Commissioning tests and commissioning test demonstration.
 - 7. Adjusting, verifying, and documenting identified systems and assemblies.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submittal procedures requirements for commissioning.
 - 2. Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.
 - 3. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal.
 - 4. Section 230800 "Commissioning of HVAC" for technical commissioning requirements for HVAC.

1.3 ALLOWANCES

- A. Labor and management costs for the performance of commissioning.
- B. The following are excluded from the commissioning allowance:
 - 1. Equipment and systems installation, startup, and field quality-control testing indicated in the Contract Documents.
 - 2. Test equipment, instrumentation, and tools (including, but not limited to, proprietary test equipment, instrumentation, and tools) required to perform tests.
 - 3. Work to correct commissioning issues.
 - 4. Work to repeat tests when equipment and systems fail acceptance criteria.

1.4 UNIT PRICES

- A. The following are excluded from the computation for the adjustment of the commissioning allowance for technician labor hours:
 - 1. Work to correct commissioning issues.
 - 2. Work to repeat tests when equipment and systems fail acceptance criteria.

1.5 DEFINITIONS

- A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.
- B. Basis-of-Design Document: A document prepared by Owner, Architect, or Commissioning Authority that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.
- C. Commissioning Authority: An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.
- D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation requirements of commissioning.
- E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of commissioning is defined in Section 011000 "Summary."
- F. Construction Phase Commissioning Completion: The stage of completion and acceptance of commissioning when resolution of deficient conditions and issues discovered during commissioning and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date Construction Phase Commissioning Completion is achieved. See Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.
 - 1. Commissioning is complete when the work specified in this Section and related Sections has been completed and accepted, including, but not limited to, the following:
 - a. Completion of tests and acceptance of test results.
 - b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
 - c. Comply with requirements in Section 017900 "Demonstration and Training."
 - d. Completion and acceptance of submittals and reports.
- G. Owner's Project Requirements: A document written by Owner, Architect, or Commissioning Authority that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

- H. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.
- I. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.
- J. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- K. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.6 COMPENSATION

- A. Should Architect, Commissioning Authority, other Owner's witness, or Owner's staff perform additional services or incur additional expenses due to actions of Contractor listed below, compensate Owner for such additional services and expenses.
 - 1. Failure to provide timely notice of commissioning activities schedule changes.
 - 2. Failure to meet acceptance criteria for test demonstrations.

1.7 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s):
 - 1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning.
 - 2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning.
 - 3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning.
 - 4. Appointed team members shall have the authority to act on behalf of the entity they represent.
- B. Members Appointed by Owner:
 - 1. Commissioning authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning.
 - 2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning.
 - 3. Architect, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning.

1.8 INFORMATIONAL SUBMITTALS

- A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedures general requirements for commissioning.
- B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors to the performance of the various commissioning requirements.
 2. Schedule of commissioning activities, integrated with the construction schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for construction schedule general requirements for commissioning.
 3. Contractor personnel and subcontractors to participate in each test.
 4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.
- C. Commissioning schedule.
- D. Two-week look-ahead schedules.
- E. Commissioning Coordinator Letter of Authority:
1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:
 - a. Make inspections required for commissioning.
 - b. Coordinate, schedule, and manage commissioning of Contractor, subcontractors, and suppliers.
 - c. Obtain documentation required for commissioning from Contractor, subcontractors, and suppliers.
 - d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.
- F. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.
1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- G. List test instrumentation, equipment, and monitoring devices. Include the following information:
1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
 2. Brief description of intended use.
 3. Calibration record showing the following:
 - a. Calibration agency, including name and contact information.
 - b. Last date of calibration.
 - c. Range of values for which calibration is valid.
 - d. Certification of accuracy.
 - e. N.I.S.T. traceability certification for calibration equipment.
 - f. Due date of the next calibration.
- H. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issues Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit print-out of log of alarms that occurred since the last log was printed.

I. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.9 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction Phase Commissioning Completion, include the following:
 - a. Pre-startup reports.
 - b. Approved test procedures
 - c. Test data forms, completed and signed.
 - d. Progress reports.
 - e. Commissioning issues report log.
 - f. Commissioning issues reports showing resolution of issues.
 - g. Correspondence or other documents related to resolution of issues.
 - h. Other reports required by commissioning.
 - i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction Phase Commissioning Completion.
 - j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction Phase Commissioning Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.10 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:

1. Documented experience commissioning systems of similar complexity to those contained in these documents on at least three projects of similar scope and complexity.
2. Certification of commissioning process expertise. The following certifications are acceptable. Owner reserves the right to accept or reject certifications as evidence of qualification.

- a. Certified Commissioning Professional, by Building Commissioning Association.
 - b. Commissioning Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.
 - c. Accredited Commissioning Process Authority Professional, by University of Wisconsin.
 - d. Accredited Commissioning Process Manager, by University of Wisconsin.
 - e. Accredited Green Commissioning Process Provider, by University of Wisconsin.
- B. Calibration Agency Qualifications: Certified by The American Association of Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

1.11 COMMISSIONING AUTHORITY'S RESPONSIBILITIES

- A. Commissioning Authority Responsibilities: Comply with requirements in Section 011000 "Summary."

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Test equipment and instrumentation required to perform the commissioning shall remain the property of Contractor unless otherwise indicated.
- B. Test equipment and instrumentation required to perform commissioning shall comply with the following criteria:
- 1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
 - 2. Calibrated and certified.
 - a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags permanently affixed.
 - b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.
 - 3. Maintain test equipment and instrumentation.
 - 4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders.
2. Label the front cover and spine of each binder with the report title, volume number, project name, Contractor's name, and date of report.
3. Record report on compact disk.
4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:
 - a. Test specification.
 - b. Pre-startup reports.
 - c. Approved test procedures.
 - d. Test data forms, completed and signed.
 - e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

- A. Construction checklists cannot modify or conflict with the Contract Documents.
- B. Create construction checklists based on actual systems and equipment to be included in Project.
- C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment, if applicable.

1. Services connection requirements, including configuration, size, location, and other pertinent characteristics.
 2. Included optional features.
 3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness and lack of damage.
 4. Installation Checks:
 - a. Location according to Drawings and approved Shop Drawings.
 - b. Configuration.
 - c. Compliance with manufacturers' written installation instructions.
 - d. Attachment to structure.
 - e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
 - f. Utility connections are of the correct characteristics, as applicable.
 - g. Correct labeling and identification.
 - h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.
- D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, minimum.
- E. Performance Tests:
1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
 2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
 3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
 4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
 5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.
- F. Deferred Construction Checklists: Obtain Owner approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist, before submitting request for Certificate of Construction Phase Commissioning Completion. When approved, deferred construction checklists may be completed after date of Construction Phase Commissioning Completion. Include the following in request for Certificate of Construction Phase Commissioning Completion:
1. Identify deferred construction checklists by number and title.
 2. Provide a target schedule for completion of deferred construction checklists.
 3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.
- G. Delayed Construction Checklists: Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting

request for Certificate of Construction Phase Commissioning Completion. When approved, delayed construction checklists may be completed after date of Construction Phase Commissioning Completion. Include the following in request for Certificate of Construction Phase Commissioning Completion:

1. Identify delayed construction checklist by construction checklist number and title.
2. Provide a target schedule for completion of delayed construction checklists.
3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.3 GENERAL EXECUTION REQUIREMENTS

- A. Schedule and coordinate commissioning with the construction schedule.
- B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.
- C. Perform test demonstrations for Owner's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies. In some instances, demonstration of a random sample of other than 100 percent of the results of a test is specified.
 1. Where sampling is specified, the sampling plan and procedure for the test demonstration shall be determined using ASQ Z1.4.
 - a. General Inspection: Level II.
 - b. Special Inspection: Level S-3
 - c. Acceptance Quality Limit (AQL) of 1.5.
 2. The "lot size" in ASQ Z1.4 is the sum of the number of items to which the test demonstration applies, as described in the scope subparagraph of each test.
 3. On determination of the sample size, the samples shall be selected randomly by Owner's witness at the time of the test demonstration.
 4. Include in the Commissioning Plan a detailed list of the test demonstrations with lot and sample quantities for each test.
- D. Report test data and commissioning issue resolutions.
- E. Schedule personnel to participate in and perform Commissioning-Process Work.
- F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:
 1. Operating the equipment and systems they install during tests.
 2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

- A. Management and Coordination: Manage, schedule, and coordinate commissioning, including, but not limited to, the following:
 1. Coordinate with subcontractors on their commissioning responsibilities and activities.

2. Obtain, assemble, and submit commissioning documentation.
3. **Attend** periodic on-site commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."
4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the construction schedule. Update schedule at specified intervals.
5. Review and comment on preliminary test procedures and data forms.
6. Report inconsistencies and issues in system operations.
7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
8. Direct and coordinate test demonstrations.
9. Coordinate witnessing of test demonstrations by Owner's witness.
10. Coordinate and manage training. Be present during training sessions to direct video recording, present training and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."
11. Prepare and submit specified commissioning reports.
12. Track commissioning issues until resolution and retesting is successfully completed.
13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.
14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

- A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.
- B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published commissioning schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning.
- C. Construction Checklists:
 1. Complete construction checklists as Work is completed.
 2. Distribute construction checklists to installing contractors before they start work.
 3. Installers:
 - a. Verify installation using approved construction checklists as Work proceeds.
 - b. Complete and sign construction checklists bimonthly for work performed during the preceding monthly.
 4. Provide Commissioning Authority access to construction checklists.
- D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

- E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.
- F. Test Procedures and Test Data Forms:
 - 1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
 - 2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
 - 3. Completed test data forms are the official records of the results of tests.
 - 4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
 - 5. Review preliminary test procedures and test data forms and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:
 - a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
 - b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.
 - 6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."
 - 7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.
- G. Performance of Tests:
 - 1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
 - 2. Perform and complete each step of the approved test procedures in the order listed.
 - 3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
 - 4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.
 - 5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.
- H. Performance of Test Demonstration:
 - 1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent unless otherwise indicated in the individual test specification.
 - 2. Notify Owner's witness at least three days in advance of each test demonstration.
 - 3. Perform and complete each step of the approved test procedures in the order listed.

4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.
 - a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.
7. False load test requirements are specified in related sections.
 - a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.

I. Deferred Tests:

1. Deferred Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction Phase Commissioning Completion as follows:
 - a. Identify deferred tests by number and title.
 - b. Provide a target schedule for completion of deferred tests.
2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction Phase Commissioning Completion. Include the following in the request for Certificate of Construction Phase Commissioning Completion:
 - a. Identify delayed tests by test number and title.

- b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.
 2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
 3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.
- K. Commissioning Compliance Issues:
 1. Test results that are not within the range of acceptable results are commissioning compliance issues.
 2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.
 3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
 4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:
 - a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
 - b. Submit commissioning compliance issue report form within 24 hours of the test.
 - c. Determine the cause of the failure.
 - d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.
 5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.
 - a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.
 - b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
 - c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
 - d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.
 6. Diagnose and correct failed test demonstrations as follows:
 - a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.

- b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
 - c. Record the results of each step of the diagnostic procedure.
 - d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
 - e. Determine and record corrective measures.
 - f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.
- 7. Retest:
 - a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
 - b. For each repeated test demonstration, submit a new test data form, marked "Retest."
- 8. Do not correct commissioning compliance issues during test demonstrations.
 - a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.6 COMMISSIONING MEETINGS

- A. Schedule and conduct commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."

3.7 SEQUENCING

- A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:
 - 1. Construction Checklists:
 - a. Material checks.
 - b. Installation checks.
 - c. Start up, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
 - d. Performance Tests:
 - 1) Static tests, as appropriate.
 - 2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
 - 3) Equipment and assembly performance tests.
 - 4) System performance tests.

5) Intersystem performance tests.

2. Commissioning tests.

- B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.
- C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.
- D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.8 SCHEDULING

- A. Commence commissioning as early in the construction period as possible.
- B. Commissioning Schedule: Integrate commissioning into Contractor's construction schedule. See Section 013200 "Construction Progress Documentation."
 - 1. Include detailed commissioning activities in monthly updated Contractor's construction schedule and short interval schedule submittals.
 - 2. Schedule the start date and duration for the following commissioning activities:
 - a. Submittals.
 - b. Preliminary operation and maintenance manual submittals.
 - c. Installation checks.
 - d. Startup, where required.
 - e. Performance tests.
 - f. Performance test demonstrations.
 - g. Commissioning tests.
 - h. Commissioning test demonstrations.
 - 3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
 - 4. Determine milestones and prerequisites for commissioning. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short interval schedule submittals.
- C. Two-Week Look-Ahead Commissioning Schedule:
 - 1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning.
 - 2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
 - 3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.
2. Notify Architect of commissioning schedule changes at least two work days in advance for activities requiring the participation of Owner's witness.

3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:
 - a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
 - b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.
 - c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
 - d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
 - e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.
2. Test data reports include the following:
 - a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
 - b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
 - c. Signatures of individuals performing and witnessing tests.
 - d. Data trend logs accumulated overnight from the previous day of testing.
3. Commissioning Compliance Issues Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

- a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
 - b. Action distribution list.
 - c. Report date.
 - d. Test number and description.
 - e. Equipment identification and location.
 - f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
 - g. Diagnostic procedure or plan to determine the cause (include in initial submittal)
 - h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
 - i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.
 - j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
 - k. Schedule for retesting.
4. Weekly progress reports include information for tests conducted since the preceding report and the following:
 - a. Completed data forms.
 - b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
 - c. Activities scheduled but not conducted per schedule.
 - d. Commissioning compliance issue report log.
 - e. Schedule changes for remaining Commissioning-Process Work, if any.
5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.
 - a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
 - b. Attach to the data form printed trend log data collected during the test or test demonstration.
 - c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.
6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."
 - a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.10 CERTIFICATE OF CONSTRUCTION PHASE COMMISSIONING COMPLETION

- A. When Contractor considers that construction phase commissioning, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to complete commissioning.
- B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction phase commissioning or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction Phase Commissioning Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction Phase Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction phase commissioning completion.
- C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.
- D. When construction phase commissioning or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction Phase Commissioning that shall establish the date of completion of construction phase commissioning. Certificate of Construction Phase Commissioning Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 01 91 13



Building Systems Commissioning Plan
Design and Construction Phase
January 17, 2024

Malcolm X College
Chicago, Illinois

WSLC Addition & Renovation Westside Learning Center

Prepared By:

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1.0) Purpose

The purpose of this document is to provide project-specific details regarding the commissioning process, the commissioning team, and the roles and responsibilities for the parties involved.

Commissioning (Cx) is the systematic process of ensuring, by verification and documentation, that all building systems perform interactively according to the design intent and the Owner's Project Requirements (OPR). The commissioning process involves all the Parties involved in the design and construction process as well as the Owner and the Commissioning Authority (CxA).

This Commissioning Plan is intended to be a roadmap for the parties involved in the Commissioning process. It lists the systems to be commissioned, the commissioning process activities, and the roles and responsibilities for each party involved. The plan outlines the sequence of testing and deliverables required from the design groups and construction groups.

The goals of the Commissioning Plan are to identify and define the following:

- Outline description, Basis of Design (BOD), goals, and scope of the project.
- Systems to be commissioned.
- Commissioning team members.
- Commissioning activities.
- Commissioning Team member responsibilities for each commissioning activity.
- Documentation requirements from each activity and commissioning team member.
- Schedule parameters (i.e., how will Commissioning activities integrate into the other project delivery milestones?).
- Acceptance criteria for the completion of commissioning.
- Provide a list of deliverables required prior to commissioning.

The Commissioning Process Matrix graphically depicts the commissioning process and shows who is responsible for what activities from the Planning Phase through the Warranty Phase. This is intended to be a quick reference for identifying the fundamental components of commissioning and their relationship to each other. The Master Commissioning Process Narrative provides more detail regarding the activities, responsibilities, and deliverables associated with each activity in the Commissioning Process Matrix. For each Matrix row, there is a corresponding narrative description.

The CxA will utilize the project documents, applicable codes and standards, submittals, manufacturer's literature, and industry practices as guides during commissioning and to develop test plans. However, it is not the responsibility of the CxA to verify compliance with these sources. Commissioning is a quality control function and the OPR is the standard against which the success of commissioning is determined. Procon Consulting will be responsible for assisting in the development and maintenance of this OPR document.

Successful commissioning requires a team effort. The CxA is responsible for managing the commissioning process. The CxA develops test checklists that must be executed by members of the commissioning team and members of the construction management team. The scheduling of Cx activities should integrate with the construction phase activities and be integrated into the construction schedule. Cooperation by all team members is essential for a successful project.

2.0) Project Description

The project is a New Community Room Addition and Link renovation to the existing single story Malcolm X College West Side Learning Center located at 4624 W Madison Street in Chicago IL 60644. The addition is a single-story building, approximately 5,000 sf located on the south end of the existing facility. Spaces included are a new community room, catering room, mechanical room, storage, and restrooms. Scope also includes modifications to a link at the existing building with a renovated area to include new vestibules, lobby area, and basement level stair enclosure with an area of refuge.

The new addition will include new mechanical, electrical and plumbing systems. The HVAC will include a new air handling unit with VRF and VAV systems. All new power and high efficiency lighting throughout. Plumbing systems will include new high efficiency lavatories with integrated hardwired sensors. New ADA compliant restrooms with high efficiency low-flow water for the fixtures. All new low voltage A/V infrastructure, power shades, and security system infrastructure. Fire Alarm will extend from the existing facility.

3.0) Project Approach Summary

The purpose of commissioning is to ensure the building and its systems meet the owner's requirements and to confirm the systems installed operate and the building performs to the owner satisfaction. This is achieved through a set of procedures to check, inspect, and test all systems installed. The commissioning agent is often involved in the design phase and construction phase of projects. It is ideal to have the CxA involved as early as possible so they can review the design as it progresses to ensure it meets the owner's project requirements.

During the design phase the CxA begins by reviewing the OPR and BOD developed by the Owner and design team to become familiar with the requirements of the project. As the design phase continues the CxA develops the pre-functional checklists, functional checklists, and performs a commissioning focused design review of the design documents against the requirements of the OPR. The pre-functional checklists are developed to supplement equipment start-up to verify the systems and equipment have been installed correctly. The pre-functional check lists are developed by the CxA with input from the responsible contractor.

During the construction phase the CxA will host commissioning meetings to ensure readiness of equipment. They will perform site visits to ensure the installation of equipment and the systems being commissioned are installed correctly and to witness various leak tests and performance testing of systems. A field report will be issued after every site visit and any issues noted will go into the issues log for correction by the responsible subcontractor. Submittal reviews by the CxA are performed concurrently with the review by the design team with comments submitted to the Contractor.

During the acceptance phase, the CxA will review the test and balance reports and O&M manuals. They will lead functional performance testing onsite and document it in the functional performance test forms. If a project has a multitude of the same equipment, a sampling of the equipment will be tested to ensure design criteria is being met. Once testing is completed, a final commissioning report summarizing the commissioning process, commissioned systems, design documentation, equipment submittals, pre-functional and functional checklists, site observations, commissioning issues log and resolution, and progress reports will be issued to the Owner.

3.1) *Design Phase Activities*

Preliminary Commissioning Plan

The Preliminary Commissioning Plan will focus on identifying project-specific commissioning activities, commissioning team members, and roles and responsibilities for all team members as part of the commissioning process. The Preliminary Commissioning Plan will be prepared by the Commissioning Manager.

Example Pre-Functional Checklists (PFCs) and Functional Performance Test scripts (FPTs) are included in the Preliminary Commissioning Plan as appendices to demonstrate the level of rigor required of future commissioning team members. Refer to Appendix 6 for the example PFC and Appendix 7 for the example FPT.

Owner's Project Requirements (OPR) Document

The Owner's Project Requirements (OPR) will quantitatively define the performance and operational requirements for the commissioned systems. These performance requirements will be the acceptance criteria against which the systems will be judged. They will include parameters such as space use and occupancy type, project schedules, temperatures, flows, pressures, moisture content, light fixture types, light levels, warranty information requirements, central system availability/tie-in capability, electrical spare capacity requirements, building automation system requirements, etc.

For LEED certification purposes, the OPR must include the following sections:

- Owner and User Requirements
- Environmental and Sustainability Goals
- Energy Efficiency Goals
- Indoor Environmental Quality Requirements
- Equipment and System Expectations
- Building Occupant and Operations and Maintenance Requirements

The Owner will oversee the development of the OPR, but critical input will be needed from the Project Manager, Occupant/User Groups, and the Design team.

The Commissioning Manager will maintain the OPR throughout the duration of the project, editing as necessary to reflect any performance expectation changes.

Basis of Design (BOD) Document

The Basis of Design (BOD) documents the design team's approach to achieving the requirements of the OPR. It describes the types of equipment to be used, system configurations, systems interactions, and general operating strategies in a narrative form potentially with schematic diagrams. It also documents any general rules, philosophies, and assumptions made by the design team. This document will be created and managed by the design team and reviewed by the Commissioning Manager.

Throughout the life of the project, the Commissioning Manager will monitor the design evolution and bring any deviations from the BOD to the attention of the design team. If changes to the system design and operational strategies are made during the project, a final BOD will be prepared by the design team at the end of construction.

Commissioning Design Reviews

The Owner and the Commissioning Manager will review the design documents at predetermined design phase milestones listed below.

- 95% Construction Documents (CD)
- 100% Construction Documents (back check comments have been incorporated only)

The Commissioning Manager will review the design drawings and specifications for the following commissioning-related items:

- Compliance with the Owner's Project Requirements.
- Clarity of the design.
- Clear integration requirements between equipment and systems
- Equipment accessibility and maintainability.
- Ability to test and validate system operation.
- O&M documentation, training, metering and monitoring, and warranty details

Comments will be prioritized as follows:

- Critical: issues which, in the Commissioning Manager's professional opinion, are related to a system's ability to achieve the Owner's Project Requirements performance criteria.
- Question: requests for clarification of intent.
- Suggestion: design features which can meet the Owner's Project Requirements but for which the Commissioning Manager has a recommendation for improved efficiency, increased reliability, and/or lower life cycle cost.
- Coordination: although a commissioning review is not a coordination review, the Commissioning Manager will note coordination items noticed during the commissioning review.

Design Review Comment Documentation and Resolution Process

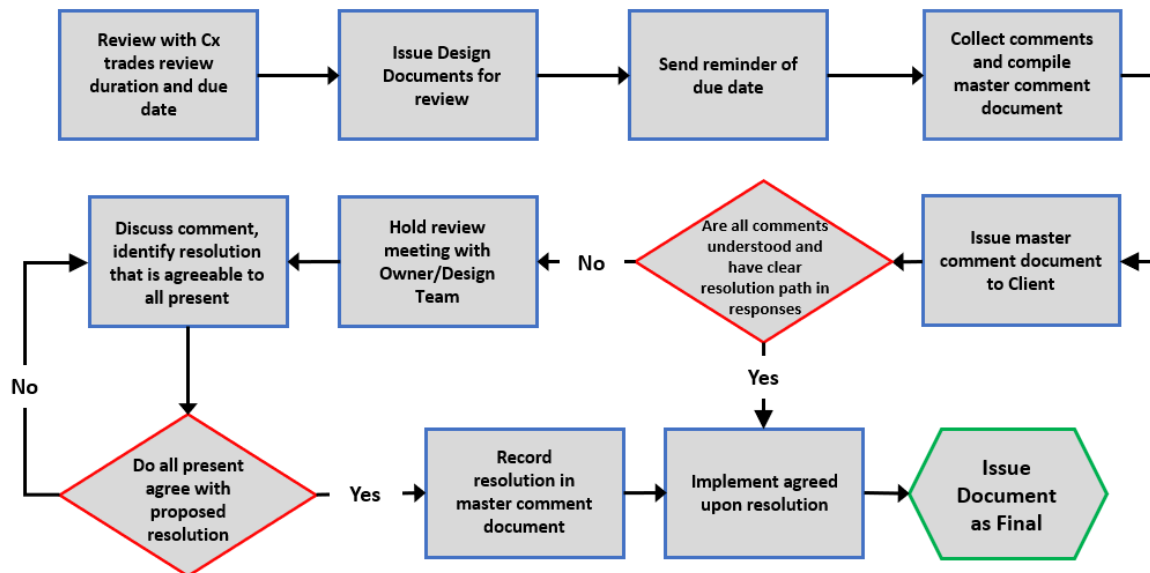
The design review process will be guided by the Commissioning Manager through input from the Construction Manager and Owner. The Commissioning Manager will notify all commissioning trades of upcoming design submissions and provide them with the review duration and comment due date. When design submission is distributed by the design team the Commissioning Manager will ensure each commissioning trade received a copy and is aware of their deadlines and the review begins.

Along with the Commissioning Manager's comments, the Commissioning Manager will collect and consolidate comments from all of the commissioning trades. The Commissioning Manager will compile the comments into a master design review log and distribute to the Construction Manager and Owner. The design review log will document the following for each comment made:

- Description of the issue
- Cause
- Recommendation
- Cost and schedule implication (qualify, not quantify)
- Priority (refer above for descriptions of priorities)
- Actions taken
- Final resolution

The design team will respond in writing to each of the comments provided. Depending on the overall severity, if a comment(s) requires clarification or the design team takes exception to review comment(s) a meeting may be required to resolve the comment. The expectation of that meeting is that all parties capable of making decisions come prepared to resolve all open items and leave the meeting with the intent to implement the resolution into the design documents and move to the next phase of design or make the final issuance.

Design Review Protocol



Final Commissioning Plan

The Commissioning Manager will prepare the Final Commissioning Plan, building on and editing the Preliminary Commissioning Plan to reflect the project at the end of the design phase. The systems to be commissioned section will be refined to represent the quantity and types of systems in the final construction documents. Sampling strategies pertaining to the functional performance testing will be detailed in the Final Commissioning Plan. The Final Commissioning Plan will be incorporated into the bid documents by reference.

Commissioning Specification

The design team will prepare a Commissioning Specification to be included in the construction documents. The Commissioning Specification will detail the Contractor's responsibilities (as outlined in the Final Commissioning Plan) during the construction, acceptance, and warranty phases of the project. The design team will incorporate the Commissioning Specification into the Division 1 specification section.

The Commissioning Specification will include, but not be limited to commissioning-related scheduling; submittal management; Pre-Functional Checklists; Functional Performance Testing; O&M and Systems Manuals; O&M and systems training; as-built drawings; and warranty management. Furthermore, the Commissioning Specification will include language defining incentive program(s), if applicable, established to encourage Contractor readiness for functional performance testing.

The Commissioning Manager will recommend coordination language to be included in other design team specification sections that will direct the Contractors' attention to the Division 1 Commissioning Specification for required commissioning activities. The design team will incorporate, as they deem appropriate, the coordination language into their respective specification sections.

Commissioning Scheduling

There will not be a separate commissioning schedule. The Contractor will be required to incorporate commissioning activities into the master project schedule. The Commissioning Manager will assist the Contractor, as needed, to understand the relationship between design and commissioning activities and develop the timeline of commissioning activities and duration needed to complete. The Owner will regularly review the master project schedule to coordinate the availability of facilities management staff for critical commissioning activities.

Master project schedule design phase commissioning milestones will include the following:

Commissioning Milestones (Design)			
Task	Cx Deliverable	Date or Duration	(1)
CxA issues preliminary commissioning plan to project team	Preliminary Design Phase Commissioning Plan	1/17/2024	
Review BOD, and OPR	Design Review Log / RFI	1/19/2024	X
CxA review of 95% Construction Documents	Design Review Log	1/19/2024	X
Confirm incorporation of the commissioning requirements into the construction documents	Commissioning Specifications	1/19/2024	
Cx Meeting - Review Cx comments with design team	Updated Design Review Log		X
100% Construction Documents (back check comments were incorporated)	Updated Design Review Log	3/27/2024	X
CxA issues revised commissioning plan to project team	Final Design Phase Commissioning Plan	3/15/2024	

(1) Coordination event that requires notifying the CxA for participation.

3.3) Construction Phase Activities

Commissioning Meetings

The Commissioning Manager will plan, facilitate, and document the commissioning meetings. The commissioning meetings are intended to help every team member understand and execute their roles and responsibilities within the commissioning process, to coordinate the details of current and upcoming commissioning activities, and to review outstanding action items.

The first meeting will be a construction phase commissioning kickoff meeting that provides an overview so that the team understands the big picture and the benefits they will accrue by participating in the process. The focus of the commissioning kickoff meeting is to review:

- The specifics of the commissioning process
- Identify the representatives to the commissioning team
- Establish communication and documentation protocols for implementing the commissioning process as efficiently and effectively as possible

Subsequent commissioning meetings will be held as frequently as deemed necessary by the Commissioning Manager to remain integrated into the construction phase process. Frequency will vary throughout the construction as the commissioning process requirements vary depending on what is happening on the construction site. It is expected that a key representative from the design team, General Contractor, and each of the subcontractors be appointed to the commissioning team and be present at each meeting to facilitate discussions regarding commissioning process topics.

Additional meetings with specific agendas will be held outside the recurring commissioning progress meetings during the construction phase. These additional meetings will cover the following topics:

- Facility Grid Training – Includes accessing and navigating the program, execution of checklists, review and use of functional performance test procedures, and responding to issues log items.
- Controls Coordination – CxA, design team, and controls contractor review design SOO to understand the intent and confirm incorporation into the controls submittal.

O/A/C Meetings

Construction meetings will be scheduled through the General Contractor. Commissioning will be added to the agenda as necessary in order to minimize the time impact on the construction team. During the OAC meetings the primary focus of the Commissioning Manager will be:

- Receive updates on the installation status of the commissioned systems.
- Coordination of significant dates for periodic site inspections.
- Update stakeholders of commissioning activities that aren't present for recurring Cx meetings.
- Receive updates on systems outside of the scope of commissioning that may impact testing such as furniture installation, specialty inspections, or areas with delays due to change orders.

Commissioning Scheduling

There will not be a separate commissioning schedule. The Contractor will be required to incorporate commissioning activities into the master construction schedule. The Commissioning Manager will assist the Contractor, as needed, to understand the relationship between construction and commissioning activities. The Owner will regularly review the master construction schedule to coordinate the availability of facilities management staff for critical commissioning activities.

Master project schedule construction phase commissioning milestones will include the following in the table below. Some of the activities may require multiple milestones due to some systems following a different construction schedule than others.

Commissioning Milestones (Construction Phase)			
Task	Cx Deliverable	Date or Duration	(1)
Construction Phase			
Weekly OAC meetings	N/A	Construction Phase	X
CxA host construction phase kickoff meeting	Meeting Minutes	July 2024	
CxA issues revised commissioning plan to project team	Revised Cx Plan		
CxA review of submittals	Submittal Review Comments		X
Review RFI, CCR, ASI, Bulletin	Incorporate changes into PFC, FPT, and Cx Plan	Construction Phase	X
CxA adds participants to Facility Grid	Facility Grid Access to Cx Team		
CxA delivers Pre-Functional Checklists	Pre-Functional Checklists		
CxA provides Facility Grid training to Cx team	Instruction Manuals		
Contractors perform ductwork and piping pressure testing	Field Report		X
Contractors perform equipment start-up	Field Report		X
Contractors perform Pre-Functional Checklists, Calibration of Sensors, and Test and Balance	Completed Checklist and Reports by Contractor		X
CxA reviews Pre-Functional Checklist, Calibration Report, and TAB report	Submittal Review Comments		
CxA delivers Functional Performance Tests (FPT)	FPT Procedure Checklist		
Conduct Functional Performance Testing Readiness Meeting	Meeting Minutes, signed and completed FPT Readiness Checklist		
CxA directs and Contractors execute Functional Performance Tests	Completed FPT Checklists		
CxA delivers Issue Log	Issues Log		
Responsible Contractors respond upon resolution of issues	Updated Issues Log		
CxA visits site with Contractors to confirm deficiencies are resolved	Updated Issues Log		
O&M Manual review	Review Comments		
Record Drawing review	Review Comments		

Substantial Completion	Not Applicable	August 2025	
Owner Occupancy	Not Applicable	January 2026	
Post-Occupancy Phase			
CxA submits Commissioning Report	Final Commissioning Report		

Notes:

1. Functional testing will not begin until pre-functional checklist, start-up, and TAB are completed for a given system.
 2. The controls system and equipment it controls are not functionally tested until all points have been calibrated and pre-functional testing completed.
 3. Frequency of periodic site visits will be determined by the CxA and coordinated during the recurring commissioning meetings.
- (1) Coordination event that requires notifying the CxA for participation.

Submittal Reviews

The General Contractor shall provide the approved list of submittals for the Commissioning Manager to review. The Commissioning Manager will identify submittals associated with systems to be commissioned that need to be reviewed by the Commissioning Manager. The General Contractor will send copies of the selected submittals to the Commissioning Manager simultaneously issuing them to the design team for review.

The Commissioning Manager will review and approve submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment, and adequacy for developing test procedures. Commissioning submittal review comments will focus on the following items:

- Compliance with the OPR and BOD
- Integration coordination
- Accessibility and maintainability
- The ability to test and validate system operation

The Commissioning Manager and Owner will be given access to all approved submittals after processing by the design team.

Periodic Site Visits

During construction, the Owner, Commissioning Manager, and Engineer will each make periodic visits to the site, as necessary, to witness equipment and system installations. The purpose of these visits is to catch potential installation issues early on in the process before they become timely repair items uncovered during the functional performance testing of the equipment when turnover of the building to the occupants is upcoming. The scheduling of these inspections are generally by milestones in the construction process and are scheduled by the Commissioning Manager.

Since periodic site visits are often related to milestones, scheduling will be coordinated throughout the General Contractor during the construction or commissioning meetings. The Commissioning Manager shall be notified in advance of major milestones to coordinate the site visit timing with the activity. Refer to the Commissioning Milestone table in the Commissioning Scheduling section for the minimum planned milestone visits that the CxA shall participate in.

Following each site visit, the CxA will provide a field report documenting the findings of the site visit. The field report will organize the results by systems/areas observed, general status of those systems, deficiencies observed, and actions items. The Commissioning Manager will distribute the field reports to the commissioning team for review and add the action items to the agenda of the recurring commissioning progress meeting and the issues log to track to resolution.

Commissioning Issues Log

The Commissioning Manager will maintain a commissioning issues log starting in the construction phase and continuing through the warranty phase to track the status of all commissioning related items. The commissioning issues log includes process-related and technical-related issues associated with successful completion of the commissioning process.

For each deficiency found during the commissioning process, the Commissioning Manager will add the item to the commissioning issues log. The commissioning issues log is the vehicle for communicating, tracking, and documenting the status and correction of each deficiency.

The Commissioning Manager will share access to the commissioning issues log with the entire commissioning team. As issues are logged, the CxA will assign responsibility to the party with the greatest responsibility for the system as it relates to the issue observed (e.g. the mechanical contractor will be assigned to an issue with a VAV not meeting its maximum cooling airflow setpoint).

Common Reasons for Assignment:

- Construction Team – Installation does not meet the requirements of the construction documents.
- Design Team - A system performs as designed but does not meet the OPR criteria for that system or design provides conflicting information.
- Owner – Acceptance of an issue that cannot be resolved due to reasons outside the control of the design and construction team or notification of an issue with existing building systems outside the scope of the project.

The responsible party will inform the Commissioning Manager in writing upon correction of each problem with an explanation of what was done to resolve the issue. Upon notification of the completion of a commissioning issue, the Commissioning Manager will review the correction at the next scheduled site visit to verify satisfactory resolution of the deficiency. In the event of a functional performance testing issue, the Commissioning Manager will schedule retesting for the affected system.

Operations & Maintenance (O&M) Manual Reviews

Early submission of the O&M manuals will help ensure they are complete and approved prior to the start of the facilities management staff training. The manuals will serve a critical part of the training program.

The Commissioning Manager will identify O&M manuals associated with systems to be commissioned that need to be reviewed by the Commissioning Manager and facilities management staff. The facilities management reviewers will submit their comments to the Commissioning Manager who will consolidate all comments and forward them to the contractors.

Final Pre-Functional Checklists & Trend Log Specifications

The Commissioning Manager will finalize pre-functional checklists (PFCs) customized for each system to be commissioned after reviewing approved submittals, requests for information, change orders, supplemental instructions, and other construction phase modifications and/or additions. The Commissioning Manager will issue final PFCs to the commissioning team representatives for review and comment. Upon incorporation of accepted commissioning team comments, the Commissioning Manager will issue final PFCs for completion and sign-off by the contractor during final system checkout.

The PFCs shall be used to document that key system-level installation, startup, programming, coordination, integration, and testing activities have been completed. These are not contractor quality control checklists for each piece of equipment but system-level confirmation of readiness for the system's functional performance test. The Construction Manager will be responsible for overseeing the completion of the checklists by the subcontractors because each system typically requires the participation of multiple subcontractors to be complete and ready for testing.

PFCs for systems controlled and/or monitored by the building automation system also include requirements for building automation system trend logs to be programmed prior to the start of functional performance testing. These requirements will include the points to be trended, the frequency of the trends, and the points to be included together on color graphic trend logs when submitted for review.

The pre-functional checklists will be distributed as two separate checklists for each type of commissioned equipment. The first checklist will document the installation of the equipment and focus on the physical installation of the equipment and ancillary components (e.g. piping and valves installed, equipment supported, no damage present). The second checklist will document the operational status of the equipment and focus on the pre-functional testing of the equipment and ancillary components (e.g. TAB completed, valves fully stroke, sensors have been calibrated).

Refer to Attachment 4 for an example pre-functional checklist.

Final Functional Performance Tests

The Commissioning Manager will finalize functional performance test procedures (FPTs) for each system to be commissioned after reviewing approved submittals, requests for information, change orders, supplemental instructions, and other construction phase modifications and/or additions. The following are the minimum criteria for the FPTs.

Refer to Attachment 5 for an example functional performance test procedure.

Step-by-Step Script

FPTs will dictate a chronological list of steps to be followed. The steps will be scripted in an efficient manner, minimizing the level of redundancy between steps as much as practical. The intent of testing is to demonstrate performance of each mode of system operation as effectively and efficiently as possible.

Repeatability

Although the Commissioning Manager will develop and oversee the execution of FPTs when they are implemented at the end of construction, the test procedures will be designed to be referenced by future facilities management staff for recommissioning purposes. As such, the test procedures will be designed to

stand alone and be understood by reasonably knowledgeable building operations personnel without the Commissioning Manager's involvement.

The action required for each step will not be open to interpretation in the field. For example, a step that reads, "Put the system into economizer mode," does not explain how that should be done. The Commissioning Manager will define whether that should be accomplished by overriding outdoor air inputs, overriding return air inputs, changing setpoints, overriding the economizer mode software point, or some other method appropriate for the system and sequence being tested. Given the differences between building automation systems and their programming, a systems' reaction is likely to vary depending on how the action is performed. To the greatest extent practical, this needs to be understood by the Commissioning Manager prior to the start of field testing.

Unambiguous Pass/Fail Acceptance Criteria

For each step of the test procedure, there will be a pass/fail definition of acceptable response. This typically is a description of how each device in a system is designed to react to the scripted action imposed on the system.

In the interest of field-testing efficiency, the acceptance criteria will be clearly defined in terms that everyone in the field can understand and agree on. Valves and dampers will "open" or "close;" fans and pumps will "start" or "stop;" modulating devices modulate "modulate higher/more open" or "modulate lower/more closed." Simply stating that the system should respond "as specified," is not acceptable in an FPT procedure.

Sampling Strategies

The Commissioning Authority can employ a sampling strategy to functionally test a fraction of the total number of non-life safety or non-critical equipment that are identical or near identical pieces of equipment (e.g., terminal units, occupancy sensors, exhaust fans, etc.). The sampling strategy is defined in Section 4 for the specific equipment. In Section 4 a *Sample Rate* is defined for the equipment where sampling strategies will be utilized. In addition to the *Sample Rate*, a *Retest Threshold* is defined for equipment where sampling is utilized. The sampling strategy shall be as follows:

- The Contractor and CxA perform the functional performance test of the *Sample Rate* percentage of a group of identical equipment.
- If less than the *Retest Threshold* of testing equipment fails the functional performance testing, as determined by the CxA, no additional groups shall undergo functional performance testing.
- If more than the *Retest Threshold* of testing equipment fails, as determined by the CxA, an additional group equal to the size of the *Sample Rate* shall undergo functional performance testing.
- If more than the *Retest Threshold* of the additional group fails, the test shall be concluded and considered as failed. The contractors shall reinspect all pieces of equipment and perform the testing themselves after all repairs are completed.
 - Contractor performed functional performance testing shall be performed for a new group equal to the same *Sample Rate*. If previously tested samples equal to 100%, the contractors shall sample equal amount of equipment from each previous test group to a total of the *Sample Rate*.
 - Example: 10 heat pumps were tested at a sample rate of 50% with a retest threshold of 25%. During the first group of 5 heat pumps, 2 failed so an additional 5 were tested where 4 more failed testing. In this scenario 2 heat pumps from the first group and 3 from the second group should be included in the sample group for pre-verification testing.

- Completion of tests shall be documented utilizing Pre-Verification Test (PVT) forms provided by the CxA.
- Upon successful completion of the PVT forms, the CxA shall review the results and schedule retesting of a new group at the *Sample Rate* and perform random checks of the original groups that failed testing to confirm repairs have been implemented.

Construction Team Review

The responsible subcontractors will review and comment on the efficiency and safety of the proposed test steps, and the Owner will review for completeness and rigor. The Commissioning Manager will incorporate the Owner's and the Contractors' recommendations as appropriate. It is the review activity that helps prevent surprises in the field on test day. Upon incorporation of the accepted Owner and Contractor comments, the Commissioning Manager will issue final FPTs for use in the system functional performance testing process.

3.4) Acceptance Phase

Commissioning Meetings

The Commissioning Manager will plan, facilitate, and document commissioning meetings. These meetings will be heavily focused on system readiness for functional performance testing and scheduling of that testing. Acceptance phase commissioning coordination meetings will be held as frequently as deemed necessary by the Commissioning Manager to keep the commissioning process on track for completion prior to substantial completion.

Additional meetings with specific agendas will be held outside the recurring commissioning progress meetings during the acceptance phase. These additional meetings will cover the following topics:

- Functional Performance Testing Readiness – Review FPT Readiness Checklist completion and coordinate testing expectations, team composition, schedule of testing events, and equipment required to execute testing.
- Major Issues Resolution – Resolve issues that take significant time and coordination.

Test, Adjust, and Balance (TAB) Report Review

The TAB Contractor will prepare a balancing report documenting that all air and hydronic systems have been adjusted and are within acceptable design values. The Commissioning Manager will review the report submitted by the TAB Contractor, concurrent with the design team as the TAB Contractor completes work on individual systems (i.e., not all systems need to be balanced before the reporting process begins). The Commissioning Manager will verify that all required data has been collected, that the measured results follow the design documents, and that any non-compliance items have been resolved and rebalanced prior to the start of functional performance testing.

The Commissioning Manager will submit their comments to the General Contractor through a formal submittal review. The TAB Contractor will provide written responses to each TAB report review comment to the Commissioning Manager. Approval of the TAB Report is a required prerequisite to functional performance testing.

Pre-Functional Checklists Completion

The pre-functional checklists (PFC) are used to document that the systems are fully installed, connected, started-up, programmed, integrated, and have successfully passed their respective functional performance tests in a contractor-only dry run. Fully executed pre-functional checklists are the contractor's validation that the systems are ready for successful functional performance testing witnessed by facilities management and the CxA. The pre-functional checklists will be documented in writing by personnel representing the responsible contractors. In some cases, multiple subcontractors will need to sign-off on each system's checklist.

These checklists are primarily inspections and procedures to prepare the equipment or system for initial operation (e.g., oil levels, fan belt tension, labels affixed, gauges in place, sensor calibration, etc.). However, some checklist items entail simple testing of a component, a piece of equipment, or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). Each piece of equipment is to receive full checkout by the contractors. No sampling strategies will be permitted.

PFC completion does not require systems to be in the ready state for functional performance testing to be started. As activities are completed the corresponding activity should be marked as completed in the corresponding checklist (e.g. installation completed but start-up hasn't occurred is an appropriate time to complete the installation PFC).

All building automation system trend logs required for a system must be programmed and collecting data before the PFCs are completed and submitted by the contractors.

Trend Log Review

The Contractor will download and submit electronic trend data to the Commissioning Manager for review at a time scheduled by the Owner and the Commissioning Manager. This may be prior to the start of functional performance testing, immediately following functional performance testing, or after occupancy.

The trend data will be submitted in editable spreadsheet format and in color graphs designed as specified in the pre-functional checklist for each affected system.

Any trend logs demonstrating performance not meeting the construction document requirements will be re-run, following remediation of the problems, and re-submitted to the Commissioning Manager for review.

Functional Performance Test Plans

The Commissioning Manager will prepare and distribute functional performance test plans prior to the start of functional performance testing. This will allow the construction team to review the proposed testing schedule, to understand which test procedures will be conducted during a specific testing period, to schedule the appropriate people to be in attendance for each test; and to verify that the necessary equipment is available when testing begins. This test plan will be utilized as an agenda item during the FPT Readiness meeting.

The Owner will schedule facilities management staff to participate in and witness functional performance testing based on the schedule outlined in each test plan.

Functional Performance Testing

Functional performance testing is the technical culmination of the commissioning process for systems acceptance by the Owner and should be performed prior to substantial completion.

The Commissioning Manager will field-direct, witness, and document the functional performance testing (FPT) for each system to be commissioned. Although the Commissioning Manager directs the tests, the contractors may be required to manipulate the systems and controls in accordance with the FPTs. For systems tested with a sampling strategy, as defined in the final functional performance test procedures, samples will need to be tested per the Sampling Strategies section of this plan.

During functional performance testing the Contractor is expected to be familiar with the contents of the test procedures and provide all necessary personnel (including subcontractors and equipment vendors), tools, and equipment to execute the procedures. Additionally, the Contractor is expected to have spare parts available to make minor repairs that will allow testing to proceed and not significantly delay the process. Issues that cannot be resolved quickly during testing will be recorded in the issues log for resolution after the completion of testing.

The facilities management representatives will witness and participate in the functional performance testing, as determined by facilities management, to understand how the systems operate and how optimal performance can be maintained.

Functional Performance Re-Testing

The Commissioning Manager will field-direct, witness, and document functional performance retesting for each system that failed to pass its initial FPT using the same method as described in the Functional Performance Testing section. For systems tested with a sampling strategy, as defined in the final functional performance test procedures, additional samples will need to be tested during re-testing per the Sampling Strategies section of this plan.

The extent and level of rigor of retesting will be as the Commissioning Manager deems necessary to confirm successful resolution of the initial deficiencies without sacrificing performance elements which had originally passed the system FPT.

In the event a repeat site visit is necessary due to systems not being ready for functional testing, the cost of this extra trip will be back charged to the General Contractor.

3.5) Warranty Phase Activities

Commissioning Report

Following resolution and/or acceptance of all commissioning action items, the Commissioning Manager will prepare the commissioning report. The report will be a compilation of documentation (both technical and process-related) associated with the commissioning process. It will be prefaced with an executive summary documenting the final system status compared to the Owner's project requirements document.

The commissioning report will include at least the following sections:

- Introduction
- Executive Summary
- Commissioning Plan
- Owner's Project Requirements
- Basis of Design

- Commissioning Specification Section
- Roles and Responsibilities
- List of Commissioned Systems
- Commissioning Issues Log
- Commissioning Coordination Meeting Minutes
- Design Review Comments
- Submittal Review Comments
- TAB Report Review Comments
- As-Built Documentation Review Comments
- O&M Manual Review Comments
- Site Observation Reports
- Pre-Functional Checklists (fully executed)
- Functional Performance Test Plans (fully executed)
- Blank Functional Performance Test Procedures

The Commissioning Manager will submit the final report to the commissioning team for review.

The Commissioning Manager will issue an addendum to the commissioning report at the end of the warranty phase to document pertinent warranty phase activities, findings, decisions, etc.

4.0) Systems and Equipment to be Commissioned

Below is a list of systems to be commissioned and comments and clarifications if the system is to be tested in a certain way to meet the OPR or BOD.

SYSTEMS TO BE COMMISSIONED	
SYSTEMS	COMMENTS & CLARIFICATIONS
MECHANICAL SYSTEMS	
BUILDING AUTOMATION SYSTEMS	
DOMESTIC HOT WATER SYSTEM	
PLUMBING SYSTEMS	Plumbing fixtures
POWER SYSTEMS	Review of completed test reports
LIGHTING CONTROL SYSTEMS	

This table lists out the commissioning receivables needed to be completed by the Owner, Design Team, and General Contractor and submitted to the Commissioning Manager for review and comments during the project.

COMMISSIONING RECEIVABLES		
Receivables	Responsible Party	Received (Y/N)
Owner's Project Requirements	Owner	
Basis of Design	Design Team	Y
Construction Drawings	Design Team	Y

Construction Specification	Design Team	Y
Commissioning Scope of work	Owner	Y
Equipment Submittals	General Contractor	
RFI's, Change Orders for Cx Issues	General Contractor	
Construction Schedule	General Contractor	

4.1) Mechanical System Description

The new addition mechanical systems provide ventilation air to the spaces via a new dedicated outdoor air system (DOAS) that maintains ventilation airflow rates in each space via supply air and exhaust air variable air volume (VAV) boxes. The VAV boxes modulate during occupied hours to maintain the zone CO₂ concentration levels. Space temperature control is maintained from two variable refrigerant flow (VRF) systems with a total of nine indoor fan coil units. Two split systems provide cooling for an IDF room located in the existing portion of the building. Electric wall heaters provide heating to the vestibules and storage room.

The table below lists out the systems to be commissioned along with the quantity of each piece of equipment and the percentage of equipment to be tested. The sampling strategies detailed in the Construction Phase Activities section shall be followed where sample rates of less than 100% are noted.

SYSTEMS TO BE COMMISSIONED	QUANTITY	SAMPLE RATE	RETEST THRESHOLD
MECHANICAL SYSTEMS			
HVAC SYSTEMS			
Dedicated Outdoor Air Units	1	100%	N/A
Air-Conditioning Units (Split Systems)	2	100%	N/A
Variable Refrigerant Flow System (FCUs)	9	100%	N/A
Terminal Units (No Reheat)	7	100%	N/A
Electric Wall Heaters	3	100%	N/A
Heat Recovery Systems (DOAS Energy Wheel)	1	100%	N/A
BUILDING AUTOMATION SYSTEMS			
Project specific items added to existing system	Per Plans	100%	N/A

This table lists the commissioning receivables needed to be completed by the GC and Mechanical Contractor and submitted to the Commissioning Manager for review and comments during the project.

MECHANICAL COMMISSIONING RECEIVABLES		
Receivables	Responsible Party	Received (Y/N)
Mechanical Equipment Submittals	GC	
Contractor Start-Up Reports	GC/Responsible Subcontractor	
Contractor Test and Balance Reports	GC/Responsible Subcontractor	
Duct Pressure Test Reports	GC/Responsible Subcontractor	
Pipe Pressure Test Reports	GC/Responsible Subcontractor	
Pre-Functional Testing Checklist	Responsible Subcontractor	

4.2) Electrical System Description

Electrical power for the addition is provided from a new 800 amp breaker in an existing switchboard located in the main building. Power is distributed via an 800 amp 120/208V panel that also sub-feeds a 225 amp 120/208V panel for plug loads. Power for lighting is provided by an existing 125 amp 120/208V lighting panel and emergency power is provided by an existing 125 amp 120/240V single phase panel.

The lighting control system utilizes occupancy sensors for office, restrooms, and corridors and vacancy sensors for storage rooms and utility closets to automatically control lighting. The lighting control panel utilizes a time-of-day schedule to universally control on/off function of lighting. Daylight harvesting controls are utilized in the Community Room and Lobby.

The table below lists the systems to be commissioned along with the quantity of each piece of equipment and the percentage of equipment to be tested. The sampling strategies detailed in the Construction Phase Activities section shall be followed where sample rates of less than 100% are noted.

SYSTEMS TO BE COMMISSIONED	QUANTITY	SAMPLE RATE	RETEST THRESHOLD
ELECTRICAL SYSTEMS			
POWER SYSTEMS			
Low-Voltage Electrical Power Conductors and Cables (review of field quality control reports detailed in 260519)	As Submitted	N/A	N/A
Panelboards (review of field quality control reports detailed in 262416)	As Submitted	N/A	N/A
Wiring Devices (review of field quality control reports detailed in 262726)	As Submitted	N/A	N/A
Surge Protective Devices for Low-Voltage Electrical Power (review of field quality control reports as detailed in 264313)	As Submitted	N/A	N/A
LIGHTING CONTROL SYSTEMS			
Occupancy/Vacancy Controls	9	100%	N/A
Time Clock	1	100%	N/A
Daylighting Harvesting System (photocells)	7	100%	N/A

This table lists the commissioning receivables needed to be completed by the GC and Electrical Contractor and submitted to the Commissioning Manager for review and comments during the project.

ELECTRICAL COMMISSIONING RECEIVABLES		
Receivables	Responsible Party	Received (Y/N)
Electrical Equipment Submittals	GC	
Electrical Test Reports	GC/Responsible Subcontractor	
Pre-Functional Testing Checklist	Responsible Subcontractor	

4.3) Plumbing System Description

The plumbing system is composed of a new domestic water heater and hot water recirculation pumps serving the two new restrooms and the catering kitchen sinks.

The table below lists the systems to be commissioned along with the quantity of each piece of equipment and the percentage of equipment to be tested. The sampling strategies detailed in the Construction Phase Activities section shall be followed where sample rates of less than 100% are noted.

SYSTEMS TO BE COMISSIONED	QUANTITY	SAMPLE RATE	RETEST THRESHOLD
PLUMBING SYSTEMS			
Water Heaters	1	100%	N/A
Circulating Pumps	1	100%	N/A
Plumbing Fixtures and Controls (Per Restroom)	2	100%	N/A

This table lists the commissioning receivables needed to be completed by the GC and Plumbing Contractor and submitted to the Commissioning Manager for review and comments during the project.

PLUMBING COMMISSIONING RECEIVABLES		
Receivables	Responsible Party	Received (Y/N)
Plumbing Equipment Submittals	GC	
Plumbing Start-Up Reports	GC/Responsible Subcontractor	
Pre-Functional Testing Checklist	Responsible Subcontractor	

5.0) Commissioning Team Members

The project team is comprised of the Owner, City Colleges of Chicago, the CxA, Procon Consulting, the design professionals, Bailey Edward and RTM, and contractors, (TDB).

The Owner shall be responsible for developing and committing to the OPR for the facility and its use. They need to provide access to information relating to the base building systems, design facility staff, and maintenance staff. They shall also participate in various meetings, training sessions and inspections. The Owner will review and approve any changes made to the OPR, review and approval all construction documents, participate in training sessions, and review and comment of progress and verification reports.

The Architect and Engineers will prepare the contract documents, review, and approve contractor submittals, approve O&M manuals and training plans, review and incorporate commissioning submittal comments into the contract documents and recommend final acceptance of the systems to the Owner.

The General Contractor shall include commissioning activities milestones in project schedule, communicate schedules impacting commissioning activities, manage subcontractors to ensure they are installing to the design documents, provide submittals to the Owner, design professions, and CxA.

The subcontractors are responsible for executing the pre-functional checklist, executing the functional performance testing, demonstrating proper system performance and prepare O&M manuals and conduct

owner training. The TAB subcontractor shall submit all final test and balance reports prior to the start of final performance testing.

The Commissioning Manager will carry out and execute all commissioning activities through writing and review of all specifications and construction documents to ensure compliance with the OPR. Complete all testing requirements necessary on systems documented to be commissioned. Perform site visits to check on system installation, develop pre-functional checklists, develop functional performance test procedures, develop functional performance test procedures, oversee, and direct functional performance testing, document functional performance testing. They will verify all O&M manuals are completed, verify owner training is completed and participate in warranty end review.

COMMISSIONING TEAM AND ROLES		
Role	Name	Company
OWNER		
Project Manager		
ARCHITECT		
Project Architect		Bailey Edward
PROJECT MANAGER		
Project Manager		
COMMISSIONING AGENT		
Project Manager	Paul Prusa	Procon Consulting
MEP ENGINEERING		
Mechanical Eng.		RTM
Electrical Eng.		RTM
CONSTRUCTION MANAGEMENT		
Project Manager		
MECHANICAL CONTRACTOR		
Project Manager		
Project Manager		
BUILDING AUTOMATION SYSTEM CONTRACTOR		
Project Manager		
TEST ADJUST AND BALANCE CONTRACTOR		
Project Manager		

6.0) Commissioning Process Matrix

The following matrix tabulates the major commissioning activities, when they occur during the project life cycle, and the commissioning team member roles and responsibilities for each activity.

In the Commissioning Team Member columns an “R” indicates the responsible team member for each activity, and a “✓” indicates a team member who needs to participate in the activity.

COMMISSIONING PROCESS MATRIX											
COMMISSIONING ACTIVITIES ✓	PROJECT PHASES				COMMISSIONING TEAM MEMBERS						
	DESIGN	CONSTRUCTION	ACCEPTANCE	WARRANTY	OWNER PROJECT MANAGER	BUILDING MAINTENANCE	CONSTRUCTION MANAGEMENT	COMMISSIONING AUTHORITY	DESIGN TEAM	CONSTRUCTION TEAM	COMMISSIONING MANAGER
Preliminary Commissioning Plan	✓							R			
Owner's Project Requirements Document	✓	✓			R			✓	✓		✓
Basis of Design Document	✓				✓			✓	R		✓
Commissioning Design Reviews	✓				✓		✓	✓	✓		R
Final Commissioning Plan		✓			✓		✓	✓	✓	✓	R
Commissioning Specifications	✓				✓			✓	R		✓
Commissioning Meetings		✓				✓	✓	✓		✓	R
Commissioning Schedule		✓					✓	✓		R	✓
Submittal Reviews		✓					✓		R	✓	✓
O&M Manual Reviews		✓					R	✓	✓	✓	✓
Pre-Functional Checklist and Functional Performance Test Development		✓				✓		✓		✓	R
Test, Adjust and Balance Report Review			✓				✓	✓	R	✓	✓
Pre-Functional Checklist Execution			✓					✓		R	✓
Functional Performance Test Execution			✓			✓		✓		✓	R
Trend Log Review			✓					✓		✓	R
Commissioning Issues Log	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	R
Functional Performance Re-testing			✓			✓		✓		✓	R
Deferred Testing				✓		✓		✓		✓	R
As-Built Documentation Review				✓			✓	✓	R	✓	✓
Commissioning Report				✓				✓			R

7.0) Attachments

ATTACHMENT 1:	Commissioning Issues Log Examples
ATTACHMENT 2:	Definitions and Abbreviations
ATTACHMENT 3:	Project Activity Flow Chart
ATTACHMENT 4:	Pre-Functional Checklist Sample
ATTACHMENT 5:	Functional Performance Test Sample
ATTACHMENT 6:	Basis of Design (BOD)
ATTACHMENT 7:	Owner's Project Requirements (OPR)

ATTACHMENT 1:

Commissioning Issues Log Examples

SAMPLE: SCREEN CAPTURE OF ONLINE ISSUES LOG

ISSUES

#	Code	Internal Ref	Status	Priority	Asset	Description	Location	Responsibility	Reported On	Responses	Last Response On	
1	GI-001		Closed	High	DOAS-01	Per Alban Engineering, the dampers in position D-1 and D-2 are to be removed. D-1 isolates the return duct and is located in the side of the unit. D-...	Floor: PENTHOUSE PENTHOUSE D 205	Mechanical Contractor	04/15/2021	4	05/27/2021 07:14 AM EDT	Actions
2	GI-002		Open	High	DOAS-02	Per Alban Engineering, the dampers in position D-1 and D-2 are to be removed. D-1 isolates the return duct and is located in the side of the unit. D-...	Floor: PENTHOUSE PENTHOUSE A 201	Mechanical Contractor	04/15/2021	3	05/26/2021 06:57 AM EDT	Actions
3	GI-003		Open	Low	DOAS-03	Per Alban Engineering, the dampers in position D-1 and D-2 are to be removed. D-1 isolates the return duct and is located in the side of the unit. D-...	Floor: PENTHOUSE PENTHOUSE B 203	Mechanical Contractor	04/15/2021	2	05/25/2021 11:51 AM EDT	Actions
4	GI-004		Open	High	DOAS-04	Per Alban Engineering, the dampers in position D-1 and D-2 are to be removed. D-1 isolates the return duct and is located in the side of the unit. D-...	Floor: PENTHOUSE PENTHOUSE A 201	Mechanical Contractor	04/15/2021	3	05/26/2021 06:57 AM EDT	Actions
5	GI-005		Open	High	DOAS-05	Per Alban Engineering, the dampers in position D-1 and D-2 are to be removed. D-1 isolates the return duct and is located in the side of the unit. D-...	Floor: PENTHOUSE PENTHOUSE B 203	Mechanical Contractor	04/15/2021	2	05/25/2021 11:52 AM EDT	Actions
6	GI-006		Closed	High	AHU-01	Per Alban Engineering, the dampers in position D-1 and D-2 are to be removed. D-1 isolates the return duct and is located in the side of the unit. D-...	Floor: PENTHOUSE PENTHOUSE D 205	Mechanical Contractor	04/15/2021	4	05/27/2021 07:15 AM EDT	Actions
7	GI-007		Open	High	AHU-02	Per Alban Engineering, the dampers in position D-1 and D-2 are to be removed. D-1 isolates the return duct and is located in the side of the unit. D-...	Floor: PENTHOUSE PENTHOUSE D 205	Mechanical Contractor	04/15/2021	3	05/26/2021 04:31 PM EDT	Actions
8	GI-008		Closed	High	DOAS-02	The unit currently does not have relief air dampers shown on the mechanical drawings or installed. These dampers are required to execute the sequence...	Floor: PENTHOUSE PENTHOUSE A 201	Mechanical Contractor	04/28/2021	3	05/25/2021 11:56 AM EDT	Actions
9	GI-009		Closed	High	DOAS-04	The unit currently does not have relief air dampers shown on the mechanical drawings or installed. These dampers are	Floor: PENTHOUSE PENTHOUSE A 201	Mechanical Contractor	04/28/2021	3	05/25/2021 11:55 AM EDT	Actions

ATTACHMENT 2:

Definitions and Abbreviations

DEFINITIONS AND ABBREVIATIONS

- **Acceptance Phase:** This is the phase of the project when the facility and its systems and equipment are inspected, tested, verified, and documented; and when most of the Functional Performance Testing and formal training occurs. This will generally occur after the Construction Phase is complete (start-up and checks have been accomplished). The Acceptance Phase typically begins with Substantial Completion and ends with Functional Completion.
- **A/E:** General reference to the projects Architect/Engineer.
- **ASHRAE:** American Society of Heating, Refrigerating, and Air Conditioning Engineers.
- **Basis of Design (BoD) Document:** The *Basis of Design* document shall respond to, and be consistent with, the performance criteria specified in the *Design Intent Document (DID)*. The *BoD* illustrates the means by which *DID* criteria are to be achieved, documenting the assumptions and parameters used in the design, and documenting the primary thought processes or decisions made that resulted in the selected alternatives. At the end of the project, the final *BoD* may be incorporated into the *Systems Manual* if desired in part or in its entirety.
- **Building Automation System (BAS):** The BAS is the computer-based control or automation system. The BAS may also be referred to as the FMS.
- **Checklist Item:** An item used to verify proper installation of equipment or systems by the Contractor. Checklist items simply require a 'Yes/No' response. Start-Up Checklist items are one component of the Start-Up Documentation.
- **CMMS:** Computerized Maintenance Management System
- **Contractor:** As used herein, 'Contractor' is a general reference to the installing party and can therefore refer to the GC, subcontractors, or vendors as inferred by its usage.
- **Construction Manager (CM):** The party retained by the Owner to represent the Owner and make decisions on the Owner's behalf throughout the design and construction process.
- **Construction Phase:** Phase of the project during which the facility is constructed and/or systems and equipment are installed and started. Contractor and subcontractors complete the installation, complete start-up documentation, submit O&M information, establish trends, and perform any other applicable requirements to get systems started. Contractor and Vendors may also conduct equipment specific training. The Construction Phase will generally end upon completed start-up and TAB of systems and equipment.
- **Contract Documents:** The documents governing the responsibilities and relationships between Parties involved in the design and construction of this project including (but not necessarily limited to):
 - a) Agreements/Contracts;
 - b) Construction Plans and Drawings;
 - c) Specifications;
 - d) Addenda;
 - e) Change Orders;
 - f) Commissioning Plan.
- **Construction Documents:** Refers generally to the Contract Documents that dictate the details of the installation (all but item a. above).
- **Commissioning (Cx):** The process of ensuring that all building systems perform interactively according to the design intent, ensuring the systems are efficient and cost effective, and the systems meet the Owner's operational needs.

- **Commissioning Authority (CA):** The Party retained by the Owner entrusted with overseeing the Commissioning process, developing many of the Commissioning requirements, managing the Commissioning process, and validating that systems and equipment are designed, installed and tested to meet the Owner's requirements.
- **Commissioning Coordinator (CxC):** This refers to the Individual within each of the various Parties that is designated the point-of-contact for that Party relative to Commissioning activities.
- **Commissioning Specifications:** Includes separate Commissioning specification sections and Commissioning-related subsections of other specifications. All Contractor requirements relating to Commissioning should be conveyed within the Commissioning Specs. Commissioning Specs should be referenced but not duplicated within the Commissioning Plan (which is designed to govern non-Contractor-related issues).
- **Commissioning Team (CxT):** The group of Parties involved in the commissioning process for any given system. The Commissioning Team will include a core group involved with all systems. This core group will typically include the CA, the CM's Commissioning Coordinator (CM-CxC), the Owner's Commissioning Coordinator (O/O-CxC) and the GC's Commissioning Coordinator (GC-CxC). On any given system, the Commissioning Team will also include the Commissioning Coordinator for the Contractor(s) responsible for the system or equipment.
- **Deficiency:** A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).
- **Design Intent Document (DID):** The *DID* defines the benchmark by which the success of the project is ultimately judged. The *DID* provides a detailed explanation of the ideas concepts, and criteria that are defined by the Owner to be important. At the end of the project, the final *DID* will be incorporated into the *Facility Manual*.
- **Development Manager:** The party that manages the entire project as the representative of the Owner. The DM retains the design professionals, commissioning professionals, VE consultants, and the construction contractors. The DM is the Owner's agent throughout the entire project and typically acts as the Activation Manager.
- **Endurance Period:** The period for critical facilities during which the systems are operated by operators and occupant representatives in accordance with the design intent to validate that it is performing properly and is maintainable. The period starts at the end of Functional Completion (completion of successful Functional Performance Testing). Substantial Completion will typically start concurrently with the Endurance Period.
- **Exception Record (ER):** Any issue that requires a response, completion, corrective or additional work, or any other action. Examples include a Request for Information (RFI), a work directive, a clarification request, a to-do item, an identified deficiency, or any other like item.
- **Exception Record List:** This is a list that is maintained and updated by the CA that includes all Action Items that relate to Commissioning activities.
- **Facility Management System (FMS):** Alternate reference to the computer-based control or automation system. FMS may also be referred to as the BAS.
- **Systems Manual:** This is a building overview and a guide to the configuration, operation, and maintenance of zones and systems. The Guide references all other design, construction, and commissioning documentation. This is generally authored by the CA using input from the DID, and BOD. It references the O&M documentation as well as all other information indicated above.
- **Facility Manual:** The *Facility Manual* is one of the final deliverables from the Commissioning process, and provides the information needed to understand, operate, and maintain the facility and its systems. It is the compilation of the Systems Manual and the O&M Documentation and this compiled and organized manual references all documentation available from the design/construction/ and Commissioning process. It should be the repository of all updates and

corrections as they occur (even through occupancy). The *Facility Manual* expands the scope of standard O&M documentation to incorporate additional information developed through the commissioning process. This is also often called a 'Systems Manual' throughout ASHRAE Commissioning references or Re-commissioning Manual throughout LEED References.

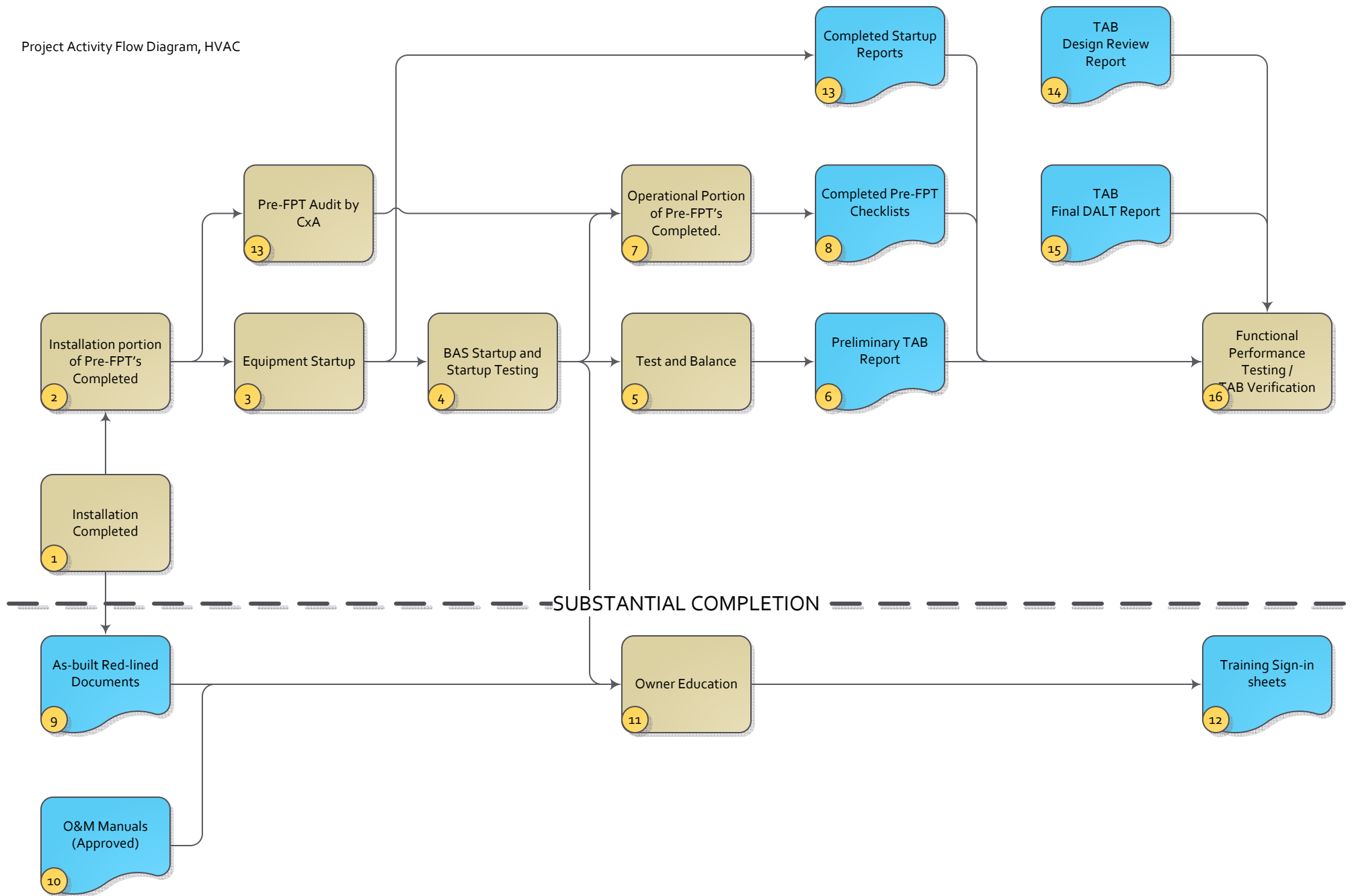
- **Factory Authorized Representative:** An individual fully trained on the equipment and certified by the manufacturer to perform the respective task.
- **Factory Testing:** Testing of equipment off-site at the manufacturer's facility. Factory testing may be witnessed by the members of the project team.
- **FF&E:** Furniture, Furnishing, and Equipment. This term is used to refer to the generally movable fit out elements of a building that are not included in the construction contract but are dealt with in the Activation
- **Fixed Construction:** Elements of the building that are permanently built into the structure. This term is typically used in contrast to FF&E.
- **Functional Completion:** A milestone that marks the completion of the Acceptance Phase and successful completion of the FPTs by the Commissioning Authority.
- **Functional Performance Testing (FPT):** The detailed and thorough testing of the building systems and their interactions with the building components and other building systems. Also referred to as *Performance Verification*.
- **IAQ:** Indoor Air Quality
- **O&M Documentation:** When a full Facility Manual is not specified, this refers to Contractor-developed documentation designed to address the needs of facilities personnel and customized for the context of the specific facility and installation. The foundation of O&M Documentation is manufacturer's literature (including 'O&M Manuals', parts lists, troubleshooting guides, etc.) as well as Contractor-developed instructions for start-up and shut-down, sequences, and other installation-specific information. O&M Documentation content is a subset of the Facility Manual, so it is common for only one or the other to be specified.
- **O&M Manuals:** This term shall be reserved for referencing manufacturer-published O&M documents, which generally has no information specific to the specific facility. Specifications should strive for this information to be submitted in electronic form whenever possible.
- **Opposite Season:** The season opposite that when the majority of the testing occurs.
- **Owner's Project Requirements (OPR):** This is the Commissioning document that outlines the primary goals, requirements, and preferences for commissioned systems. It is developed by the Commissioning Authority and used throughout the project as a benchmark as to whether the project is meeting the Owner's expectations.
- **Party:** Individual, company or entity. Refer to the Commissioning Plan for specific names and definitions.
- **Performance Verification (PV):** The detailed and thorough testing of the building systems and their interactions with the building components and other building systems. Also referred to as *Functional Performance Testing (FPT)*.
- **Point of Contact (POC):** General reference to the key individual within each Party.
- **Project Phases:** Phases of the project include the Design, Construction Phase, Acceptance Phase, Warranty Phase, and Occupancy.
- **Project Officer (PO):** Individual or entity directly employed by the Owner who is in charge of the design and construction coordination for the project. Alternately, the Owner may employ a separate CM to perform this function.
- **RFI:** Request for Information

- **Scheduled Outage:** A period of time, scheduled by Owner, in which the system is out-of-service or not to be used by occupants.
- **Start-Up:** Refers to the process whereby the Contractor verifies the proper installation of a device or piece of equipment, executes the manufacturer's starting procedures, completes the Start-Up Checklist, energizes the device, verifies that it is in proper working order and ready for dynamic testing, and completes the Start-Up Tests.
- **Start-Up Documentation:** The record of the startup activity. These are typically forms produced by the manufacturer or the Commissioning team to document the key startup related parameters and to solicit, from the startup technician, confirmations of successful completion of required activities. The startup technician completes the startup documentation and signs off on it for confirmation
- **Start-Up Procedures:** Refers to the tasks and processes indicated by the Start-Up Checklists and Start-Up Tests. Start-Up Procedures are typically performed by the Contractor with or without a formal Commissioning process. The Contractor documents the start-up process by completing and submitting the Start-Up Procedures.
- **Test:** A task, procedure or measurement that confirms capacity, functionality, accuracy, etc.. Tests have a status of Pass, Fail, Couldn't or Didn't.
- **TAB:** Can refer to the test, adjust, and balance process or the Testing, Adjusting, and Balancing Contractor.
- **Temporary Conditioning Plan:** A plan that summarizes the logistics, procedures and protocols for taking permanent equipment and using it to maintain conditions throughout construction. The Temporary Conditioning Plan must be approved by all members of the Commissioning Team prior to placing equipment into temporary service.
- **Testing Agency:** An independent agency typically retained by the Contractor to perform specialized testing of systems or equipment (most commonly electrical). The Testing Agency shall be qualified and equipped to perform the testing and shall submit appropriate qualifications.
- **Trending:** Monitoring and recording a history of parameters typically using the building automation system.
- **Warranty Phase:** Includes the early occupancy of the building and can continue through the Warranty Period and at least into the opposite season from when it was initially tested
- **Witnessed Startup:** A period at the end of equipment or systems startup during which quality control checklist items are completed to ensure the startup was done to a high standard of care. The contractor provides notification of the activity, and operators and Commissioning Team members are invited to witness, however, the contractor does not schedule around anyone.

ATTACHMENT 3:

Project Activity Flow Chart

Project Activity Flow Diagram, HVAC



NOTE: Brown items are tasks. Blue items are documents.

ATTACHMENT 4:

Pre-Functional Checklist Sample

VRF CONDENSING UNIT

Test Type: Pre-Functional Testing

Status: Draft

Equipment Verification

Equipment / Component	Approved Submittal Data	Installed As Submitted?	Installed Data
Manufacturer			
Model Number			
Serial Number			

Questionnaire

#	Question	Answer	Details
CASING AND GENERAL INSPECTION			
1	Equipment is properly installed on and secured to the roof curb.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> <div>Mechanical Contractor_____</div>
2	Neoprene pad for vibration isolation is in place.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> <div>Mechanical Contractor_____</div>
3	The equipment is level and plumb when observed using the unaided eye.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> <div>Mechanical Contractor_____</div>
4	Maintenance access is acceptable for equipment and all components.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> <div>Mechanical Contractor_____</div>
5	Casing condition: The equipment is not marked, scratched, gouged, etc... and any painted surfaces are free from blemishes, UV exposure cracks, etc...	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> <div>Mechanical Contractor_____</div>
6	All casing screws are in place.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> <div>Mechanical Contractor_____</div>

#	Question	Answer	Details
7	Access panels can be easily removed for maintenance or service.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
8	Clean up of equipment (interior and exterior) is completed per contract documents.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____

PIPING / MECHANICAL

1	Height difference between the indoor and outdoor units is within the manufacturer's limitations (see equipment submittal for details).	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
2	Refrigerant piping does not exceed the maximum length as defined by the manufacturer (see equipment submittal for details).	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
3	Refrigerant piping is complete at the equipment.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
4	Piping is well supported. Support saddles are installed where needed.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
5	Refrigerant pipe penetrations through floors / roof have been sealed. Refrigerant pipe penetrations through any exterior walls have been sealed and have escutcheons at exterior wall.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
6	Refrigerant piping is properly labeled	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____

INSULATION

1	Insulation of liquid and suction lines is complete.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
2	Refrigerant loop pipe and/or fittings are not exposed - no condensate is dripping or running from any location.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____

#	Question	Answer	Details
3	All components that operate below the dew point are insulated on the unit (no sweating occurs that could promote corrosion).	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
4	Pipe insulation does not have punctures or tears.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
5	Sizing (mastic or paint) has been applied to all exposed edges.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____

ELECTRICAL

1	All electrical devices exposed to the elements are appropriately rated (NEMA 3R, 4, etc....)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Electrical Contractor_____
2	All junction boxes have covers installed.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Electrical Contractor_____
3	The electrical distribution panel / circuit is labeled with the proper equipment ID and location.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Electrical Contractor_____
4	Permanent power has been provided to the equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Electrical Contractor_____
5	An electrical disconnect for all powered components has been installed within sight of the equipment.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Electrical Contractor_____
6	Flexible conduit was used for final connections to all devices mounted on the unit, and flexible conduit is secured adequately.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Electrical Contractor_____
7	Overload breakers / heaters installed and correct size	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Electrical Contractor_____

EQUIPMENT SPECIFIC

#	Question	Answer	Details
1	VRF condensing unit fan rotation correct.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
2	A protective screen has been installed around the lower section of the condenser to prevent debris and to minimize the potential of damage to the refrigeration components.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
3	The compressor section is accessible for service - access is sufficient to remove and replace compressor.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
4	The unit has been charged with refrigerant.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
5	There is no damage to the intake side of the condenser coil. Note if there is any damage which cannot be fully repaired with a fin comb.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____

CONTROLS

1	Equipment instrumentation is installed according to specification (thermometers, pressure gages, flow meters, etc.)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Controls Contractor_____
2	All control enclosures, junction boxes, and control components are mounted securely and have covers with all screws installed.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Controls Contractor_____
3	Control electrical installation does not impede any maintenance activities and cannot become caught by tools or personnel working on the equipment.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Controls Contractor_____
4	No exposed and un-jacketed wires are visible (applies to field wiring - not factory equipment wiring).	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Controls Contractor_____

#	Question	Answer	Details
5	All fittings, transformers and relays connected to junction boxes or troughs are secured and cannot be rotated by hand.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Controls Contractor_____
6	Flexible conduit (Greenfield/Liquidtight) is secured and is not dangling.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
7	Network wiring is completed and tested. Communication to all remote VRF components verified.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____

OPERATIONAL

1	Unit field startup report completed and documentation record submitted.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
2	The unit is powered and in Auto. All disconnects ON.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
3	There are no undue vibrations of the equipment or piping while the equipment is operating.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
4	BAS point-to-point checks completed and documentation record submitted	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Controls Contractor_____
5	Equipment integration has been completed and verified by the manufacturer and controls vendor.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____
6	Manufacturer has verified operation in all applicable modes as detailed in the sequence of operations in the construction documents.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<div></div> Mechanical Contractor_____

END TEST

ATTACHMENT 5:

Functional Performance Test Sample

DOAS UNIT

Test Type: Functional Performance Testing

System Description

This test applies to all Dedicated Outside Air Systems providing ventilation air to areas conditioned by the VRF systems.

Set Points

				Setpoint		Acceptable Range	
Parameter	Description	Provided	Alarm	Pre-Test	Return to Pre-Test	Min	Max
Supply Fan Status	<p>Fan failure due to no current sensed by current switch</p> <p>Expected Result:</p> <ul style="list-style-type: none"> • Supply and Relief fans are de-energized • Energy wheel rotation is stopped • Outside air and relief air dampers modulate to normal position (closed) • BAS generates and broadcasts a supply fan failure alarm 						
Relief Fan Status	<p>Fan failure due to no current sensed by current switch</p> <p>Expected Result:</p> <ul style="list-style-type: none"> • Supply and Relief fans are de-energized • Energy wheel rotation is stopped • Outside air and relief air dampers modulate to normal position (closed) • BAS generates and broadcasts a relief fan failure alarm 						

				Setpoint		Acceptable Range	
Parameter	Description	Provided	Alarm	Pre-Test	Return to Pre-Test	Min	Max
Condensate Float	Unit failure due to high condensate in the drain pan. Expected Result: <ul style="list-style-type: none"> • Supply and Relief fans are de-energized • Energy wheel rotation is stopped • Outside air and relief air dampers modulate to normal position (closed) • BAS generates and broadcasts a general unit failure alarm 						

Sensor Calibration

Sensor & Location	Location OK?	First Gauge or BAS Value	Instrument Measured Value	Final Gauge or BAS Value	Pass
Outside Air Temperature (OA-T)					
Outside Air Humidity (OA-H)					
Outside Airflow Measuring Station (OA-VP)					
Outside Outlet Temperature from Heat Wheel (PH-T)					
Outlet Temperature from DX Coil (CC-T)					

Sensor & Location	Location OK?	First Gauge or BAS Value	Instrument Measured Value	Final Gauge or BAS Value	Pass
Supply Air Temperature (DA-T)					
Return Air Temperature (EA-T)					
Return Air Humidity (EA-H)					
Energy Recovery Exhaust Temperature (EAHR-T)					
Zone Carbon Monoxide (ZN-CO)					

Device Calibration

Device or Actuator & Location	Type	Procedure/ State	First BAS Value	Device State/ Display Readout	Final BAS Value	Pass
Outside Air Damper	Modulating	Full Open				
		% Open				
		Closed				
DX Cooling Capacity	Modulating	Full Open				
		% Open				
		Closed				

Device or Actuator & Location	Type	Procedure/ State	First BAS Value	Device State/ Display Readout	Final BAS Value	Pass
Hot Gas Reheat Capacity	Modulating	Full Open				
		% Open				
		Closed				
Natural Gas Heating Capacity	Modulating	Full Open				
		% Open				
		Closed				
Relief Air Isolation Damper	Two Position	Full Open				
		Closed				
Supply Fan Speed	VFD	Hz				
		Hz				
		Hz				
Relief Fan Speed	VFD	Hz				
		Hz				
		Hz				
Energy Recovery Wheel Speed	VFD	Hz				
		Hz				
		Hz				

Questionnaire

#	Question	Answer	Details
---	----------	--------	---------

PREREQUISITE CHECKLIST

- | | | | |
|---|--|--|--|
| 1 | The pre-functional checklists have been completed and submitted for the equipment. System is ready for functional testing. | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |
| 2 | Unit startup is completed. | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |
| 3 | Control Program Review. Review the software control program(s) for this equipment. Parameters, set-points and logic sequences appear to follow the specified written sequences | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |
| 4 | All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final set-points, alarms, trends and schedules with debugging, loop tuning and sensor calibrations completed. | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |
| 5 | The following points are to be trended at 15 minutes samples: Zone temperature; Zone temperature setpoint. | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |
| 6 | The following alarms are to be configured: Low Zone Temp (<65 degF); High Zone Temp (>80 degF); High Zone CO2 (>1100 PPM). | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |
| 7 | BAS contractor has completed the Operational Verification through Facility Grid. | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |

OPERATIONAL VERIFICATION

Occupied Mode Start

- | | | | |
|---|--|--|--|
| 1 | Verify that the unit is in unoccupied mode. If necessary, adjust the operating schedule for the day of the test to place the DOAS Unit into Unoccupied mode. | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |
| 2 | Action: Modify the DOAS weekly schedule (for the test day only) to allow a transition from unoccupied mode to occupied mode.
Expected Result: <ul style="list-style-type: none"> The DOAS enters Occupied Mode and the BAS display reflects this. The outdoor air damper modulates open. The relief air damper opens. The supply air and relief air fans are started The total energy heat recovery wheel is enabled and operates based on outside air conditions. The packaged air-cooled DX coil, hot gas reheat coil and natural gas furnace modulate capacity to maintain supply air temperature set point. | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A | |

#	Question	Answer	Details
FPT Procedure: Heating Mode			
1	Verify the system is in the occupied mode and total heat recovery wheel is energized.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
2	Action: Simulate conditions such that outdoor air temperature is below 45 degF, verify the following: Expected Result: • The heat wheel is modulated to maintain the supply air temperature setpoint. • The natural gas furnace capacity is modulated to maintain the supply temperature setpoint.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
3	Action: From the BAS, raise the supply air temperature setpoint 5 degF above the current supply air temperature value, verify the following: Expected Result: • The heat wheel is modulated to maintain the supply air temperature setpoint. • The natural gas furnace capacity is modulated to maintain the supply temperature setpoint. • The supply fan speed is modulated to maintain the supply air flow setpoint. • The speed of the relief fan modulates to maintain a slightly positive pressure in the zone.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
4	Action: From the BAS, set the supply air temperature setpoint equal to the current supply air temperature value, verify the following: Expected Result: • The heat wheel is modulated to maintain the supply air temperature setpoint. • The natural gas furnace capacity is modulated to maintain the supply temperature setpoint. • The supply fan speed is modulated to maintain the supply air flow setpoint. • The speed of the relief fan modulates to maintain a slightly positive pressure in the zone.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
FPT Procedure: Cooling Mode			
1	Verify the system is in the occupied mode and total heat recovery wheel is energized.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
2	Action: Simulate conditions such that outdoor air temperature is between 60 degF and 75 degF, verify the following: Expected Result: • The heat wheel speed is reduced to 1/4 RPM. • The DX cooling capacity is modulated to maintain the supply temperature setpoint.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	

#	Question	Answer	Details
3	<p>Action: From the BAS, lower the zone temperature setpoint 5 degF below the current zone temperature value, verify the following: Expected Result:</p> <ul style="list-style-type: none"> • The supply air temperature setpoint is slowly indexed down to the minimum setpoint value of 55 degF. • The heat wheel is running at 100% speed. • The DX cooling modulates capacity to maintain the supply air temperature setpoint. • After the supply air temperature reaches the minimum supply air temperature setpoint, the supply air volume setpoint is slowly indexed up to the maximum scheduled supply air volume setpoint. • The supply fan speed is modulated to maintain the supply air flow setpoint. • The speed of the relief fan increases to maintain a slightly positive pressure in the zone. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
4	<p>Action: From the BAS, set the zone temperature setpoint equal to the current zone temperature value, verify the following: Expected Result:</p> <ul style="list-style-type: none"> • The heat wheel is running at 100% speed. • The DX cooling is modulated to maintain the supply temperature setpoint. • The supply airflow setpoint is reduced from the design maximum air flow setpoint to 50% of the design air maximum air flow setpoint • The supply fan speed is modulated to maintain the supply air flow setpoint. • The speed of the relief fan decreases to maintain a slightly positive pressure in the zone. • After the supply airflow setpoint is reduced to 50% of the design maximum air flow setpoint, the supply air temperature setpoint is slowly indexed up toward a zone neutral value. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
FPT Procedure: Cooling Mode			
1	<p>Verify the system is in the occupied mode and total heat recovery wheel is energized.</p>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
2	<p>Action: Simulate conditions such that outdoor air temperature is between 60 degF and 75 degF, verify the following: Expected Result:</p> <ul style="list-style-type: none"> • The heat wheel speed is reduced to 1/4 RPM. • The DX cooling capacity is modulated to maintain the coil leaving air temperature setpoint. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	

#	Question	Answer	Details
3	<p>Action: From the BAS, lower the supply air temperature setpoint 5 degF below the current supply air temperature value, verify the following: Expected Result:</p> <ul style="list-style-type: none"> • The heat wheel is running at 1/4 RPM. • The DX cooling modulates capacity to maintain a coil leaving air temperature setpoint of 55 degF. • The hot gas reheat modulates to maintain the supply air temperature setpoint. • The supply fan speed is modulated to maintain the supply air flow setpoint. • The speed of the relief fan modulates to maintain a slightly positive pressure in the zone. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
4	<p>Action: From the BAS, set the supply air temperature setpoint equal to the current supply air temperature value, verify the following: Expected Result:</p> <ul style="list-style-type: none"> • The heat wheel is running at 1/4 RPM. • The DX cooling modulates capacity to maintain a coil leaving air temperature setpoint of 55 degF. • The hot gas reheat modulates to maintain the supply air temperature setpoint. • The supply fan speed is modulated to maintain the supply air flow setpoint. • The speed of the relief fan modulates to maintain a slightly positive pressure in the zone. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
FPT Procedure: Cooling Mode with ERW			
1	<p>Verify the system is in the occupied mode and total heat recovery wheel is energized.</p>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
2	<p>Action: Simulate conditions such that outdoor air temperature is greater than 75 degF, verify the following: Expected Result:</p> <ul style="list-style-type: none"> • The heat wheel speed is running at 100% speed. • The DX cooling capacity is modulated to maintain the coil leaving air temperature setpoint. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
3	<p>Action: From the BAS, lower the supply air temperature setpoint 5 degF below the current supply air temperature value, verify the following: Expected Result:</p> <ul style="list-style-type: none"> • The heat wheel is running at 100% speed. • The DX cooling modulates capacity to maintain a coil leaving air temperature setpoint of 55 degF. • The hot gas reheat modulates to maintain the supply air temperature setpoint. • The supply fan speed is modulated to maintain the supply air flow setpoint. • The speed of the relief fan modulates to maintain a slightly positive pressure in the zone. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	

#	Question	Answer	Details
4	<p>Action: From the BAS, set the supply air temperature setpoint equal to the current supply air temperature value, verify the following: Expected Result:</p> <ul style="list-style-type: none"> • The heat wheel is running at 100% speed. • The DX cooling modulates capacity to maintain a coil leaving air temperature setpoint of 55 degF. • The hot gas reheat modulates to maintain the supply air temperature setpoint. • The supply fan speed is modulated to maintain the supply air flow setpoint. • The speed of the relief fan modulates to maintain a slightly positive pressure in the zone. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
FPT Procedure: Outside Air CO2 Control			
1	<p>Action: Simulate conditions where one of the zone CO2 sensors is reading 1100 PPM. Expected Result:</p> <ul style="list-style-type: none"> • The supply air flow setpoint increases from 50% of scheduled maximum air flow to the full scheduled maximum air flow value. • Supply fan speed modulates to maintain the supply air flow setpoint. • The relief fan modulates speed to maintain an offset air volume from the supply fan. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	
2	<p>Action: Simulate conditions where all the zone CO2 sensors are reading below 750 PPM. Expected Result:</p> <ul style="list-style-type: none"> • The supply air flow setpoint decreases from the full scheduled maximum supply air flow to the 50% of the full scheduled maximum air flow value. • Supply fan speed modulates to maintain the supply air flow setpoint. • The relief fan modulates speed to maintain an offset air volume from the supply fan. 	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A	

END TEST

ATTACHMENT 6:

Basis of Design (BOD)



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Basis of Design (BOD) Summary

MX West Side Learning Center Addition and Renovations

Programming per the Contract Documents

The project is a New Community Room Addition and Link renovation to the existing single-story Malcolm X College West Side Learning Center located at 4624 W Madison Street in Chicago IL 60644. The addition is a single-story building, approximately 5,000sf located on the Southend of the existing facility. The occupancy use is classification A-1 large assembly with the construction type as IIB, noncombustible. Spaces included are a new community room, catering room, mechanical room, storage, and restrooms. Scope also includes modifications to a link at the existing building with a renovated area to include new vestibules, lobby area, and basement level stair enclosure with an area of refuge.

The annex is a steel frame construction with light gauge metal stud framed wall within an exterior metal rainscreen system. At other parts of the structure, a masonry veneer and curtain wall system complete the exterior envelope. The single-story building is a concrete slab on grade with extended below slab insulation and vapor barrier, along with a perimeter concrete footing. The roof is a flat, modified bitumen roofing system and taper insulation with gypsum sheathing. The structural roof spans with a metal decking between the beams.

The existing renovated lobby will be reclad which includes structural roof framing and wall modifications.

The new addition will include new mechanical, electrical and plumbing systems. The HVAC will include a new air handling unit with VRF and VAV systems. All new power and high efficiency lighting throughout. Plumbing systems will include new high efficiency lavs with integrated hardwired sensors. New ADA compliant restrooms with high efficiency low-flow water for the fixtures. All new low voltage A/V infrastructure, power shades, and security system infrastructure. Fire Alarm will extend from the existing facility.

Scope Phasing of the project:

- **Phase – 1 (Base)** includes construction of the New Addition, Link with site development. renovations to the existing building lobby and stairwell.
- **Phase – 2 (NIC)** anticipated for the existing building renovations, TBD by CCC per budgeting availability.

MX WSLC [Base Scope]

The programming within the Community Room Addition and Existing Lobby Renovation area as follows: Per Base Scope included in the 100% Construction Documents dated 2/8/2019.

- 3,124 SF Community Room, Multi-use with movable dividable partition, acoustical ceiling and wall panels.
- 346 SF Chair Storage Room



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- 225 SF Catering Room includes cabinetry, warming cabinet niche, hand sink and two bowl sink.
- 162 SF Storage Room accessible from the exterior with roof ladder access
- 456 SF Covered Patio
- 354 SF Restrooms with Accessible Stalls and Fixtures
- 400 SF Lounge and Entry to the Community Space
- 40 SF Electrical Room
- 86 SF Security Room.
- 1625 SF Lobby Space with Large Desk, turnstiles, including entry vestibules. Updates to the existing stair and lower-level stair enclosure that includes an area of refuge.

Exterior Wall:

Opaque Wall

Metal Clad Rainscreen:

- 1 ½" Thick Metal Panel Cladding with fiberglass girt
- 4" Semi-rigid mineral wool insulation
- Factory applied fluid air barrier over 5/8" exterior grade sheathing
- Metal Stud Back up with 3" Close cell spray foam at interior face of exterior sheathing.

Masonry veneer wall:

- Norman brick dark iron spot
- 1" Air cavity
- Factory applied fluid air barrier over 5/8" gypsum sheathing.
- Metal Stud Back up with 3" Close cell spray foam at interior face of exterior sheathing.

Roof System:

- Modified Bituminous Membrane Roofing System
- 5/8" Cover Board
- Tapered insulation and Rigid Insulation totaling R-30 min.
- Vapor Barrier over 5/8" Gypsum Sheathing and 1 ½" 18 GA MTL. Decking

Fenestration:

Low-e insulated, thermally broken curtain wall system.

Low-e insulated, thermally broken storefront system.

Mechanical:

- Dedicated Outdoor Air Unit with integral vibration isolation and noise control curb.
- Roof top condensing units
- VRF, VAV and Fan Coil units



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- Electric heaters at vestibules, and storage room.

Electrical:

- New 800amp Distribution Panel, using existing service. [Refer to new added scope below]
- New 225 Amp MCB

Lighting/Accessories:

- LED low voltage lighting throughout
- Occupancy sensors
- Motorized Shades (Curtainwall)

AV/IT

- AV/IT System infrastructure throughout, (Equipment provided and installed by CCC, i.e. Projectors, Carts, etc.)

Plumbing:

- New Water Service
- New Gas Service
- High efficiency faucets with infrared detection
- Toilets and lavatories fixtures with hardwired flush valve

Security and Access Controls

- Infrastructure indicated and within door hardware. Cameras, Turnstiles, Access Controls and Security system provided and installed by CCC.
- ~~Fire Alarm tied into existing fire alarm.~~ **[Refer to new added scope below]**

Signage

- Infrastructure w/devices for Code Compliance (I.e. Directional, Room, Exterior Building) **[Selective Interior Graphics provided by CCC, installed by GC]**

Site Development

- New Asphalt resurfacing and restriping of existing parking lot, bike racks, Fixed FF&E (Benches and Trash Receptacles) [AOR Confirmation w/DWM Stormwater Management requirements]

MX WSLC [Anticipated Added Scope]

Per the 100% construction documents dated 2/8/2019. Pricing indicated is from 11/3/2022 by Middleton, for reference only, and have not been updated to accommodate supply chain, labor shortages, escalation, phasing/logistics, and construction time of completion requirements.

1. Sprinkler System in the new addition and existing building. With the current building code, sprinkler system throughout is required without a fire separation.



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- ~~Estimated cost for 2024 Construction~~ **\$541,573 [TBD, Pending confirmation w/CoC FIRE Dept.] [Include per CCC for Phase-1]**
2. LEED v4.0 Certification – Silver minimum **[Include per CCC for Phase-1]**
 3. Commissioning by CxA **[Include per CCC for Phase-1]**
 4. Fire Alarm: Remove fire alarm system from existing building and install new system throughout existing and new addition. ~~Estimated cost for 2024~~ **\$326,875 [Include per CCC for Phase-1]**
 5. AV/IT/Security.
 - a. Per Construction Documents items are by CCC to provide and install for the following:
 - i. Low Voltage Wiring: ~~Estimated Cost for 2024 construction~~ **\$40,477 [Provided and Installed by CCC for Phase-1]**
 - ii. A/V systems: ~~Estimated Cost for 2024 construction~~ **\$85,000 [Provided and Installed by CCC for Phase-1]**
 - iii. Security Systems: CCTV Cameras ~~Estimated Cost for 2024 construction~~ **\$49,500 [Provided and Installed by CCC for Phase-1]**
 - iv. Access Controls ~~estimated cost for 2024 construction~~ **\$23,877 [Provided and Installed by CCC for Phase-1]**
 - v. New IT IDF Closet ~~Cost to be determined.~~ **[Pending AOR location confirmation in Existing Building. Include per CCC for Phase-1]**
 6. FF&E ~~Cost to be determined.~~ **[Provided and Installed by CCC]**
 7. Existing Building Full Roof Replacement. ~~Estimated Cost for 2026 Construction~~ **\$1,631,060 [Include per CCC for Phase-1]. Noted Impacts: Structural System, Parapets, Curbs, Conduits, Environmental ACM, etc.**
 8. Existing Building AHU Replacement (3 Rooftop Units). ~~Estimated Cost for 2024 construction~~ **\$718,396 [Include per CCC for Phase-1]. Noted Impacts: Ductwork, Curbs, Roof system, Upgrade Gas & New Electrical Service, T&B, Controls, BAS System, Supply Chain Procurement/Delivery, etc.**
 9. Existing Building Renovation ~~Estimate Cost for 2026 construction~~ **\$8,799,416 [NIC, price as Alternate for Phase-2]**
 10. New Electrical Service to replace existing and tie into new addition. ~~Cost to be determined.~~ **[Reference Scope above: AHU Replacement, Include per CCC]**
 11. Infrastructure for New EV Ready Stations in parking lot **[Include per CCC for Phase-1, Code Confirm per FTE]**

End of Program Document

ATTACHMENT 7:

Owner's Project Requirements (OPR)

SECTION 02 13 15 – SMALL SCALE DISTURBANCE OF ASBESTOS CONTAINING MATERIALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. These environmental requirements apply to all Board projects. These specifications apply for all demolition and construction activities that may include drilling, coring and/or anchoring into asbestos containing building materials or building materials assumed to contain asbestos but shall not disturb greater than a total of three (3) square feet or three (3) linear feet during the entire project work at the school.
- B. Disturbance of small quantities of asbestos containing materials in interior building spaces, covered walkways or porticos connecting buildings, and on outdoor mechanical systems which condition indoor air (such as air handling units, air conditioners, cooling towers, etc.) is governed by rules established by the Illinois Department of Public Health (IDPH) and the Chicago Department of Public Health (CDPH). These specifications address or reference the requirements for complying with IDPH, CDPH, OSHA, and EPA NESHAP asbestos rules. Each and every rule requirement may not be restated in detail since trained, accredited, and licensed Contractors and individuals are required for this work and are presumed to be familiar with the relevant laws and rules. Full regulatory compliance is required, and is a part of the contract, whether specifically stated herein or not.

1.02 DEFINITIONS

- A. In addition to the terms listed below, all definitions in the laws and regulations specified elsewhere in this Section are incorporated by reference, whether or not restated herein.
- B. Abatement Contractor (AC): the entity responsible for performing the work in this Section, with the training and accreditation to competently perform the work. This entity shall obtain and maintain any licenses required for the work in this Section.
- C. CDPH: the Chicago Department of Public Health.
- D. Managing Environmental Consultant (MEC): the entity with overall responsibility for the environmental aspects of the project, including design, organization, direction, oversight and control as well as investigations, assessments, and supervision of project manager.
- E. Environmental Project Manager (EPM): the person selected by the Managing Environmental Consultant to perform environmental monitoring and act on behalf of the Board or its agents on the project.
- F. General Contractor (GC): the entity responsible for performing the complete scope of work in the Documents. The GC may elect to self-perform or subcontract out any portion of the work. If the GC acts as the AC, it must have the same credentials, training, accreditations and licenses required by the AC.
- G. HEPA Filter: a High Efficiency Particulate Air filter capable of trapping 99.97% percent of particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.
- H. IDPH: the Illinois Department of Public Health.
- I. OSHA: the federal Occupational Health and Safety Administration

- J. Plasticize: to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.
- K. SDS: Safety Data Sheets, required by OSHA for any chemical in the workplace that that could be expected to cause an exposure to workers during normal use or in emergency situations.
- L. Work Area: areas where activities that disturb small quantities of asbestos containing materials are conducted.
- M. Work Site: the room or rooms or routes for construction/distribution/mounting of the electrical systems undergoing activities covered by this section. All closets/book rooms/coat hanger rooms/vestibules/washrooms within a room are considered part of the work site in which work has been identified on the drawings, whether or not they are numbered/named separately. All other areas of the school (attics, basements, hallways, crawl-spaces etc) are considered part of the work site, even if they are not explicitly identified in the documents.

1.03 REFERENCE STANDARDS

- A. The Contractor is responsible for compliance with all applicable local, state and federal laws, regulations and ordinances including, but not limited to, those listed below, which are incorporated by reference.
- B. The following laws, regulations and standards are incorporated by reference:
 - 1. 29 CFR 1910: US OSHA General Industry Standards
 - 2. 29 CFR 1926: US OSHA Construction Standards
 - 3. 40 CFR Part 61: USEPA National Emissions Standards for Hazardous Air Pollutants (NESHAP)
 - 4. 77 Ill. Adm. Code 855 Rules for Asbestos Abatement for Public and Private Schools and Commercial and Public Buildings in Illinois.
 - 5. 11-4-2170: Chicago Building Code- Demolition and renovation safeguards
 - 6. 11-4-2150: Environmental standards related to the demolition, renovation, asbestos abatement and maintenance, sandblasting, chemical washing, and grinding of buildings, facilities or other structures.

1.04 PROJECT CONDITIONS

- A. The Work includes the control of dust emissions caused by construction, demolition, renovation, restoration, or related activities that disturb less than three square feet or three linear feet of asbestos containing materials including, but not limited to drilling sawing, cutting, grinding, sanding, abrading, sweeping, crushing, scraping, screwing into, or any other related processes. IN NO CASE CAN THE TOTAL QUANTITY OF DISTURBED ASBESTOS CONTAINING MATERIALS EXCEED THREE (3) SQUARE FEET THREE OR (3) LINEAR FEET FOR THE ENTIRE PROJECT AREA AND DURATION.
- B. No visible emissions or unreasonable odors will be permitted within the work area.
- C. All products/processes/equipment planned for use that will possibly cause emissions or odors shall be accompanied with SDS sheets and submitted to the AOR prior to the use of the product.
- D. Use of licensed Asbestos Contractor and crew is required when building materials are confirmed to contain asbestos or assumed to contain asbestos.

PART 2 - PRODUCTS

2.01 TOOLS AND EQUIPMENT

- A. All tools and equipment shall at least conform to minimum industry standards and IDPH regulations.
- B. Equipment:
 - 1. Negative Air Machines shall provide HEPA filtration and conform to ANSI Z9.2 fabrication criteria.
 - 2. Respirators shall be NIOSH approved for use with lead, asbestos, or other contaminants anticipated in the Work.
 - 3. Contractor is fully responsible for complying with OSHA rules for other Safety equipment, such as hard hats, safety harnesses, eye protection, gloves, footwear, and any other safety devices used on the site.
 - 4. Tools:
 - a. Shovels and scoops shall be rubber or plastic, suitable for use in a plasticized containment. Metal shovels are not permitted.
 - b. Scrapers, brushes, utility knives and other hand tools shall be of good quality and suitable for the intended uses. The Contractor shall keep an ample supply on hand for the completion of the Work.
 - c. Power tools such as, but not limited to saws, pneumatic chisels, brushes, sanders, and needle guns shall be equipped with shrouds and HEPA-filtered local exhaust systems to capture released particles.

2.02 MATERIALS

- A. All materials shall at least conform to minimum industry standards and IDPH regulations.
- B. Installed materials which become a part of the Work such as, but not limited to, encapsulants shall be of good quality, non-lead-bearing, free of asbestos, and conform to the respective reinstallation specification sections prepared by others.
 - 1. Contractor shall ensure that encapsulants and sealants used as primers, basecoats, or covering existing materials are compatible with the respective existing or reinstallation materials and their manufacturers' warranties.
 - 2. Encapsulants for surfaces to which fireproofing shall be applied (beams, columns, floor or roof decks, other structural members) shall be tested and rated as a component of the fireproofing system and listed in the UL Fire Resistance Directory with the specific fireproofing material to be installed.
- C. Abatement Materials:
 - 1. Fire-retardant Poly sheeting for all applications shall be 6 mil nominal thickness for critical seals, floors, ceilings and drop cloths, and 4 mil for walls.
 - 2. Tape shall be 2" or 3" duct tape or other waterproof tape suitable for joining poly seams and attaching poly sheeting to surfaces.
 - 3. Spray adhesives shall be non-flammable and free of methylene chloride solvents.
 - 4. Disposal bags shall be 6 mil.
 - 5. Disposable suits, hoods, and foot coverings shall be TYVEK or similar.
 - 6. Solvents shall be compatible with any primers, mastics, adhesives, paints, coatings, or other surfacing materials to be installed following their use.

PART 3 - EXECUTION

3.01 ASBESTOS WORK DETAILS

- A. This specification section applies only to the disturbance of asbestos materials or materials assumed to contain asbestos in quantities less than three (3) square feet or three (3) linear feet. IN NO CASE CAN THE TOTAL QUANTITY OF DISTURBED ASBESTOS CONTAINING MATERIALS EXCEED THREE (3) SQUARE FEET OR THREE (3) LINEAR FEET FOR THE ENTIRE PROJECT AREA AND DURATION.
- B. The Contractor is responsible for verifying quantities, conditions, and logistics in the field before bidding. Any questions about the scope or clarifications shall be obtained from the AOR prior to bidding. Any interpretations of the design documents shall only be made by the AOR.
- C. The General Contractor and licensed Asbestos Contractor are responsible for security to the work area(s) during any activities covered by this Section.
- D. Contractors and/or licensed Asbestos Contractors shall not move, disturb, displace or dispose of any assumed and/or confirmed asbestos containing ceiling tiles under this specification.
- E. Any process that disturbs asbestos containing materials (assumed or confirmed) shall be conducted by a licensed Asbestos Contractor as detailed in IDPH Asbestos Regulation 855.330.
- F. Contractor shall label bags and/or containers for asbestos waste with the following information:
 - 1. Generator Name
 - 2. Project Location
 - a. Contractor shall secure sample of label and retain as part of daily log/final report.
- G. The General Contractor and licensed Asbestos Contractor shall execute and provide to the MEC the required Waste Shipment Record (WSR) for any asbestos waste generated during Work provided under this specification. WSR shall be signed by the generator, transporter and landfill. All WSRs shall be returned to the Board within 30 days of transportation from the school building.
- H. Abatement Contractor shall submit to the MEC current IDPH Asbestos Contractor license and accreditation and items listed in Section 855.350 (d). All documents shall be provided to the MEC upon final acceptance of the work.

END OF SECTION 02 13 15

SECTION 02 41 16 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Demolition and removal of site improvements.
 - 2. Abandoning in-place or Removing below-grade construction.
 - 3. Disconnecting, capping or sealing, abandoning in-place, or removing site utilities.
 - 4. Salvaging items for reuse by Owner.

- B. Related Sections:

- 1. Division 01 Section "Summary" for use of the premises and phasing requirements.
 - 2. Division 01 Section "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
 - 3. Division 02 Section "Selective Structure Demolition" for partial demolition of buildings, structures, and site improvements.
 - 4. Division 23 Sections for demolishing or relocating site mechanical items.
 - 5. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 SUBMITTALS

- A. Qualification Data: For qualified demolition firm.
- B. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control and for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
 - 3. Shutoff and capping or re-routing of utility services.
- D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- E. Predemolition [Photographs] or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before the Work begins.
- F. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review and finalize protection requirements.
 - 4. Review procedures for noise control and dust control.
 - 5. Review procedures for protection of adjacent buildings.
 - 6. Review items to be salvaged and returned to Owner.

1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than 1 week's notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. On-site storage or sale of removed items or materials is not permitted.

1.8 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 31 Section "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations. Comply with Division 01 Section "Photographic Documentation."

3.2 PREPARATION

- A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. All Utility shutdowns must be scheduled in advance so as not to interfere with University operations. The University must be notified at least two (2) weeks prior to removal of any work connected to utilities so that arrangements can be made for proper disconnection of such utilities. The locations of all known gas lines, underground telephone cables, underground electrical cables and conduit, water lines, chilled water lines, sanitary and storm sewer lines, and steam lines must be marked before performing any work.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 3. Arrange to shut off indicated utilities with utility companies.
 - 4. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 5. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- C. Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 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 storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least 1 weeks' notice to occupants of affected buildings if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 01 Section "Temporary Facilities And Controls."
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.

2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain adequate ventilation when using cutting torches.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.
- B. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet outside footprint indicated for new construction. Abandon utilities outside this area.
1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Division 31 Section "Earth Moving."
 2. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 3. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.
- C. 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.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 31 Section "Earth Moving."
- C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Division 01 Section "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

END OF SECTION 02 41 16

SECTION 02 41 18 - PAVEMENT REMOVAL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing labor, material, equipment and services necessary for pavements, sidewalk, curb, and base removal and disposal of materials as shown on the Drawings and as required in this Specification Section.
- B. Related Work Specified In Other Sections Includes, But is Not Limited to, the Following:
 - 1. Section 01 11 00 - Summary of Work
 - 2. Section 31 20 00 - Earth Moving
 - 3. Section 32 12 00 - Asphalt Paving
 - 4. Section 32 13 00 - Concrete Paving
 - 5. IDOT Standard Specifications for Road and Bridge Construction, Latest Edition. "Standard Specifications". This work shall be performed in accordance with the applicable portions of the Standard Specifications, Sections 440". Articles of the Standard Specifications covering "Method of Measurement" and "Basis of Payment" are not applicable.
- C. Special Requirements:
 - 1. Protection: Provide protection barricades, maintain all lights and signals and other measures as required by federal, state, and municipal laws, for the full period of demolition operations and remove same when directed. In removing Work, perform all Work required to protect and maintain adjacent property, streets, alleys, sidewalks, curbs, and other structures remaining in place.

1.2 REFERENCES

- A. Chicago Department of Transportation, Regulations for Openings, Construction and Repair in the Public Way, latest edition.

1.3 SUBMITTALS

- A. Submit for review by the Owner, pre-construction photographs or videotape showing existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by construction operations. Submit before demolition begins.
- B. Submit for review by the Owner, the temporary protective Work plan in accordance with this Specification Section.

1.4 PROJECT CONDITIONS

- A. Demolitions shall be coordinated with all trades and project phasing.

- B. Conduct site-clearing operations to ensure minimum interface 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 Owner.
- C. Provide protections necessary to prevent damage to existing improvements, including City property. Restore any damaged improvements to their original condition.

1.5 EXISTING SERVICES

- A. The indicated locations shown on the drawings are approximate from the best available record drawings. Exact locations shall be determined in the field prior to commencing the work.
- B. Notify, in advance, any affected Utility Company for approval. Arrange and pay from disconnecting, removing, capping and plugging utility services.
- C. Place markers to indicate the location of disconnected services and identify on the Record Documents.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Backfill materials shall be in accordance with Specification Section 31 20 00 – Earth Moving.

PART 3 EXECUTION

3.1 GENERAL

- A. All exposed surfaces of concrete or bituminous concrete to be cut with pavement saw prior to breaking, ensuring that a straight joint is sawed.
- B. Removal of the pavement is inclusive of the aggregate subbase, which consists of aggregate, black sand and cinders.
- C. Equipment and methods for removing pavement or curbs will be such as to prevent cracking, shattering or spalling of the pavement remaining in place.
- D. The bottoms of all excavations must be properly leveled and all loose materials removed from excavations. All wood, timber and organic materials that are exposed at the bottom of all excavations, to be removed and the area backfilled per Specification Section 31 20 00 – Earth Moving.
- E. On completion of the demolition Work, excavation Work and before acceptance by the Owner, clean the areas affected, including areas outside the limits of the Work area where permission to Work has been granted. Remove surplus construction material or debris resulting from the demolition Work and excavation work, and dispose of legally off the site.

END OF SECTION 02 41 18

SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected site elements.
 - 2. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for use of premises.
 - 2. Division 01 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition operations.
 - 3. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 4. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
 - 5. Division 01 Section "Construction Waste Management and Disposal" for disposal of demolished materials.
 - 6. Division 02 Section "Structure Demolition" for demolition of entire buildings, structures, and site improvements.
 - 7. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and 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 SUBMITTALS

- A. Qualification Data: For demolition firm.
- B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
- C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- D. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

1.5 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. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 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 and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 4. Review areas where existing construction is to remain and requires protection.

1.6 PROJECT CONDITIONS

- A. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- B. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

- C. Storage or sale of removed items or materials on-site is not permitted.
- D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.
 - 1. Comply with requirements specified in Division 01 Section "Photographic Documentation."
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Under the direction of Facilities Management, locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished. If utility services are required to be removed, relocated, or abandoned, before proceeding with building demolition provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures. Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. All Utility shutdowns must be scheduled in advance so as not to interfere with University operations. The University must be notified at least two (2) weeks prior to removal of any work connected to

utilities so that arrangements can be made for proper disconnection of such utilities. The locations of all known gas lines, underground telephone cables, underground electrical cables and conduit, water lines, chilled water lines, sanitary and storm sewer lines, and steam lines must be marked before performing any work.

2. Owner will arrange to shut off indicated services/systems when requested by Contractor.
3. Arrange to shut off indicated utilities with utility companies.
4. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
5. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
6. Existing valve boxes and manholes should be protected so they will not be crushed, buried with earth or covered with construction material and made inaccessible.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain 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.

B. Removed and Salvaged Items:

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

C. Removed and Reinstalled Items:

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.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

- B. 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.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- E. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

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

3.8 SELECTIVE DEMOLITION SCHEDULE

- A. Existing Items to Be Removed and Reinstalled: Existing revenue booth building shall be removed and reinstalled on new concrete pads, as shown on the plans.

END OF SECTION 02 41 19

SECTION 02 82 13 - ASBESTOS ABATEMENT - PRIOR TO DEMOLITION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. These environmental requirements apply to all Board projects. These specifications apply for all demolition, construction and renovation projects that require the removal and disposal of asbestos containing materials prior to the demolition of a building in accordance with all applicable regulations.

1.02 PROJECT CONDITIONS

- A. Asbestos abatement work prior to demolition is required to follow all applicable Local, State and Federal regulations. This specification is intended to provide for the removal of friable and Category I and II non-friable asbestos-containing materials prior to a structural demolition. Abatement of these items is specified in the specifications. When only a portion of the structure is being demolished, related paragraphs in Division 02 Section "Interior Abatement - Interior" may be referenced or included for barrier walls or related ACM in the areas to remain.

1.03 DEFINITIONS

- A. In addition to the terms listed below, all definitions in the laws and regulations specified elsewhere in the specifications are incorporated by reference, whether or not restated herein.
- B. Abatement Contractor (AC): the entity responsible for performing the work in the specifications and has the training and accreditation to competently perform the work. This entity shall obtain and maintain licenses required for the indoor work in the specifications.
- C. ACM: Asbestos Containing Material.
- D. Architect of Record (AOR): any person or firm employed by the Board for the purpose of designing the project.
- E. Asbestos Abatement Supervisor (Supervisor): any person who supervises asbestos abatement workers. This person must be trained, accredited, and meet OSHA competent person criteria for asbestos abatement.
- F. Board: means the Owner of the property and the authority ordering the work specified herein.
- G. Board Representative: the entity responsible for overall project coordination and completion.
- H. CDPH: Chicago Department of Public Health.
- I. Competent person: one who is capable of identifying existing asbestos hazards 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 roofing materials (considered Class II work) who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor, or its equivalent.

- J. Contractor: the entity responsible for performing the complete scope of work in the documents. The Contractor may elect to self-perform or subcontract out any portion of the work.
 - K. Drawings: Any drawings and sketches referenced by Contract or incorporated into the Contract by a bulletin issued by the AOR or Change Order as the Work progresses
 - L. Managing Environmental Consultant (MEC): the entity with overall responsibility for the environmental aspects of the project, including design, organization, direction, and control as well as investigations, assessments and on-site supervision of project managers.
 - M. Environmental Project Manager (EPM) is the project manager selected by the MEC to perform environmental monitoring and act on behalf of the MEC for the Board on the project.
 - N. HEPA Filter: a High Efficiency Particulate Air filter capable of trapping 99.97% percent of particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.
 - O. IDPH: the Illinois Department of Public Health.
 - P. OSHA: the federal Occupational Health and Safety Administration.
 - Q. Plasticize: to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.
 - R. Personal Protection Equipment (PPE): the protective suits, head and foot covers, gloves, respirators and other items used to protect persons from asbestos or other hazards.
 - S. RCRA: the Resource Conservation and Recovery Act and associated regulations.
 - T. SDS: Safety Data Sheets, required by OSHA for any chemical in the workplace that that could be expected to cause an exposure to workers during normal use or in emergency situations.
 - U. TCLP: the Toxicity Characteristic Leaching Procedure as specified in EPA 530/SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods 3rd edition, November 1986.
 - V. User: means the entity for which or on whose behalf the Board has undertaken to cause the Work to be performed.
 - W. Work: the obligations of the Contractor under the Contract Documents. Work includes, unless specifically excepted by the Contract Documents, the furnishing of all materials, labor, equipment, supplies, plant, tools, scaffolding, transportation, superintendence, permits, inspections, occupancy approvals, insurance, taxes, and all other services, facilities and expenses necessary for the full performance and completion of the requirements of the Contract Documents. Work also means that which is furnished, produced, constructed, or built pursuant to the Contract Documents.
 - X. Work Area: the area or areas where asbestos abatement is being conducted.
- 1.04 SCOPE OF WORK.
- A. Refer to Contract Drawings and Hazardous Material Assessment Report.
 - B. The Work includes all labor, equipment, materials, and supplies necessary to perform the scope of work in the documents by the procedures described herein. The Contractor, by submitting a bid for the Work,

represents itself as knowledgeable and expert in the performance of the Work, and includes all things usually and customarily necessary to provide a complete and finished job, whether specifically mentioned or not.

- C. Removal of friable and non-friable asbestos-containing materials listed in the documents, including isolating the Work Areas, protection of adjacent areas, cleanup, proper packaging and disposal of wastes, and all other steps necessary to complete the scope of work.
- D. Repair or replacement of damaged surfaces, fixtures, or furnishings in portions of the structure that will not be demolished, if any, to restore them to their pre-existing condition to the satisfaction of the Board Representative.
- E. Compliance with all applicable laws, regulations, standards, and these specifications. In the case of a conflict, the Contractor shall comply with the most stringent.
- F. All licenses, accreditations, permits, fees, notifications, reports, or other documents required by law, regulation, this specification, or the documents.
- G. Provide project closeout documentation to the EPM within thirty (30) days after final clearance. This documentation shall include, but is not limited to submittals requirements specified elsewhere in the specifications.

1.05 LAWS, REGULATIONS AND STANDARDS

- A. The following laws, regulations, and standards are incorporated by reference:
 - 1. 29 CFR 1910: US OSHA General Industry Standards
 - 2. 29 CFR 1926: US OSHA Construction Standards
 - 3. 29 CFR 1926.1101: US OSHA Asbestos Construction Standards
 - 4. 40 CFR Part 61: US EPA National Emissions Standards for Hazardous Air Pollutants (NESHAP), 11/90 revision
 - 5. 40 CFR 763 Subpart E, US EPA Asbestos Model Accreditation Plan (MAP): Appendix C - Interim Final Rule
 - 6. 11-4-2170: Chicago Building Code - Demolition and renovation safeguards
 - 7. 11-4-2150: Environmental standards related to the demolition, renovation, asbestos abatement and maintenance, sandblasting, chemical washing, and grinding of buildings, facilities and other structures.

1.06 ASSESSMENT, MONITORING, TESTING AND ANALYSIS

- A. The MEC will perform inspection, testing and design services prior to the start of work, and monitoring during the project and upon its completion:
 - 1. Prior to the start of work, the MEC shall:
 - a. Verify the Board has notified the appropriate regulatory agencies of the decommissioning of school building(s).
 - b. Identify suspect materials and confirm their asbestos content through review of the school's management plan or by testing.
 - c. Design the project and address any design changes as requested. EPM and Air Sampling Professional changes shall be submitted to the IDPH.
 - d. Collect background air samples before conditions are disturbed. Background samples shall be analyzed by PCM.
 - e. During the work, the MEC shall:

- 1) Observe the work with sufficient frequency to ensure contractor compliance with the specifications.
 - 2) Assure that all personnel and visitors have the proper current medical screening, respirator fit test, and training for their respective duties prior to entering a regulated area.
 - 3) Collect air samples in and around the Work Area, as needed, to verify exposure conditions.
 - 4) The MEC may stop the work if airborne asbestos concentrations at the Work Area perimeter exceed 0.01 f/cc. Contractor shall be responsible for taking corrective action to reduce exposure levels and prevent recurrence, and cleaning adjacent areas that become contaminated by the asbestos abatement activities.
- f. Upon completion of the work, the MEC shall:
 - 1) Visually inspect for visible debris. Contractor shall be required to re-clean the area or portions of areas until no visible debris remains.
 - 2) Conduct final clearance testing as required.
 - 3) Prepare the project report.
- B. The Contractor shall provide OSHA compliance air monitoring to determine exposures to its employees in accordance with OSHA 29 CFR 1926.1101. Frequency of testing shall comply with OSHA requirements for the anticipated and actual exposure levels.
 1. A written Exposure Assessment may be provided prior to the start of the work to determine the requirements for respiratory protection and frequency of OSHA monitoring for each type of activity. The contractor should note that a Negative Exposure Assessment (NEA) may be possible for many tasks.
 2. Analysis may be performed on site.
- C. Credentials required for testing and analysis of PCM air samples:
 1. Accreditation by AIHA or AAR; or
 2. Participation in the Proficiency Analytical Testing (PAT) program.
 3. Certification of individual qualification to read samples on site when on site analysis is conducted.

1.07 SUBMITTALS

- A. THE FOLLOWING SHALL BE SUBMITTED TO THE MEC NO LESS THAN 10 DAYS PRIOR TO THE START OF THE ASBESTOS ABATEMENT ACTIVITIES.
- B. Ten (10) day NESHAP notification to the Illinois EPA when the asbestos quantities reach or exceed 260 linear feet or 160 square feet. Two (2) day IDPH notification for asbestos abatement quantities less than 260 linear feet or 160 square feet. Submit ten (10) day notification to CDPH for all asbestos work.
 1. Ten (10) day IEPA Asbestos Notification on revised form, including inspector license number and landfill permit number.
 2. Evidence that all contractor employees in the Work Areas are trained and accredited in accordance with OSHA, NESHAP, and EPA MAP requirements:
 - a. Current Annual refresher training certificate.
 - b. Current IDPH asbestos license (optional, in lieu of initial training certificate).
 - c. Current physicians written opinion.
 - d. Current respirator fit test for negative pressure respirators when respirators are used.
 - e. Copy of OSHA exposure assessment, if available.
 - f. OSHA compliance air monitoring records generated during the project.
 - g. Waste shipment records.
 - h. Worker license and certification log.

- i. Safety Data Sheets (SDS) for chemicals used on site.
 - j. Work plan and schedule.
- C. Prior to beginning work, the AC shall submit required notifications to applicable regulatory agencies and receive an Owners Authorization and Notice to Occupants from the Board for buildings where asbestos abatement will take place. The AC shall provide copies of all regulatory notices to the Board's Representative, the MEC, and the EPM within 24 hours of sending such notices to the regulatory authority. The AC shall not begin a project until such notices are provided to the Board and the EPM.

PART 2 - PRODUCTS

2.01 TOOLS AND EQUIPMENT

- A. All tools and equipment shall at least conform to minimum industry standards and IDPH regulations.
- B. Equipment:
 - 1. Negative Air Machines shall provide HEPA filtration and conform to ANSI Z9.2 fabrication criteria.
 - 2. Respirators shall be NIOSH approved for use with lead, asbestos, or other contaminants anticipated in the Work.
 - 3. Contractor is fully responsible for complying with OSHA rules for other safety equipment, such as hard hats, safety harnesses, eye protection, gloves, footwear, and any other safety devices used on the site.
 - 4. Pressure differential manometer with readable tape shall be provided by the Contractor including calibration documentation.
- C. Tools:
 - 1. Shovels and scoops shall be rubber or plastic, suitable for use in plasticized containment. Metal shovels are not permitted.
 - 2. Scrapers, brushes, utility knives and other hand tools shall be of good quality and suitable for the intended uses. The Contractor shall keep an ample supply on hand for the completion of the Work.
 - 3. Power tools such as, but not limited to saws, pneumatic chisels, brushes, sanders, and needle guns shall be equipped with shrouds and HEPA-filtered local exhaust systems to capture released particles.

2.02 MATERIALS

- A. All materials shall at least conform to minimum industry standards and IDPH regulations.
- B. Abatement materials:
 - 1. Fire-retardant, poly sheeting for all applications shall be 6 mil nominal thickness for critical seals, floors, ceilings and drop cloths, and 4 mil for walls.
 - 2. Tape shall be 2" or 3" duct tape or other waterproof tape suitable for joining poly seams and attaching poly sheeting to surfaces.
 - 3. Spray adhesives shall be non-flammable and free of methylene chloride solvents.
 - 4. Disposal bags shall be 6 mil.
 - 5. Disposable suits, hoods, and foot coverings shall be TYVEK or similar.
 - 6. Solvents shall be compatible with any primers, mastics, adhesives, paints, coatings, or other surfacing materials to be installed following their use.

PART 3 - EXECUTION

3.01 EMPLOYEE TRAINING, QUALIFICATION AND MEDICAL SCREENING

- A. Supervisors and Workers shall be trained, accredited, and licensed in accordance with IDPH rules.
 - 1. Contractor shall keep copies of licenses, initial training course certificate, and most recent annual refresher training certificate at the jobsite at all times for all contractor personnel.
 - 2. A Supervisor (competent person) shall be present at the worksite at all times when work under the specifications is being conducted.
- B. Medical Screening. All contractor personnel shall have a current medical examination in accordance with OSHA requirements. Copies of the Physician's Written Opinions shall be kept on site.

3.02 PERMISSIBLE EXPOSURE LIMITS

- A. The OSHA Permissible Exposure Limit (PEL) for worker exposure to airborne asbestos is 0.1 f/cc as an 8-hour time-weighted average (TWA).
- B. The OSHA short term excursion limit for worker exposure to airborne asbestos is 1.0 f/cc for a 30 minute sample.

3.03 EXPOSURE ASSESSMENT AND MONITORING

- A. The Contractor shall make a written assessment of the potential airborne asbestos fiber exposures for this project. Assessments shall conform with OSHA requirements and may be based upon:
 - 1. Initial monitoring of representative workers who the contractor believes are exposed to the greatest airborne concentrations of asbestos, or
 - 2. Past monitoring (within the past 12 months) or objective data for conditions closely resembling the processes, type of material, control methods, work practices and environmental conditions to be used for this project.
- B. The Contractor shall perform personal monitoring in accordance with the following requirements:
 - 1. Initially, to establish an exposure assessment when past monitoring or objective data are not available for an initial determination.
 - 2. Periodically if the exposures are, or are expected to be, below the PEL.
 - 3. Daily, if exposures are above the PEL.
 - 4. Whenever there has been a change of equipment, process, control, personnel, or a new task has been initiated that may affect employee exposures, the exposure assessment shall be updated, and monitoring shall be re-instituted if exposures are unknown or are expected to exceed the PEL.

3.04 RESPIRATORY PROTECTION

- A. Respiratory protection shall be worn in accordance with all applicable regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications.

3.05 HYGIENE PRACTICES

- A. Eating, drinking, smoking, chewing gum or tobacco, and applying of cosmetics are not allowed in the Work Area.

- B. All persons entering the Work Area are required to wear appropriate PPE, and follow the entry and exit procedures posted in the Personnel Decontamination Enclosure System.
- C. Personal Protection Equipment (PPE) is required when airborne exposures are, or are expected to be above the PEL, or as needed to protect the safety of personnel and visitors. PPE may include:
 - 1. Full body disposable suits, headgear, and footwear.
 - 2. Gloves.
 - 3. Hardhats.
 - 4. Non-disposable footwear and clothing shall remain in the Work Area and shall be disposed of as contaminated waste when the job is completed.
 - 5. Authorized visitors shall be provided with suitable PPE when PPE is required in the Work Area. The EPM shall assure that visitors have proper and current medical screening and fit test, and awareness training or other appropriate training.
 - 6. A Personnel Decontamination Facility is required when worker exposures are expected to exceed the PEL. The decontamination unit may be remotely located if not feasible to locate adjacent to the Work Area.
 - a. When a remote decon unit is used, personnel shall use a double-suiting procedure for traveling between the Work Area and the decon. Persons shall HEPA-vacuum the exterior of their disposable suits at the entry to the Work Area, put on a clean suit over the existing suit, and proceed to the decon unit for shower decontamination and change into street clothes.
 - 7. When exposures are below the PEL, protective disposable suits are recommended, but not required. To exit, persons shall HEPA-vacuum down clothing at the Work Area entry, and leave the Work Area. When disposable suits are used, they shall be HEPA-vacuumed, stripped off, and deposited in an asbestos disposal bag. Personnel may then leave the Work Area.

3.06 PROHIBITED ACTIVITIES

- A. Dry removal or dry sweeping, except:
 - 1. During freezing weather. In this case, temperature and weather conditions must be recorded at the start, during, and at the end of the shift.
 - 2. On roofs with 3:1 slope or greater. In this case, roofing shall be removed in an intact condition, as much as possible.
 - 3. For roofing areas of less than 25 square feet.
 - 4. When equipment damage or other hazard exists. In this case, written permission from IEPA is required prior to performing dry removal.
- B. Use of compressed air for cleaning.
- C. Use of high speed power tools not equipped with a HEPA-filtered local exhaust or water spray system.
- D. Removing respirators or other PPE in the Work Area.
- E. Contractor shall not salvage or recycle building materials unrelated to abatement scope of work.

3.07 WORK AREA ISOLATION AND PREPARATION

- A. General Preparation. Contractor shall:
 - 1. Post:

- a. Caution signs meeting the specifications of OSHA 29 CFR 1926.1101 (k)(6) at any location and approaches to a location where airborne concentrations of asbestos may exceed ambient background levels.
 - b. Decontamination and work procedures in equipment rooms and clean rooms.
 - c. EPA NESHAP asbestos rules (40 CFR Part 61, subparts A & M) in the clean room.
 - d. OSHA Asbestos Construction Standards (29 CFR 1926.1101) in the clean room.
 - e. List of telephone numbers in the clean room for:
 - 1) Local hospital and/or local emergency squad.
 - 2) School security office (if applicable).
 - 3) Owner representative reachable 24 hours per day.
 - 4) Contractor's headquarters.
 - 5) Architects or consultants directly involved in the project.
 - f. Secure the Work Area from entry by unauthorized persons.
2. Exterior Preparation:
- a. 6 mil plastic sheeting shall be placed over the ground, foundation, or other surfaces below the abatement area.
 - b. Unauthorized entry shall be prevented by using appropriate barriers, such as warning tape, fencing, or other suitable barriers.
 - c. Nearby air intakes, grilles, and other openings into the building interior areas not being demolished above, below, or besides the Work Area that could be exposed to airborne dust shall be closed or sealed off with poly and tape.
 - d. All electric power in the Work Area shall be protected with ground-fault circuit interrupters.

3.08 ABATEMENT PROCEDURES

A. General Removal Requirements:

1. Asbestos materials shall be wetted and kept wet during removal.
2. ACM shall be bagged or containerized as it is removed. Wastes shall not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it shall be lowered via covered, dust-tight chute, crane, hoist, or other means that prevent the wastes from being dropped or thrown.
3. Appropriate OSHA fall protection shall be provided when appropriate:
 - a. Scaffolding more than one section high shall be equipped with handrails and mid-rails designed to provide fall protection, or full-body safety harnesses shall be worn and tied off to a secure anchor point.
 - b. Workers in man-lifts shall wear full body harnesses and tie to the tie-off point provided on the man-lift basket whenever the basket is elevated from ground level.
 - c. Personal fall protection consisting of full body harnesses, lanyards, and OSHA-compliant lifelines, anchorage, and deceleration devices shall be provided whenever personnel are within 6 feet of an opening, hole, or edge where there is a risk of falling 6 feet or more.
4. Roofing:
 - a. General: Remove in an intact state to the extent feasible. ACM roof mastics, cements, underlayments, and flashings. Asbestos-containing shingles may occasionally break even when removed carefully. The fact that otherwise intact roofing materials become separated or broken does not by itself render them non-intact. However, if they become pulverized, reduced to powder or dust, they have become non-intact.
 - 1) The Contractor shall take care to minimize the amount of roofing material damage.
 - 2) If the materials are rendered non-intact, the AC shall employ methods to contain the dust and debris and utilize hygiene practices appropriate for friable (OSHA Class I) ACM, including PPE, decontamination units, and monitoring. Monitoring may include

area samples at the Work Area perimeter to determine that airborne asbestos fibers are not being released in concentrations above the PEL.

- b. Built-up roofing and asphalt shingles:
 - 1) Power cutting machines shall be equipped with a HEPA-filtered dust collection system or shall be misted during use.
 - 2) Dust generated by the cutting operation shall be collected with HEPA vacuums or wet cleaning methods.
- c. Rigid roofing materials, such as cement asbestos shingles: remove intact and minimize breakage.
- 5. Transite, Galbestos sheeting (galvanized metal with a baked-on asbestos paint), Asbestos/Cement pipe, or other rigid panels shall be removed using wet methods.
- 6. Other:
 - a. Coatings, electric cable insulation or joint coverings, and other miscellaneous materials that are to be removed with the substrate or that can be removed without becoming friable may be removed as intact (OSHA Class II, EPA NESHAP Category I or II non-friable) in accordance with procedures described in General Removal Requirements and Roofing paragraphs above.
 - b. Coatings, and other miscellaneous materials that must be removed from the substrate or that otherwise shall become friable must be removed as non-intact (OSHA Class I, EPA NESHAP friable) in accordance with procedures described in General Removal Requirements and Roofing paragraphs above.

3.09 CLEANING AND DECONTAMINATION

- A. All visible accumulations of ACM, debris, tools, and unnecessary equipment shall be removed from the Work Area.
- B. Protective poly shall be folded in on itself, rolled up, placed in asbestos disposal bags, and disposed as asbestos waste.
- C. Surfaces which have been exposed to friable ACM or its dust shall be HEPA vacuumed.
- D. Dry sweeping of surfaces that have been exposed to friable ACM or its dust is not permitted.

3.10 FINAL CLEARANCE

- A. Cleaning may be discontinued when there is no visible debris and area air monitoring results verify that exposures are below the PEL.
- B. Final (aggressive) clearance sampling will be conducted by the EPM. Each sample result, as determined by Phase Contrast Microscopy, shall be less than or equal to 0.01 f/cc. If the sampling results indicate a concentration of airborne fibers in excess of this clearance criteria, the contractor shall re-clean the contained and/or regulated area. The Contractor shall not be released until the contained and/or regulated Work Area meets the clearance criteria.

3.11 WASTE DISPOSAL AND EQUIPMENT LOAD-OUT

- A. Category I and II non-friable waste may be adequately wetted and loaded in bulk into lined receptacles, such as dumpsters or trailers. Receptacles shall be closeable and lockable to provide security and to prevent air emissions. It is the abatement contractor's responsibility to determine and provide for more stringent manifesting or packaging requirements that may be imposed by transporters or landfills.

- B. Packaged friable asbestos wastes:
1. Asbestos-containing wastes, including removed ACM and debris, poly, critical barrier materials, suits, respirator filters, vacuum HEPA filters, water filters, and other asbestos-containing items shall be properly packaged for disposal.
 2. Use 6 mil plastic bags with a gooseneck seal, drums, or other type of sealed container.
 3. Wrap large or irregular items in 6 mil poly sheeting and seal with tape.
 4. Sharp, jagged, or other items that may puncture poly shall be packaged in rigid impermeable containers such as drums or boxes, or wrapped in burlap or other protective covering before sealing in bags or poly sheeting.
 5. Label containers for friable ACM waste:
 - a. OSHA warning label.
 - b. DOT performance-oriented hazardous material label.
 - c. Name and address of generator and abatement location.
 6. Removing items from the Work Area:
 - a. Packaged asbestos wastes shall be HEPA-vacuumed before removing from the Work Area.
 7. Storage of packaged asbestos wastes shall be in a completely enclosed dumpster, or other suitable container that can be secured. The secured area shall be kept locked at all times to prevent unauthorized access.
 8. Shipment of items from the project:
 - a. Decontaminated tools and equipment may be shipped by normal carrier to warehouse, another jobsite, or other destination.
 - b. For asbestos wastes:
 - 1) Line shipping container with 6 mil poly prior to loading packaged friable asbestos wastes.
 - 2) Post NESHAP placards during loading of friable asbestos wastes.
 - 3) Execute the NESHAP-required Waste Shipment Record (WSR) to be signed by the generator, transporter, and landfill. All WSRs shall be returned to the MEC within 30 days of shipment.
 - 4) Only landfills approved and permitted for accepting asbestos wastes may be used for disposal.

END OF SECTION 02 82 13

SECTION 02 83 19 - LEAD-BASED PAINT ABATEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. These environmental requirements apply to all Board projects. These specifications apply for all demolition, construction and renovation projects that require removal and disposal of lead based paint in accordance with all applicable regulations.
- B. The Illinois Department of Public Health regulations apply to all facilities occupied by children 6 years old or younger. The Chicago Department of Public Health inspects for, and regulates, lead contamination in all Board facilities. Abatement of all interior and exterior lead-bearing substances is covered by these specifications.

1.02 DEFINITIONS

- A. In addition to the terms listed below, all definitions in the laws and regulations specified elsewhere in this Section are incorporated by reference, whether or not restated herein.
- B. Abatement Contractor (AC): the entity responsible for performing the Work in this Section, with the training and accreditation to competently perform the work. This entity shall obtain and maintain any licenses required for the Work in this Section.
- C. Architect of Record (AOR): any person or firm employed by the Board for the purpose of designing the project.
- D. Board: the Owner of the property and the authority ordering the Work specified herein.
- E. Board Representative: the entity responsible for overall project coordination and completion.
- F. CDPH: the Chicago Department of Public Health.
- G. Contractor: the entity responsible for performing the complete scope of work in the Documents. The Contractor may elect to self-perform or subcontract out any portion of the work.
- H. Competent person: one who is capable of identifying existing lead hazards in the workplace and selecting the appropriate control strategy for lead exposure, who has the authority to take prompt corrective measures to eliminate them, who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan for supervisor, or its equivalent.
- I. Drawings: drawings and sketches identified in the Contract or incorporated by a bulletin issued by the Architect or Change Order as the Work progresses
- J. Environmental Project Manager (EPM): the person selected by the Environmental Consultant to perform environmental monitoring and act on behalf of the Board on the project.
- K. HEPA Filter: a High Efficiency Particulate Air filter capable of trapping 99.97% percent of particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.
- L. IDPH: the Illinois Department of Public Health.

- M. Lead Abatement Contractor/Supervisor (supervisor): any person who supervises lead abatement workers. This person must be trained, accredited, and licensed as required, and must also meet OSHA “competent person” criteria for lead abatement.
- N. Lead-Based Paint: paints or coatings that are lead bearing substances as defined by IDPH regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications.
- O. Lead Bearing Soil: soil containing an amount of lead in excess of applicable guidelines.
- P. Lead Bearing Substance: any dust on surfaces or furniture or other non-permanent items and any paint or other surface coating material as defined by IDPH regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications.
- Q. Managing Environmental Consultant (MEC): the entity with overall responsibility for the environmental aspects of the project, including design, organization, direction, oversight and control as well as investigations, assessments, and supervision of project manager.
- R. OSHA: the federal Occupational Health and Safety Administration.
- S. Plasticize: to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.
- T. RCRA: the Resource Conservation and Recovery Act and associated regulations as referenced in Laws, Regulations and Standards specified elsewhere in the specifications.
- U. SDS: Safety Data Sheets, required by OSHA for any chemical in the workplace that that could be expected to cause an exposure to workers during normal use or in emergency situations.
- V. TCLP: the Toxicity Characteristic Leaching Procedure as specified in EPA 530/SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods 3rd edition, November 1986
- W. User or User Agency: means the entity for which or on whose behalf the Board has undertaken to cause the Work to be performed.
- X. Wet Cleaning: cleaning all surfaces with a phosphate-free lead dissolving detergent.
- Y. Work: the obligations of the Contractor under the Contract Documents. Work includes, unless specifically excepted by the Contract Documents, the furnishing of all materials, labor, equipment, supplies, plant, tools, scaffolding, transportation, superintendence, permits, inspections, occupancy approvals, insurance, taxes, and all other services, facilities and expenses necessary for the full performance and completion of the requirements of the Contract Documents. Work also means that which is furnished, produced, constructed, or built pursuant to the Contract Documents.
- Z. Work Area: areas where lead abatement activities are conducted.
- AA. AWork Site: the room or rooms undergoing lead abatement activities. All closets/book rooms/coat hanger rooms/vestibules/washrooms within a room are considered part of the Work Site in which abatement work has been identified on the Drawings, whether or not they are numbered separately.

1.03 SCOPE OF WORK

- A. The work includes all labor, equipment, materials, and supplies necessary to perform the Scope of Work in the bid documents by the procedures described herein. The contractor, by submitting a bid for the work, represents itself as knowledgeable and expert in the performance of the work, and includes all things usually and customarily necessary to provide a complete and finished job, whether specifically mentioned or not.
- B. Clean-up of lead-bearing dust, flakes, and residues; abatement of paint, architectural components, substrates, or other lead-bearing items listed in the Bid documents including pre-cleaning, moving of furnishings, establishing regulated areas, isolating the Work Areas, protection of adjacent surfaces, containment when required, cleanup and decontamination to the specified clearance levels, proper packaging and disposal of wastes, and all other steps necessary to complete the scope of work.
- C. Repair or replacement of damaged surfaces, fixtures, or furnishings to restore them to their pre-existing condition to the satisfaction of the Board Representative, MEC and school engineer.
- D. When the Bid documents include lead and asbestos abatement items in the same spaces, they should be performed in the sequence and combinations that produce the most efficient results and the least amount of total waste. That sequence will generally be:
 - 1. Cleanup and removal of failed or delaminated friable asbestos-containing debris, if any.
 - 2. Cleanup of lead dust, flakes, chips, and residues. If these lead wastes are mixed with asbestos debris, they must be disposed together as regulated lead waste or asbestos waste depending on TCLP results.
 - 3. Removal of friable asbestos materials and cleanup of visible residues.
 - 4. Removal of architectural components with lead-based paint still adhered, such as wood trim, doors, plaster, drywall, window frames, etc.
 - 5. Removal of non-friable asbestos materials from the exterior. If both asbestos and lead are on the same components, for example lead paint and asbestos-containing glazing compound, the components may be removed and disposed as construction debris as long as both the lead- and asbestos-bearing materials remain intact.
 - 6. Removal of lead-based paint, coatings, or surfacing material.
 - 7. Final cleanup and decontamination of the work space. Final air clearance (asbestos) and wipe samples (lead) may be performed concurrently.
 - 8. When lead and asbestos work is combined, the more stringent regulations and procedures shall apply for both.
 - 9. Waste disposal:
 - a. Classified waste: loose paint flakes, chips, and dust; lead cleaning and decontamination supplies; combined final decontamination supplies; contaminated soil; disposable suits, gloves, head covers, and foot covers; respirator, vacuum, or negative air machine filters; or other items likely to fail a TCLP or RCRA test.
 - b. Special waste: asbestos-containing waste materials and lead-contaminated waste that has passed TCLP or other RCRA tests.
 - c. Construction and demolition (C&D) debris: lead-bearing architectural components; cleaned poly sheeting from lead projects; concrete and lumber without tile or mastic attached, demolition debris, and other general wastes.
 - d. All asbestos-containing or lead-bearing wastes shall be disposed in a facility permitted to accept asbestos-containing or lead-bearing waste materials.
- E. Compliance with all applicable laws, regulations, standards, and these specifications. In the case of a conflict, the contractor shall comply with the most stringent.

- F. All licenses, accreditations, permits, notifications, reports, or other documents required by law, regulation, this specification, or the Bid documents.

1.04 LAWS, REGULATIONS, AND STANDARDS

- A. PBC contractors shall maintain compliance with all applicable current laws, regulations, and standards including, but not limited to those listed below which are incorporated by reference:
 - 1. 410 ILCS 45: Illinois Lead Poisoning Prevention Act
 - 2. 7-4-110 & 7-4-120: Municipal Code of the City of Chicago
 - 3. 77IAC845: Illinois Lead Poisoning Prevention Code (Revision 8/1/2000)
 - 4. 29 CFR 1910: US OSHA General Industry Standards
 - 5. 29 CFR 1926: US OSHA Construction Standards
 - 6. HUD Guidelines: Lead Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, except Chapter Seven (1995); Chapter 7 of the Guidelines, Lead Based Paint Inspection (Revised, 1997)
 - 7. 40 CFR Part 61: US EPA National Emissions Standards for Hazardous Air Pollutants (NESHAP)
 - 8. 40 CFR Part 261: Identification and Listing of Hazardous Waste (Resource Conservation and Recovery Act, RCRA)
 - 9. 11-2-2190: Chicago Building Code- Sandblasting, grinding and chemical washing of buildings facilities or other structures; permit and notification requirements; performance standards for lead paint abatement, and disposal of debris.
 - 10. 11-4-2170 Chicago Building Code- Demolition and Renovation Safeguards.
 - 11. 40 CFR 245: Lead Renovation, Repair and Painting.
- B. Regulatory changes shall be incorporated into this specification on their effective date. Contractors shall reflect these changes into ongoing projects without any additional notice or cost to the Board.

1.05 ASSESSMENT, MONITORING, TESTING, AND ANALYSIS

- A. The MEC will perform inspection, testing, and monitoring services during the work and upon its completion:
 - 1. Testing of coatings, soils, dust, and debris to determine the presence of lead or other hazardous substances.
 - 2. Area air monitoring during the work to determine the airborne concentrations of lead inside and outside of the Work Area. The EPM shall stop the Work if airborne lead concentrations outside the Work Area exceed the OSHA Action Level of 30 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$) as an 8-hour time-weighted average. The Work may re-start when the source of lead release has been identified and resolved, and corrective measures have been instituted to prevent recurrence.
- B. The Abatement Contractor shall perform:
 - 1. An Exposure Assessment prior to the start of the Work to determine the requirements for respiratory protection and frequency of OSHA monitoring for each type of activity.
 - 2. Perform OSHA compliance air monitoring to determine exposures to its employees in accordance with Laws, Regulations and Standards specified elsewhere in the specifications.
- C. Credentials required for analysis of lead:
 - 1. Accreditation by AIHA or AALA; or
 - 2. Participation in the Environmental Lead Proficiency Analytical Testing (ELPAT) program or Environmental Lead Laboratory Accreditation Program (ELLAP); or
 - 3. Participation in the Proficiency in Analytical Testing (PAT) for metals analysis.

1.06 SUBMITTALS

- A. The Abatement Contractor (AC) shall submit the following information to the EPM:
 - 1. Written notification to Illinois Department of Public Health.
 - 2. Written Notification to CDPH.
 - 3. Evidence that all contractor employees in the Work Areas are licensed, trained and accredited in accordance with OSHA, NESHAP, and EPA MAP requirements:
 - a. Current refresher training certificate.
 - b. Current IDPH lead license
 - c. Current physician's written opinion
 - d. Current respirator fit test data.
 - 4. Copy of OSHA Exposure Assessment, if available.
 - 5. OSHA compliance air monitoring records generated during the project.
 - 6. Waste Shipment Records.
 - 7. Worker license and certification log.
 - 8. Safety Data Sheets (SDS) for chemicals used on site.
 - 9. Work Plan and Schedule.
 - 10. Laboratory or analyst credentials and proficiency certificates for contractor samples.
- B. Prior to beginning Work, the AC shall submit required notifications to applicable regulatory agencies and receive an Owners Authorization and Notice to Occupants from the Board for buildings where lead abatement will take place. The AC shall provide copies of all regulatory notices to the Board Representative, the MEC, and the EPM within 24 hours of sending such notices to the regulatory authority. The AC shall not begin a project until such notices are provided to the Board Representative.

1.07 RECORDKEEPING

- A. AC shall retain records for 6 years:
 - 1. Name and address of the contractor who performed the project.
 - 2. Location of the project.
 - 3. Summary of abatement techniques used.
 - 4. Location of the disposal site for lead-based substances removed from the Work site.
 - 5. Starting and completion dates of the lead abatement project.

PART 2 - PRODUCTS

2.01 TOOLS AND EQUIPMENT

- A. All equipment shall at least conform to minimum industry standards.
- B. Equipment:
 - 1. Negative Air Machines shall provide HEPA filtration and conform to ANSI Z9.2 fabrication criteria.
 - 2. The AC should ensure that respirators are NIOSH approved for use with lead, asbestos, or other contaminants anticipated in the Work.
 - 3. Contractor is fully responsible for complying with OSHA rules for other Safety equipment, such as hard hats, safety harnesses, eye protection, gloves, footwear, and any other safety devices used on the site.
- C. Tools:
 - 1. Shovels and scoops shall be suitable for use in a plasticized containment. Plastic or rubber models are preferred, but metal shovels are acceptable when used with care to prevent damage to poly

- sheeting and permanent surfaces. Appropriate tape may be applied to the leading edges to aid in poly damage prevention.
- 2. Scrapers, wire and bristle brushes, utility knives and other hand tools shall be of good quality and suitable for the intended uses. The contractor shall keep an ample supply on hand for the completion of the Work.
- 3. Power tools such as, but not limited to saws, pneumatic chisels, brushes, sanders, and needle guns shall be equipped with shrouds and HEPA-filtered local exhaust systems to capture released particles.

2.02 MATERIALS

- A. Installed materials which become a part of the Work such as, but not limited to, primers, paints, surfacing compounds, and other surface coverings or finishes shall be new unless specified otherwise, of good quality, non-lead-bearing, and shall conform to the respective reinstallation specification sections.
- B. Abatement materials:
 - 1. Poly sheeting for all applications shall be 6 mil nominal thickness for all applications.
 - 2. Tape shall be 2" or 3" tape suitable for joining poly seams and attaching poly sheeting to surfaces.
 - 3. Spray adhesives shall be non-flammable and free of methylene chloride solvents.
 - 4. Chemicals used for LBP removal and cleanup shall be free of methylene chloride solvents. The chemicals shall be low-odor and free of volatile compounds.
 - 5. Disposal bags shall be 6 mil where used for single-bagging, and minimum 4 mil where used for double-bagging.
 - 6. Disposable suits, hoods, and foot coverings shall be TYVEK or similar.
 - 7. Solvents shall be compatible with any primers, paints, coatings, or other surfacing materials to be installed following their use.
 - 8. Cleaning solutions shall cause lead to chelate, precipitate, or otherwise effectively release lead from surfaces. Cleaning solutions shall not leave residue on surfaces to be painted.

PART 3 - EXECUTION

3.01 EMPLOYEE TRAINING, QUALIFICATION AND MEDICAL SCREENING

- A. Supervisors and workers shall be trained, accredited, and licensed in accordance with IDPH rules.
 - 1. Contractor shall keep current, up-to-date copies of licenses at the job site at all times.
 - 2. A licensed supervisor (competent person) shall be present at the Work site at all times when Work under this Section is being conducted.
- B. Medical Screening shall be instituted for contractor's employees in accordance with regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications. Medical certificates shall be current.

3.02 PERMISSIBLE LIMITS

- A. Permissible Limits of lead in lead bearing substances. Substances with lead content below the following levels are not regulated and are not subject to the requirements of this Section:
 - 1. 5,000 parts per million (ppm), or 0.5% lead by weight in any substance. However, note that OSHA regulations apply to any operation that releases lead into the air in concentrations in excess of the action level of 30 µg/m³ (see Permissible Exposure Limits for contractor employees below), and the CDPH shall require remedial action when dust contains greater than 40 µg/sf (see sub-paragraph below) of surface area. Actions such as sandblasting, dry sanding, or other dry

aggressive abrasive disturbances can generate lead concentrations greater than either of these limits on substances with lower lead contents and, in such instances, shall be required to adhere to this specification, regardless of substance lead content.

2. 400 micrograms per gram ($\mu\text{g/g}$) of soil in high contact play areas.
3. 400 micrograms per gram ($\mu\text{g/g}$) of soil in other areas.
4. 40 micrograms per square foot ($\mu\text{g/sf}$) of surface area of dust on interior floors.
5. 200 micrograms per square foot ($\mu\text{g/sf}$) of surface area of dust on other surfaces.

B. Permissible Exposure Limits for contractor employees:

1. No person shall be exposed to a lead concentration in excess the regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications.
2. Where exposures exceed regulated levels, medical monitoring shall be instituted by the AC in accordance with the regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications.

3.03 EXPOSURE ASSESSMENT AND MONITORING

- A. The AC shall make an assessment of the exposures expected by the tasks to be used for the scope of work listed in the Bid documents. Assessment may be based upon:
1. Initial monitoring of representative workers who the contractor believes are exposed to the greatest airborne concentrations of lead, or
 2. Past monitoring (within the past 12 months) or objective data for conditions closely resembling the processes, type of material, control methods, Work practices and environmental conditions to be used for this document, or
 3. In the absence of an exposure assessment or monitoring, the contractor shall assume the following exposure conditions:
 - a. = 400 $\mu\text{g/m}^3$ for manual demolition of lead-bearing substances (i.e., drywall, other architectural components), manual scraping, manual sanding, heat gun use, and power tool cleaning with dust collection systems, or any other task where there is reason to believe an employee may be exposed to airborne lead.
 - b. = 2,500 $\mu\text{g/m}^3$ for lead burning, rivet busting, power tool cleaning without dust collection systems, cleanup of dry spent abrasives, or movement or removal of abrasive blasting enclosures.
 - c. > 2,500 $\mu\text{g/m}^3$ for abrasive blasting, welding, cutting, and torch burning.
- B. The contractor shall perform personal monitoring in accordance with the regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications.
- C. The contractor may be required to perform air monitoring outside the Work Area if there is observance of contamination escape from the Work Area (such as dust accumulation), or evidence of failure of control methods to contain the release of airborne lead particles.

3.04 RESPIRATORY PROTECTION

- A. Respiratory protection shall be worn in accordance with all applicable regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications.

3.05 HYGIENE PRACTICES

- A. Eating, drinking, smoking, and applying of cosmetics are not allowed in the Work site or area.

- B. A changing area and shower shall be provided for changing into and removing personal protective clothing and for showering or washing before leaving the Work Area. Any person leaving the Work site or Work Area shall rinse his or her mouth with potable water and wash hands and face thoroughly before eating drinking, or smoking. A portable lavatory facility, potable water supply, or portable decontamination unit shall be provided by the contractor for the washing of face and hands before any abatement activities are started. School lavatory facilities shall not be used.
- C. Equipment decontamination procedures shall be employed to prevent the spread of lead contamination. Disposable items shall not be reused and shall be disposed of properly.
- D. Personal Protection Equipment (PPE) shall include:
 - 1. Full body suits with hoods and shoe covers. Tyvek or similar disposable suits may be worn only once, and must be disposed in accordance with the Waste Disposal Article in the specifications.
 - 2. Appropriate PPE shall be used as required by regulations referenced in Laws, Regulations and Standards specified elsewhere in this Section and established industry practice.

3.06 PROHIBITED ACTIVITIES

- A. The following methods shall not be permitted:
 - 1. open flame burning
 - 2. dry-sanding
 - 3. uncontained hydro-blasting or sandblasting
 - 4. use of methylene chloride
 - 5. dry-scraping

3.07 WORK AREA ISOLATION AND PREPARATION

- A. General Preparation
 - 1. Post caution signs at all entrances and exits to the Work Area in accordance with OSHA rules:
 - a. at least 20" x 14"
 - b. date and location of the lead abatement project
 - c. Wording at least 2" high stating, "Caution, Lead Hazard, Do Not Remain in Work Area Unless Authorized"
 - 2. Secure the Work Area from entry by children, pregnant women, school staff or other unauthorized persons.
 - 3. Close off the Work Site from other portions of the building by closing doors tightly, taping shut when necessary, or with 6 mil poly z-flap curtains over doorways or entrances to the Work Site.
 - 4. At Work Area exit, provide walk-off pan, wet towel, or other means to prevent tracking lead contamination to other parts of the facility. A protective liner that is watertight shall be placed under the walk-off pan, wet towel, to prevent damage to the underlying surface.
- B. Interior Preparation
 - 1. Furniture, personal items, and other moveable objects in the Work Site shall be protected with 6 mil poly sheeting and sealed with tape, or moved from the Work Site and stored in a location designated by the MEC. Items shall be cleaned before being moved to another area to prevent cross-contamination.
 - 2. Turn off all forced air ventilation and seal exhaust and intake points in the Work Site.
 - 3. Turn off electrical circuits in the Work Area to isolate them from contact. Provide temporary power equipped with Ground-Fault Circuit Interrupter (GFCI) devices to prevent electric hazards in the wet working environments. Power cords must be in good condition, not spliced, not more than 100

- feet long, and shall be suspended off the floor and out of workers' way to protect the cords from damage. Cords must not be fastened with staples, hung from nails, or suspended with wire.
4. Seal the opening seams of all food storage units, such as cabinets or refrigerators, or cover with poly sheeting taped securely in place.
 5. Cover all objects that cannot be moved, such as radiators, stoves, cabinets, built-in furniture, bookcases, or other stationary items with 6 mil plastic sheeting taped securely in place.
 6. If required by the scope of work, remove all carpeting from the Work Site. Lightly mist with water prior to removal to prevent lead dust exposure. Carpeting shall be professionally cleaned or replaced, if required by scope of work.
 7. Cover and protect floors in the Work Site with 6 mil plastic sheeting, sealed with tape. Additional protection may be required to protect flooring materials from potential damages resulting from the /abatement processes. All additional protection shall be provided as needed to ensure that all building surfaces will be adequately protected during the /abatement processes and be included in the base bid.
 8. Establish a negative pressure system to prevent contaminated air from escaping from the Work Site to uncontaminated areas, and consisting of:
 - a. Negative air machines (NAMs) exhausted from the Work Site, and vented to the outside of the building whenever possible.
 - b. Provide sufficient number of NAMs to provide a negative pressure of 0.02" wc between the Work Area and adjacent spaces, and 4 air changes per hour. Assume NAMs operate at 80% of design capacity. At least one backup NAM shall be available per Work Site.
 - c. The negative air system shall remain in continuous operation until cleanup and clearance is achieved.

C. Exterior Preparation

1. 6 mil plastic sheeting shall be placed over the ground, foundation, or other surfaces adjacent to or below the abatement area.
2. Close or otherwise seal windows, grilles, intakes, or other nearby openings (above, below, or beside) that could be exposed to airborne dust from the work.
3. Sheeting shall extend out from the foundation 3 feet per story to be abated, with a minimum of 5 feet and a maximum of 20 feet. This sheeting shall remain in place until completion of final cleaning.
4. Sheeting shall be secured at the foundation and along all edges and seams.
5. When liquid waste is produced by any abatement method used, the edges of the plastic sheeting shall be raised a sufficient distance to contain the liquid waste.

3.08 LEAD ABATEMENT

A. General:

1. Unless otherwise specified in the Bid documents, lead-bearing substances listed in the Bid documents shall be removed by methods that minimize the generation of dust or debris.
2. Lead-based paint abatement practices shall be compatible with, and shall produce surfaces that are in conformance with Division 09.
3. Where existing lead-bearing substances may be disturbed by the installation of new work, they shall be removed sufficiently to prevent such disturbances.
4. Following any window dismantlement activity in the Work Area, the abatement contractor shall wet scrape the loose paint off the exposed window lintel and prepare, seal, prime and paint the lintel surface. If the lintel is to be replaced as required by the architect, the abatement contractor shall only remove all the loose paint and not repaint the lintel surface.

5. Where disturbances of lead-bearing substances produce dust, the dust must be assumed to contain lead until tested and proven otherwise. Dust suppression methods, such as misting with water and HEPA vacuums shall be used.
 6. Movement of lead-bearing wastes through unsecured school areas:
 - a. Wastes shall be contained in 6 mil impermeable (i.e. poly) bags.
 - b. Architectural components and other debris shall be wrapped in 6 mil plastic sheeting and sealed with tape.
 - c. Load-out only during non-school hours.
 - d. Dust and debris shall not be tracked or spilled outside the Work Site. In the event of spillage or tracking, contractor shall HEPA vacuum visible debris and wet wipe all affected areas with a non-TSP lead-dissolving detergent solution.
- B. Interior Abatement methods may include:
1. Removal and replacement of the component or surface.
 2. Wet scraping of lead-bearing material.
 3. Heat gun with operating temperatures not to exceed 700° F.
 4. Nonflammable chemical strippers shall not contain methylene chloride. This method is generally used with unique, irreplaceable, architecturally, or historically significant components. Chemical strippers shall be compatible with new paints, coverings, or coatings to be installed.
 5. Sander, needle gun, chipper, scarifier, or other mechanical paint removal system. All such power tools shall be equipped with a HEPA vacuum collection system.
 6. Enclosure with a durable material or coating that does not readily tear or peel, such as but not limited to, gypsum board; fiberglass mats; canvas-backed vinyl wall coverings; high pressure, laminated plastic sheet, such as Formica®, tile, vinyl flooring, paneling, plastic, metal, or wood. Enclosures shall only be used when specified in the Bid documents.
- C. Exterior abatement methods may include:
1. All methods listed under Interior Abatement.
 2. Vacuum-blasting.
 3. Contained hydro-blasting or sandblasting.
 4. When vacuum-blasting or contained hydro-blasting is used, window interiors shall be sealed with 6 mil plastic sheeting and secured with waterproof tape. All seals shall be checked every two (2) hours to assure integrity. Leaks shall be repaired immediately.
 5. Window replacement:
 - a. The room interior shall be sealed off and protected from dust entry. If windows are removed from the inside, the room must be fully protected in accordance with Work Area Isolation and Preparation "Interior Preparation" and "Exterior Preparation" specified elsewhere in Part 3. When windows are removed from the outside, protection must be in accordance Work Area Isolation and Preparation "Exterior Preparation" specified elsewhere in Part 3, including at least a seal over the wall immediately inside the window Work Area. In either case, the AC is responsible for preventing lead dust contamination of interior spaces.
 - b. Damaged lead-based paint must be removed from the wood window frame parts that will remain, both on the inside and on the outside. MEC will direct the AC whether to abate or mitigate undamaged lead-based paint from wood window frames or frame parts on a case by case basis.
 - c. Metal window replacements: The contractor is cautioned that high concentrations of lead dust and asbestos containing caulk have been found behind the window frame caps installed over the original lead-based painted frames during previous window replacements. Although a lead license is not required for non-LBP metal window removal, contractor must assume that he or she may encounter concentrated lead dust. When removing these caps,

the room interior shall be protected in accordance with Work Area Isolation and Preparation “Interior Preparation” specified elsewhere in Part 3.

- D. Soil Removal or Remediation:
1. Identify and eliminate the source of lead contamination if possible, to prevent re-contamination of remediated soil.
 2. Dust generation shall be held to a minimum and dust suppression methods shall be performed, such as misting with water during handling.
 3. Monitoring of airborne dust shall be performed by the MEC and shall not exceed acceptable levels.
 4. Soil that is stockpiled prior to disposal shall be:
 - a. placed on a layer of impermeable plastic;
 - b. kept moist to avoid dust generation; and
 - c. covered with impermeable plastic which is secured to the ground.
 5. Soil shall be subjected to a TCLP test to determine waste classification.
 6. Contaminated soil shall be transported to disposal facility in sealed containers or covered vehicles. Care shall be taken to prevent tracking of contaminated soil off-site by vehicular or foot traffic.
- E. Demolition. Structural demolition of buildings does not require removal of lead-bearing substances or lead-licensed contractors or workers. However, the following minimum requirements must be observed to prevent spread of lead contamination:
1. Close windows and seal doors of adjacent or nearby structures. Cover air intakes or other openings on facing walls or roof areas where dust could enter.
 2. Mist the demolition activities with water to suppress dust release.
 3. Remove and dispose of loose lead-based paint from substrate prior to demolition. Conduct waste characterization for proper disposal.
 4. Remove and dispose of loose lead-based paint from floors and horizontal surfaces. Conduct waste characterization for proper disposal.
 5. Do not spread debris outside the immediate demolition area.
 6. Do not allow foot or other traffic through the demolition area that may spread lead-bearing dust to other building areas.
 7. Pulverized painted components may generate lead dust that may require TCLP testing and waste characterization prior to disposal.

3.09 CLEANING AND DECONTAMINATION

- A. Interior Cleaning: includes any furniture, cabinets, or other item that was located in the Work Area during the lead-based paint /abatement activities.
1. Properly containerize and remove all lead wastes from the Work Site.
 2. HEPA vacuum all surfaces including woodwork, walls, windows, window wells, and floors.
 3. Wet clean all surfaces with a cleaning solution.
 4. Allow all surfaces to dry and HEPA vacuum any remaining visible residue.
- B. Exterior Cleaning:
1. Recover all visible debris from exterior areas.
 2. HEPA vacuum surfaces that have been abated, paying particular attention to horizontal surfaces, such as window sills, wells, mullions, ledges, etc., both in the abated area and on nearby windows and surfaces.

3.10 FINAL CLEARANCE

- A. A lead abatement Work Area shall be complete if lead dust levels on horizontal interior surfaces are below 40 micrograms per square foot ($\mu\text{g}/\text{sf}$) on floors or 200 micrograms per square foot ($\mu\text{g}/\text{sf}$) on other surfaces by the EPM. At least 3 wipe samples per contained Work Area shall be collected by the MEC from floors, window sills, countertops, tops of cabinets, or other representative surfaces.
- B. The contractor shall restore the Work Area to usable condition including reconnection of electrical, water and HVAC services, removal of barriers and contractor equipment, waste removal and disposal and returning furniture removed as required by Work Area Isolation and Preparation specified elsewhere in Part 3.

3.11 WASTE DISPOSAL

- A. All plaster, paint chips, lead dust, cleaning supplies, HEPA filters, vacuum contents and filters, disposable suits, and other concentrated lead-bearing waste shall be packed in at least two 6 mil plastic bags.
 - 1. Dispose of concentrated lead wastes separately from architectural components.
 - 2. Subject concentrated wastes to TCLP test to determine waste classification.
 - 3. Prepare a Waste Shipment Record, to be signed by the generator, shipper, and disposal site; to be returned to the generator within 45 days. IEPA and USEPA Generator I.D. numbers shall be provided by the Board.
- B. Architectural components, other items to which lead-based paint remains adhered, and cleaned plastic sheeting may be disposed of as common construction and demolition debris. Components shall be wrapped in 6 mil plastic sheeting and sealed with tape. Components shall be transported after school hours if carried through the building.
- C. All lead-bearing wastes shall be stored in covered, locked containers until transported off-site.
- D. Remove lead waste from the Work Site in accordance with RCRA and special waste disposal requirements.
- E. Transport all non-hazardous wastes in covered vehicles to an IEPA-approved landfill.
- F. Transport all hazardous wastes in covered vehicles to a hazardous waste landfill permitted to accept lead wastes.
- G. Wastes from the site shall not be mixed with wastes from other sites.

END OF SECTION 02 83 19

SECTION 02 86 13 - HAZARDOUS AND UNIVERSAL WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. These environmental requirements apply to all Board projects. These specifications apply for all demolition, construction and renovation projects that require the removal and disposal of hazardous and/or universal waste in accordance with all applicable regulations.
- B. This Section describes the segregation, packaging, labeling, transport, and disposal and/or recycling of hazardous and universal waste materials generated by demolition/renovation activities and the subsequent shipment of properly packaged and labeled waste materials to open, permitted and Owner-approved disposal sites.
- C. The Contractor's Work includes work area preparation, sampling and analysis, on-site handling, supervision of all Work, preparation of reports, protection of on-site persons, utilities, and property, and payment of all transport and disposal/recycling fees.

1.02 DEFINITIONS

- A. In addition to the terms listed below, all definitions in the laws and regulations specified elsewhere in the specifications are incorporated by reference, whether or not restated herein.
- B. Board: the Owner of the property and the authority ordering the Work specified herein.
- C. Board Representative: the entity responsible for overall project coordination and completion.
- D. Capacitor: device for accumulating and holding a charge of electricity and consisting of conducting surfaces separated by dielectric fluid.
- E. CFR: the Code of Federal Regulations, is the basic component of the Federal Register publication system. The CFR is a codification of the regulations of the various Federal Agencies.
- F. Chemical Waste Landfill: an open and approved landfill, permitted under 35 IAC Subtitle G Part 814 at which protection against risk of injury to health or the environment from migration of PCBs to land, water or the atmosphere is provided from PCBs and PCB items deposited therein by locating, engineering, and operating the landfill as specified in 40 CFR 1761.75.
- G. Component: all removable parts/materials which make up ballasts, bulbs, batteries, and other electrical equipment, a percentage of which can be recycled.
- H. Container: any portable device, in which material is sorted, transported, treated, disposed of, or otherwise handled.
- I. Contractor: the entity responsible for performing the complete scope of work in the Documents. The Contractor may elect to self-perform or subcontract out any portion of the work.
- J. Disposal: to intentionally or accidentally discard, throw away or otherwise complete or terminate the useful life of PCBs and PCB items. Disposal includes spills, leaks, and other uncontrolled discharges of PCBs as

well as actions related to containing, transporting, destroying, degrading, decontaminating, or confining PCBs and PCB items.

- K. Disposal Facility: a facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which waste will remain after closure.
- L. EPA Identification: the unique number assigned by the EPA to each generator or transporter of hazardous waste, and each treatment, storage or disposal facility.
- M. Fluorescent light ballast: a device that electrically controls fluorescent light fixtures and that includes a capacitor containing 0.1 kg or less of dielectric.
- N. Leak or Leaking means any instance in which PCB, chemical, hazardous or universal waste Article, Container or Equipment has any PCB, chemical, hazardous or universal waste residue on any portion of its external surface or surrounding area.
- O. Facility: all contiguous land, structures, other appurtenances, and improvements on the land, used for treating, storing or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units, e.g. one or more landfills, surface impoundments, or a combination of them.
- P. On-site: within the boundaries of a contiguous property unit.
- Q. OSHA: the federal Occupational Health and Safety Administration.
- R. Landfill: an open and permitted disposal facility or part of a facility where hazardous and special wastes are placed in or on land and which is not a land treatment facility, a surface impoundment, or a combination of them.
- S. Managing Environmental Consultant (MEC): the entity with overall responsibility for the environmental aspects of the project, including design, organization, direction, oversight and control as well as investigations, assessments, and supervision of project manager.
- T. Manifest: the shipping document, EPA form 7710-53, used for identifying the quantity, composition, origin, routing, and destination of hazardous waste during its transportation from the point of generation to the point of treatment, storage or disposal.
- U. Polychlorinated Biphenyls (PCBs): any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contains such substance.
- V. PCB Article Container: any package, can, bottle, bag, barrel, drum, tank, or other device that contains PCB Articles or PCB Equipment, and whose surface(s) has not been in direct contact with PCBs.
- W. PCB Container: any package, can bottle, bag, barrel, drum, tank, or other device that contains PCBs or PCB Articles and whose surface(s) has been in direct contact with PCBs.
- X. PCB Item: any PCB Article, PCB Article Container, PCB Container, or PCB Equipment, that deliberately or unintentionally contains or has as a part of it any PCB or PCBs.
- Y. Recover Refrigerant: to remove refrigerant in any condition from an appliance without necessarily testing or processing it in any way.

- Z. Recycle Refrigerant: to extract refrigerant from an appliance and clean refrigerant for reuse without meeting all of the requirements for reclamation. In general, recycled refrigerant is refrigerant that is cleaned using oil separation and single or multiple passes through devices such as replaceable-core filter-driers, which reduce moisture, acidity, and particulate matter.
- AA. AReclaim Refrigerant: to reprocess refrigerant to at least the purity specified in Air-Conditioning and Refrigeration Institute (ARI) Standard 700-1988, "Specification for Fluorocarbon refrigerants", and to verify this purity using the analytical methodology prescribed in the standard. In general reclamation involves the use of processes or procedures available only at the processing or manufacturing facility.
- BB. AStorage: the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, destroyed, disposed of or stored elsewhere.
- CC. ASDS: Safety Data Sheets, required by OSHA for any chemical in the workplace that that could be expected to cause an exposure to workers during normal use or in emergency situations.
- DD. AToxic Characteristic Leaching Procedure (TCLP): a laboratory test method to determine the mobility of both organic and inorganic compounds present in liquid, solid, and multiphasic wastes performed in accordance with test methods required under 40 CFR Part 261 and 268.
- EE. ATransporter: any person engaged in the off-site transportation of special waste and/or hazardous waste within the United States, by air, rail, highway or water, if such transportation requires a manifest under 40 CFR Part 262.

1.03 SCOPE OF WORK

- A. The work includes all labor, equipment, materials, and supplies necessary to perform the Scope of Work in the bid documents by the procedures described herein. The Contractor, by submitting a bid for the work, represents itself as knowledgeable and expert in the performance of the work, and includes all things usually and customarily necessary to provide a complete and finished job, whether specifically mentioned or not.

1.04 QUALITY ASSURANCE

- A. Work outlined in this Section must be performed by a qualified Contractor, with a minimum of 10 years' experience, who is thoroughly familiar with working with regulated waste materials of similar size and scope, the Contractor must be familiar with and capable of complying with all federal, state, and local regulatory requirements pertaining to waste handling.
- B. Medical Examinations: The Contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.134 and 29 CFR 1926.62. The examination will not be required if adequate records show that employees have been examined as required within the last year. The Contractor shall institute a medical surveillance program for all employees who are or may be exposed above the action level for more than 30 days per year.

1.05 LAWS, REGULATIONS, AND STANDARDS

- A. The Contractor shall assume full responsibility and liability for the compliance with all applicable federal, state, and local regulations pertaining to hazardous, special and universal waste management and disposal/recycling.

B. Federal Requirements:

1. Federal requirements which govern the management, hauling and disposal of hazardous, special and universal waste/recycled material include but are not limited to the following:
 - a. DOT: U. S. Department of Transportation, including but not limited to the following:
 - 1) Hazardous Substances, Title 49, Part 171 and 172 of the Code of Federal Regulations.
 - 2) Hazardous Material Regulations, General Awareness and Training Requirements for Handlers, Loaders and Drivers,
 - 3) Title 49, Parts 171-180 of the Code of Federal Regulations.
 - 4) Hazardous Material Regulations, Editorial and Technical Revisions, Title 49, Parts 171-180 of the Code of Federal Regulations.
 - a) EPA: U. S. Environmental Protection Agency (EPA), including but not limited to the following:

Management of Hazardous Wastes Resource Conservation and Recovery Act (RCRA), Title 40, Parts 260-299 of the Code of Federal Regulations.

Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, and Use Prohibitions, Title 40, Parts 761, of the Code of Federal Regulations.

Protection of Stratospheric Ozone, Title 40, Part 82 of the Code of Federal Regulations.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Title 42, Section 103.

Universal Waste Rule, Title 40, Part 273 of the Code of Federal Regulations.
 - b) LABOR: Occupational Safety and Health Administration, including but not limited to:

Occupational Safety and Health Guidelines, Respiratory Protection, Title 29, Part 1910.134.

Occupational Safety and Health Guidelines, Occupational Safety and Health Standards, Lead, Title 29, Part 1910.1025.

Occupational Safety and Health Guidelines, Occupational Safety and Health Standards, Hazard Communication, Title 29, Part 1910.1200.

Safety and Health Guidelines for Construction, Title 29, Part 1926 of the Code of Federal Regulations.

C. State Requirements: Abide by all state requirements which govern the management, hauling and disposal of hazardous, special and universal waste/recycled material. In

Illinois, this includes, but is not limited to the following:

1. Title 35 of the Illinois Administration Code (IAC), including but not limited to the following:
 - a. Wastestream Authorization, IAC Chapter I, Subpart b, Part 709.
 - b. Hazardous Waste Management Systems: General, IAC Chapter I, Subchapter c, Part 720.
 - c. Identification & Listing of Hazardous Waste, IAC Chapter I, Subchapter c, Part 721.
 - d. Standards Applicable to Generators of Hazardous Waste, IAC Chapter I, Subchapter c, Part 722.
 - e. Standards Applicable to Transporters of Hazardous Waste, IAC Chapter I, Subchapter c, Part 723.
 - f. Standards Applicable to Treaters, Storers, and Disposers of Hazardous Waste, IAC Chapter I, Subchapter c, Part 724.
 - g. Interim Status Standards of Hazardous Waste Treaters, Storers, and Disposers, IAC Chapter I, Subchapter c, Part 725.
 - h. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities, IAC Chapter I, Subpart c, Part 726.

- i. Land Disposal Restrictions, IAC Chapter I, Subchapter c, Part 728.
 - j. Universal Waste Management, IAC Chapter I, Subchapter d, Part 733.
 - k. Solid Waste, IAC Chapter I, Subchapter i, Part 807.
 - l. Special Waste Classifications, IAC Chapter I, Subchapter i, Part 808.
 - m. Special Waste Hauling, IAC Chapter I, Subchapter i, Part 809.
 - n. Standards for New Solid Waste Landfills, IAC Chapter I, Subchapter i, Part 811.
 - o. Procedural Requirements for Permitted Landfills, IAC Chapter I, Subchapter i, Part 813.
 - p. Standards for Existing Landfills and Units, IAC Chapter I, Subchapter g, Part 814.
 - q. Standards for Management of Used Oil, IAC Chapter I, Subchapter e, Part 739.
- D. Local Requirements: Abide by all local requirements as outlines within the Municipal Code of the City of Chicago which governs the management, hauling, and disposal of hazardous, special and universal waste/recycled material.

1.06 SUBMITTALS

- A. Before start of any hazardous waste removal Work, the Contractor must submit a Hazardous Waste Management Plan to the MEC fifteen (15) days prior to the start of Work.
- B. During the Work, the Contractor must submit the following to the MEC, with ten (10) days of activity, off-site removal, or completion of work if duration is less:
- 1. TCLP test results, as required to characterize waste paint chip debris for segregation and packaging purposes prior to transport from the site.
 - 2. Submit copies of all executed manifests and disposal site receipts and waste quantities within ten (10) days to the MEC.
 - 3. Receipts for all recycled materials accepted at authorized recycling facilities. The receipts will include the number of components recycled as well as the amount of materials recycled and/or disposed.
 - 4. Documents for the removal, handling, recycling or disposal of CFC Refrigerant/Reclamation.
 - 5. Daily Reports - list names of active workers for each day, work starting and stopping times, visitors to the site, and description of Work accomplished.
- C. Submittal Review:
- 1. Review of submittals or any comments made do not relieve the Contractor from compliance with the requirements of the contract specifications and drawings. The purpose of this check is to review for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents.
 - 2. The Contractor must not begin any Work applicable to this section until all required submittals have been reviewed and accepted by the MEC.

1.07 HAZARDOUS WASTE PLAN REQUIREMENTS

- A. General Applicability of Codes and Regulations:
- 1. Except to the extent that more explicit or more stringent requirements are written directly into the Contract Documents, all applicable codes and regulations have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies are bound herewith.
- B. Contractor Responsibility:

1. Notice shall be provided to the Board Representative a minimum of 2 working days prior to the removal of any hazardous, special or universal waste and/or recycled hazardous, special or universal waste from the site.
 2. Notice will be provided to the Board Representative within 4 hours of any environmental problems, complaints, fines, citations or issues by any government body or regulatory agency pertaining to hazardous, special or universal waste management and disposal. Written confirmation will be provided to the Board Representative within 48 hours of the incident that indicates that all problems and issues have been satisfactorily addressed.
- C. The Contractor must prepare a Hazardous Waste Plan designating appropriate procedures and equipment for performing the Work. The Hazardous Waste Plan must address the proper management/handling and disposal/recycling of wastes generated during Work activities. The Contractor's Hazardous Waste Plan for this project must include as a minimum the items listed below:
1. List of Hazardous Waste Equipment:
 - a. A description of the proposed equipment to be used during the removal, handling, temporary storage and transport of hazardous materials related to the Work.
 - b. Hazardous Material Handling:
 - 1) Procedures including a description of the method of transportation and
 - 2) Contractor shall provide a description of procedures for on-site
 - 3) The plan will include the following documentation for each transporter:
 - a) A copy of state and local special waste and/or hazardous waste hauler licenses for each transporter must be provided in the Plan.
 - b) U.S. EPA Identification Number of waste hauler.
 - c) Current list of all transporting vehicles to be used including:
Vehicles make, model and year.
Serial number for each vehicle.
Vehicle license number.
Number of axels.
Weight capacity of vehicle.
 - d) A list of all licensed qualified truck drivers. Drivers should be able to provide their driver's license upon request.
 - e) Instances where rail haulers are being used, copies of all applicable permits and licenses for the load on/off site location(s) and/or transfer location(s) will be provided.
 - 4) Contractor shall provide the following documentation for each disposal/recycling facility:
 - a) Name and address of waste disposal facility where hazardous waste materials are to be disposed including:
Contact person and telephone number.
Copy of state license and permit.
Disposal facility permits.
 - b) A signed statement from an authorized representative of the recycling or disposal facility stating the percentage of recycled materials for each of the components including the estimated percentage pertaining to each component which has no recycling value.
 - 5) Safety Precautions -Personnel:
 - a) List safety equipment and clothing to be used per OSHA regulations.
 - b) A description of emergency procedures to be followed in case of physical contact, ingestion, inhalation, etc.
 - 6) Emergency Spills:
 - a) A description of methods to be used for containment.

- b) A description of methods to be used for collection and disposal.
- c) A description of methods and materials to be used to restore areas harmed by emergency spills.
- 7) Lead-containing Paint Management:
 - a) A description of the work procedures that will be utilized to minimize the generation of airborne lead into the environment.
- 8) In addition, the Plan will provide:
 - a) Specimen copy of Uniform Hazardous Waste Manifest form.
 - b) Copy of EPA "Notice of Hazardous Waste Activity" form.
 - c) Copy of forms and permits required by federal, state, and local agencies.
 - d) Sample of disposal label(s) to be used.

PART 2 - PRODUCTS

2.01 TOOLS AND EQUIPMENT

- A. Disposal Bags: Provide 6 mil (0.15 mm) thick leak-tight polyethylene bags.
- B. DOT Hazardous Waste Disposal Drums: Provide DOT 17-H Open -Top Drums (55-gallon) in accordance with DOT title 49 CFR Parts 173, 177, 178, and 179.
- C. Fiberboard Drums, cylindrical containers manufactured from sturdy fiberboard will be utilized for storage transportation of electrical equipment.
- D. PCB containing ballasts shall be place in 55-gallon drums with vermiculite packing. The drums will be sealed, and labeled as containing hazardous PCB waste. The label shall also include the name and address of the parcel. However, if ballasts are damaged they shall be stored prior to disposal in accordance with 40 CFR 761.65.
- E. DOT Hazardous Waste Labels: in accordance with DOT regulations Title 49 CFR parts 173, 177, 178, and 179.
- F. Corrugated "Gaylord" Boxes with the use of a liner will be used to store and transport bulk materials which will be kept on pallets during storage and transportation.
- G. Materials to be used to restore areas harmed by emergency spills.
- H. Safety equipment and associated clothing to be used.
- I. Hazardous material manifests and other related forms required by state and local agencies.
- J. Utilize equipment to recover refrigerant that is appropriate for the following:
 - 1. Type of system encountered
 - 2. Refrigerant type
 - 3. Achieving IEPA-mandated vacuum levels

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. The Contractor shall train each employee performing Work prior to the time of initial job assignment in accordance with applicable regulations.
- B. Respiratory Protection Program:
 - 1. The Contractor shall furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter if required by 29 CFR 1910.1025.
 - 2. The Contractor shall establish and implement a respiratory protection program as required by 29 CFR 1910.134 and 29 CFR 1926.62.
- C. Hazard Communication Program: Establish and implement a Hazard Communication Program as required by 29 CFR 1910.1200.
- D. Post warning signs at entry points to hazardous Work area, as necessary.
- E. Segregate, package, label, transport and dispose of Hazardous Waste in accordance with DOT, EPA, state, and local regulations.
- F. Scheduling/Sequencing of the demolition and/or abatement is to be coordinated by the Contractor.
- G. Contractor shall decontaminate all residues from all surfaces where pre-existing leaks occur. Contractor shall decontaminate all surfaces where leaks occur during the removal and disposal process.
- H. Extreme care shall be used to prevent leakage of chemicals, liquid wastes, refrigerant, etc. during removal processes.
- I. Do not mix potentially hazardous waste streams or different refrigerants in the same recovery vessel. Where feasible, separate each type of hazardous waste from other types of hazardous wastes and construction waste.
- J. All electrical circuits shall be de-energized and locked out prior to removal of ballasts. Contractor shall provide temporary lighting as needed.
- K. The Contractor shall identify the location and Commissioning of all on-site transformers. The contents from each transformer shall be characterized for PCB content by the Contractor for proper disposal.
- L. The Contractor shall determine location and type of each radiological waste. The Contractor shall make all arrangements from the proper decommissioning of equipment and disposal of related materials.

3.02 HAZARDOUS WASTE DESIGNATION

- A. Where not otherwise designated by the Owner as hazardous waste, characterize applicable suspect waste products by conducting representative TCLP testing and referencing 40 CFR Part 261.
- B. Work shall include characterization and proper disposal of any soot contained within boilers, incinerators, or stacks; maintenance fluids within heating/cooling equipment; hazardous chemicals; storage tanks; or lead content of paint present.

- C. Fluids from transformers, electrical equipment, hydraulic equipment, etc. shall be characterized for PCB content per 40 CFR Part 761.
- D. Representative sampling of waste products will be in accordance with EPA Document SW 846.
- E. TCLP test analysis will be performed in accordance with EPA Method 1311.
- F. Radiological Wastes shall be classified in accordance with the NRC operating agreement.

3.03 HAZARDOUS WASTE

- A. The following waste products are designated by the Owner as non-salvageable and as Hazardous Waste Types:

- 1. Waste Type A: PCB waste.

- a. PCB-containing ballasts from fluorescent light fixtures.
- b. PCB-containing electrical transformers and switch gears.
- c. PCB-containing hydraulic fluid, which can be found within but not limited to the following equipment:

- 1) Hydraulic-lift elevators
- 2) Hydraulic trash compactors
- 3) Hydraulic loading dock lifts
- 4) Waste Type B: Mercury-containing waste.
 - a) Thermostats with mercury switches. Individually bagged mercury-containing thermostats.
 - b) Fluorescent and mercury-vapor lamps/bulbs.
 - c) Thermometers.
 - d) Gauges and regulators (including those found in waste medical equipment).
 - e) Elemental mercury.

- 5) Waste Type C: Medical Waste.

- a) Used and unused sharps.
- b) Contents of bio-hazard waste containers, including drums and bins.
- c) Surplus medical supplies.
- d) Contents of medical devices, such as dialysis machines, ventilators.
- e) Human and animal pathological wastes including tissue samples stored on slides and preserved and unpreserved specimens.

- 6) Waste Type D: Chemical Wastes.

- a) Cleaning chemicals such as bleach, ammonia, carpet cleaner, etc.
- b) Laboratory chemicals such as xylenes, benzene, acetic acid, dyes, formaldehyde, etc.
- c) Boiler and water treatment chemicals.
- d) Developing chemicals associated with the processing of x-rays and other photographic images, both used and virgin product.
- e) Unused medicine.
- f) Building maintenance chemicals such as paint, adhesives, glazing compound, caulk compound, roofing materials, concrete binder, resurfacing compounds, etc.
- g) Equipment maintenance chemicals such as lubricants, solvents, and oils.
- h) Fuels, such as gasoline, No. 2 Fuel Oil, and diesel fuel.
- i) Equipment and vessels containing chemicals, such as fire extinguishers, gas cylinders, batteries, and film developing equipment.

- 7) Waste Type E: Refrigerants and CFCs

- a) Refrigerators and freezers.
- b) Air Conditioning units.
- c) Cryogenic Supplies.
- d) Bulk storage of refrigerants.
- 8) Waste Type F: Equipment
 - a) Mechanical equipment, such as compressors, generators, compressors, water conditioning vessels, motors, etc.
 - b) Electrical equipment such as televisions, computers, monitors, current controllers, etc.
 - c) Medical equipment such as vital signs monitors, incubators, crash carts, MRIs, ultrasounds, ventilators, dialysis machines, etc.
- 9) Waste Type G: Radiological Waste
 - a) Drummed Radioactive waste.
 - b) Equipment that uses a radioactive source including x-rays, mammograms, CAT scans, electron microscopes, scintillation spectrometers, etc.
 - c) Smoke detectors.
- 10) 1Waste Type H: Lead-containing waste.
 - a) Lead paint (liquid or containerized paint wastes).
 - b) Lead-contaminated wastes (paint chips, loose debris, etc.).
- 11) 1Waste Type I: Other
 - a) Drums of hazardous waste generated prior to the start of the contract.
 - b) Wastes accumulated in Crock Pots.
 - c) Lab trap drain wastes.
 - d) Soot encountered in stacks, incinerators, or associated equipment.

3.04 HAZARDOUS WASTE PACKAGING AND LABELING

- A. Package each segregated Hazardous Waste Type in containers for offsite removal and disposal/recycle.
IMPORTANT: Do Not Mix Waste Streams.
- 1. Waste Types A, B, C and I, as applicable:
 - a. Package in DOT 17-H Open-Top Drums polyethylene disposal bag liners in accordance with 49 CFR Parts 171-180.
 - b. Fill to capacity only with waste.
 - c. Install gasket on lid, apply lock ring, and seal.
 - d. Apply Hazardous Waste Label to drum side.
 - e. Enter required DOT shipping data per applicable regulations.
 - f. Adjacent to each label, enter the date indicating when waste was first placed in each drum.
- 1) Waste Type D - Chemical Wastes:
 - a) Package other wastes as applicable in accordance with Hazardous Wastes Resource Conservation and Recovery Act (RCRA), Title 40, Parts 260-299 of the Code of Federal Regulations. Overpack drums shall be required as necessary to complete Work.
- 2) Waste Type E - Refrigerants and CFCs:
 - a) Reference Section 3.8 for details.
- 3) Waste Type F - Equipment:
 - a) Package all equipment in closable and lockable containers for off-site removal. Ensure that all liquids, gases or other regulated materials are removed from equipment, as applicable, prior to placement in containers. Comply with all DOT regulations for each type of equipment.
- 4) Waste Type G - Radiological Wastes:

- a) All radiological equipment shall be packaged and shipped in accordance with 32 IAC 341 regulations.
- 5) Waste Type H - Lead-containing Wastes:
 - a) Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265.
 - b) Comply with land disposal restriction notification requirements as required by 40 CFR 268.
 - c) Non-hazardous waste may be disposed of as demolition debris (general refuse).
 - d) Submit results of TCLP testing to the EC prior to disposal.
- B. Sealed and Labeled Containers: maintain all containers in a continuously sealed condition after they have been sealed.
 - 1. Do not reopen sealed containers
 - 2. Do not place additional waste in sealed containers.

3.05 TEMPORARY STORAGE

- A. Partially filled containers of hazardous waste may be stored at the Work site for intermittent packaging provided that the following conditions are met:
 - 1. Each container is properly labeled when it is first placed in service, including the date;
 - 2. Each container remains closed at all times except when compatible waste types are added;
 - 3. Each Work site must be secured and/or attended at all times; and
 - 4. When moved from site to site, each container remains within the geographic boundaries of the facility without moving nor crossing public access highways; and
 - 5. UNDER NO CIRCUMSTANCES WILL THE ACCUMULATED WASTE REMAIN ON SITE BEYOND NINETY (90) DAYS FROM THE DAY THAT ACCUMULATION IN THE CONTAINER WAS INITIATED.

3.06 REMOVAL OF HAZARDOUS WASTES

- A. Immediately seal containers of hazardous waste as each the container is filled. Remove containers of hazardous waste from the Work site within forty-eight (48) hours of being filled.
- B. Transporting filled containers from the Work site to an approved disposal site or recycling center utilizing licensed hauler.
- C. All fluorescent light ballasts shall be removed. Those labeled "NO PCBs" shall be packaged separately from those which indicate PCB or do not indicate PCB condition.
- D. Subject to the Board Representative's approval, the Contractor shall arrange with the electric utility provider for the removal of transformers which are owned by the utility provider from the site.
- E. Subject to the Commission Representative's approval, the contractor shall remove and dispose of all transformers which are not owned by the electric utility provider.
- F. Continuously maintain custody of all hazardous material generated at the Work site including security, short-term storage, transportation and disposition until custody is transferred to an approved disposal site or recycling center.

- G. Do not remove, or cause to be removed, hazardous waste from the Property without a legally executed Uniform Hazardous Waste manifest.
- H. At completion of hauling and disposal of each load, submit copy of waste manifest, chain of custody form, and landfill receipt to the Board Representative.

3.07 RECYCLING AND RECOVERY

- A. Turn over waste which contains materials for which recovery and/or recycling is possible to an approved recycling center. Materials subject to recycling include, but are not limited to:
 - 1. Fluorescent light tubes.
 - 2. Lead acid batteries.
 - 3. Combustible lead-based painted building components and lead-based paint chips.
 - 4. Televisions and computers.
 - 5. Ethylene Glycol or other related fluids found within cooling systems.
 - 6. Mechanical and medical equipment.
 - 7. Non-PCB-containing oils.
 - 8. Fuel.
 - 9. Maintenance chemicals.
 - 10. Gas cylinders and fire extinguishers.
 - 11. Lead Shielding Materials.

3.08 STORAGE & TRANSPORTATION OF REFRIGERANTS / CFCS

- A. Use proper storage vessel when recovering refrigerants.
 - 1. IDOT containers meeting the ARI standard.
 - 2. Container working pressure rating must comply with IDOT requirements (49 CFR).
 - a. For Refrigerant HCFC-22: Minimum working pressure rating of 260 psig.
 - b. For Refrigerant CFC-11 (Low-Pressure Refrigerants): Drums of steel construction and designated as 17C or 17E.
 - 1) Open top and plastic drums shall not be used.
 - 2) Previously filled, disposable cylinders shall not be used to store or transport recovered refrigerants.
- B. All recovery vessels shall be visually inspected by the Contractor prior to filling. The Contractor shall inspect and provide the following upon request:
 - 1. Verification of proper IDOT specification.
 - 2. Pressure rating verification.
 - 3. Current hydrostatic test date.
 - 4. Cylinder shall be free of surface dents and imperfections.
- C. Provide required labeling for recovery vessel.
- D. Return all refrigerant to reclamation facilities to be reprocessed to ARI 700 1988 Standards or dispose in an approved facility.
- E. The Contractor shall provide the Commission representative with required documents for CFC Refrigerant/Reclamation within ten (10) days.

3.09 REMOVAL OF NON-HAZARDOUS WASTE MATERIAL

- A. Transport and legally dispose of non-hazardous waste products, materials, residues and refuse at a location not on City's property.
- B. Non-hazardous waste products, materials, residues and refuse include, but are not necessarily limited to:
 - 1. Materials which are determined to be non-hazardous wastes through objective sampling in accordance with EPA Document SW-846 and laboratory analysis in accordance with EPA Method 1311.
 - 2. Emptied hazardous material containers: containers holding a material with constituents listed on the SDS as hazardous.
 - a. When a container is emptied of its hazardous contents by pouring or scraping so that less than one inch of material remains in the bottom of the container, the container is considered "empty" and is not in itself a hazardous waste.
 - b. Emptied hazardous material containers may be disposed of as construction debris waste (i.e. non-hazardous).
 - 1) Personal protective clothing and safety equipment with de minimis or trace contamination.
- C. Keep premises in a clean and orderly condition during performance of all Work.
- D. Place non-hazardous construction debris wastes in secure containers for local landfill disposal on a daily basis.

END OF SECTION 02 86 13

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cast-in-Place Concrete required to complete the work indicated on all the project construction drawings except for related sections.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans.

1.3 SUBMITTALS

- A. Product Data: Submit preprinted data for each type of manufactured material and product demonstrating compliance requested by the Architect.
- B. Design Mixes: Submit design mix for each concrete mix. Include field test data used to establish the required average strength in accordance with ACI 301. Review of design mixes and field test data will be for general information only. Production of concrete to comply with specified requirements is the responsibility of the contractor. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until each mix has been reviewed by the Architect.
 - 1. Indicate amounts of mix water to be withheld for later addition at Project site.
- C. Shop Drawings:
 - 1. Steel Reinforcement Shop Drawings: Submit details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

- A. 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.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- 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. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
 - E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."
 - F. Publications: Comply with the latest edition of the following, except as modified by the Contract Documents. Maintain a copy of the latest edition of ACI 301, 117, 318, and 347 at the project site at all times. Where provisions of the above codes and standards are in conflict with the building code in force for the Project, the building code shall govern.
 - 1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - 2. ACI 301, "Standard Specification for Structural Concrete."
 - 3. ACI 302, "Guide for Concrete Floor and Slab Construction."
 - 4. ACI 305, "Hot Weather Concreting"
 - 5. ACI 306, "Cold Weather Concreting"
 - 6. ACI 308, "Standard Practice for Curing Concrete"
 - 7. ACI 318 "Building Code Requirements for Structural Concrete"
 - 8. ACI 347 "Recommended Practice for Concrete Formwork"
 - 9. AWS D12.1 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction."
 - 10. CRSI "Manual of Standard Practice."
 - G. Concrete Testing Service: The Owner will employ a testing laboratory to perform initial field quality control testing.
 - 1. Materials and installed Work may require testing and retesting, at anytime during the progress of the Work. Allow free access to material stockpiles and facilities at all times. Tests, not specifically indicated to be done at the Owner's expense, including the retesting of rejected materials and installed Work, shall be done at the Contractor's expense.
 - H. Pre-Concrete Conference
 - 1. Conduct a meeting to review the detailed requirements for preparing the concrete design mixes and to review the drawings, specifications, and the project.
 - 2. Require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:
 - a. Contractor's superintendent
 - b. Laboratory responsible for the field quality control
 - c. Concrete subcontractor
 - d. Architect
 - e. Owners Representative
 - 3. Type and print minutes from the meeting and distributed to all parties within 5 days of the meeting.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - 1. Avoid damaging coatings on steel reinforcement.
- 1.6 PROJECT CONDITIONS

- A. Before commencing work, examine all adjoining work on which this work is in any way dependent for proper installation and workmanship and report to the Contractor any condition which prevents performing first class work.
- B. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.
- C. Protect adjacent finish materials against spatter during concrete placement.
- D. Provide all barricades and safeguards at all pits, holes, shaft and stairway openings, and the like. Provide all safeguards as required by authorities having jurisdiction. Take full responsibility for safety precautions and methods.

2.1 FORM-FACING MATERIALS

- A. Formed Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Rust-free metal.
 - 2. Exterior-grade undamaged, unpatched plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
 - b. Structural 1, B-B, or better, mill oiled and edge sealed.
 - c. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.
 - 3. Architecturally Exposed Concrete: Medium-density overlay, class 1 or better, mill-release agent treated and edge sealed.
- B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist plastic concrete loads imposed by concrete without deformation.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), 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 (25 mm) to the plane of the exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
 - 4. Furnish stainless steel ties where drawings indicate exposed.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M.
- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Deformed-Steel Wire: ASTM A 496.
- E. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A coated, plain-steel wire.
- F. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
 - 1. Welded wire fabric maybe used in lieu of carbon steel fibers for interior slabs on grade and interior elevated concrete topping on metal deck when acceptable to the Architect.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
 - 4. Do not use wood, masonry, concrete or other similar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.
- C. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars.
- D. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 755M.
- E. Mechanical Reinforcement Couplers: ASTM A-519, Minimum tensile strength 100,000 psi

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I. Type III cement may be used in lieu of Type I at Contractor's option, when acceptable to the Architect.
 - 1. Use only one brand of cement throughout project, except as otherwise indicated.
- B. Fly Ash: ASTM C618, Class C or F
- C. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Severe weathering region, but not less than 3S.
 - 2. Nominal Maximum Aggregate Size: 3/4 inch (19 mm) unless otherwise indicated.
- D. Lightweight Aggregate: ASTM C 330.

1. Nominal Maximum Aggregate Size: 3/4 inch (19 mm).
2. Provide water cooled expanded blast furnish slag such as True-Lite by LaFarge manufactured within 500 miles of the Project.

E. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride thycyanates or admixtures containing more than 0.1 percent chloride ions.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F.

2.6 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete with an expansion delay coating to allow concrete cure prior to expansion.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
 - b. Conseal CS-231; Concrete Sealants Inc.
 - c. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
 - d. Hydrotite; Greenstreak.
 - e. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.
 - f. Adeka Ultra Seal; Mitsubishi International Corporation.
 - g. Superstop; Progress Unlimited Inc.

2.7 VAPOR RETARDERS

- A. Vapor Retarder: ASTM E 1745, Class C, of one of the following materials; or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick. Use only materials which are resistant to decay when tested in accordance with ASTM E 154:
 1. Nonwoven, polyester-reinforced, polyethylene coatd sheet; 10 mils (0.25 mm) thick.
 2. Three-ply, nylon- or polyester-cord-reinforced, laminated, high-density polyethylene sheet; 7.8 mils (0.18 mm) thick.

2.8 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Drinkable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.9 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Reglets: Fabricate reglets of not less than 26 gage (0.0217-inch) (0.55-mm) thick galvanized steel sheet with 45 degree slot minimum 1" deep and 1/4" wide and formed with upper lip bent back to engage concrete. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- D. Dovetail Anchor Slots: Hot-dipped galvanized steel sheet not less than 0.0217 inch (0.55-mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) 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 (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm).
 - 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 (3 to 6 mm) or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5700 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

- C. Provide a minimum 28 day compressive strength of 4000 psi (27.7 MPa) and a maximum water-cementitious material ratio of 0.44, unless otherwise indicated.
- D. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows unless otherwise indicated:
 - 1. Compressive Strength (28 Days): 4,500 psi (27.6 MPa) with a maximum water cementitious material ratio of 0.44 (air-entrained).
 - 2. Maximum Slump at point of placement: 4 inches (100 mm).
 - 3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches (200 mm) after admixture is added to concrete with 2- to 4-inch (50- to 100-mm) slump.
- E. Slab-on-Grade: Proportion normal-weight concrete mix as follows unless otherwise indicated:
 - 1. Exterior Exposed Concrete - Compressive Strength (28 Days): 5,000 psi (34.5 MPa) with a maximum water-cementitious material ratio of 0.4 (air-entrained).
 - 2. Interior Concrete - Compressive Strength (28 Days): 4,000 psi (27.6 MPa) with a maximum water-cementitious material ratio of 0.44.
- F. Cementitious Materials:
 - 1. For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements.
 - 2. For all other concrete, limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - a. Fly Ash: Provide 25% by weight.
- G. Air Content: Use air-entraining admixture in exterior exposed concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
 - 1. Air Content: 6 percent for 3/4-inch (19-mm) nominal maximum aggregate size.
- H. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.
- I. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) 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 mixes where indicated.
- J. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use an independent testing facility acceptable to the Architect for preparing and reporting proposed mix designs.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." In the case of fabrication errors, do not rebend or straighten reinforcement.

- B. Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in the Work:
 - 1. Bar lengths, depths or bends exceeding specified fabrication tolerances.
 - 2. Bends or kinks not indicated on the Drawings or final Shop Drawings
 - 3. Bars with reduced cross section due to excessive corrosion or other cause.
 - 4. Bars with damaged corrosion resistive coating (if specified).

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F (30 and 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.

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 concrete structure can support such loads within acceptable deflection limits.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, and inserts, and other features required.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3 mm), for surfaces predominantly exposed to public view.
 - 2. Class B, 1/4 inch (6 mm), for course-textured concrete formed surfaces intended to receive plaster, stucco, or wainscoting.
 - 3. Class C, 1/2 inch (13 mm), for all other 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. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 - 1. 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 with 3/4" x 3/4" strips (unless otherwise indicated) accurately formed and surfaced to produce uniform straight lines and tight edges. Unexposed corners may be formed square or chamfered.

- 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, including those under separate prime contracts (if any).
- 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 non-staining, rust preventative form-release agent, according to manufacturer's written instructions, before placing reinforcement. Rust stained steel formwork is not acceptable.
- M. Support form facing materials by structural members spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces of accurate alignment, from irregularities and within allowable tolerances
- N. Elevate formwork as required for anticipated deflections due to weight and pressures of fresh concrete, shortening of formwork system, and construction loads.
- O. Carefully inspect falsework and formwork during and after concrete placement to determine abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimensions.
- P. Form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.
- Q. Forms for exposed Concrete:
 - 1. Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes.
 - 2. Do not use metal cover plates for patching holes or defects in forms.
 - 3. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersection.
 - 4. Use extra studs, walers and bracing to prevent bowing of forms between studs and to avoid bowed appearance of concrete. Do not use narrow strips of form material that will produce bow.
 - 5. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.

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.
 - 2. Install reglets to receive top edge of foundation sheet 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 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved 28-day design compressive strength.
 - 1. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions and as follows:
 - 1. Use sheets as large as practical. Overlap minimum 6" and tape. Tape to perimeter and to projections.

3.5 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.
- 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.
 - 1. At a spacing not to exceed 4'-0" on center in either direction. For slabs on grade, use supports not to exceed 4'-0" o.c. with sand plates or horizontal runners where base material will not support chair legs.
 - 2. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two mesh spacings. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

3.6 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 from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) 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 at not more than 60 feet in any horizontal direction. 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 15-foot maximum perpendicular strips, and areas not exceeding 225 square feet. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete within 24-hours after initial floating, 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: Install joint-filler strips at all 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 (12 mm) or more than 1 inch (25 mm) below finished concrete surface where 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. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
 - 1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

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

3.8 CONCRETE PLACEMENT

- A. Pre-Placement Inspection:
 - 1. Before concrete placement, check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems. During concrete placement, check formwork and related supports to ensure that forms are not displaced and that completed Work will be within specified tolerances.
 - 2. Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts involved in ample time to permit the installation of their Work; cooperate with other trades in setting such Work, as required.
 - 3. Thoroughly wet wood forms immediately before placing concrete, as required where form coatings are not used.
 - 4. Soil at bottom of foundation systems are subject to testing for soil bearing value by the testing laboratory, as directed by the Architect. Place concrete immediately after approval of foundation excavations.
 - 5. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
 - 6. Remove soil, debris, standing water, ice, snow, loose mill scale or coating and other foreign matter from formwork and metal deck.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless indicated on trip ticket.
- C. Deposit concrete continuously or in 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 specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) 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 mix 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. Place concrete in accordance with the practices and recommendations of ACI 304, and as herein specified.
 - 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 derbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or 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 air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow. 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 mix designs.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) 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. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- 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 defective areas. Remove fins and other projections.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 - 2. Do not apply rubbed finish to smooth-formed finish.
- C. Rubbed Finish: Apply one of the following to finished concrete exposed to view:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 - 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part Portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
 - 1. F(F) defines the maximum floor curvature allowed over 24 in. Computed on the basis of successive 12 in. elevation differentials, F(F) is commonly referred to as the "Flatness F-Number".
 - 2. F(L) defines the relative conformity of the floor surface to a horizontal plane as measured over a 10 ft. distance, commonly referred to as the "Levelness F-Number".
 - 3. All floors shall be measured in accordance with ASTM E-1155 "Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number" System.
 - 4. All slabs shall achieve the specified overall tolerance. The minimum local tolerance (1/2 bay) shall be 2/3 of the specified tolerances.
- B. Trowel Finish: Apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen 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. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
 - 1. Slab on grade overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15 other.
- C. Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 - 2. After broadcasting and tamping, apply float finish.
 - 3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

3.11 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 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.

3.12 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 301, ACI 306.1 for cold-weather protection, and with recommendations in ACI 305R 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 (1 kg/sq. m 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 by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive resilient sheet floor coverings. Cure concrete surfaces to receive other floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
 - 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 (300-mm) 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 (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

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. Comply with ACI 301.
- 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 (1.2-mm) 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 (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) 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 (0.25 mm) 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 (6 mm) 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 (25 mm) 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 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix 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 (25 mm) 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 Agency: Owner will engage a qualified independent testing and inspecting agency to inspect reinforcing, sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

- B. Testing Services: 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 one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of five standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39
 - a. Test two specimens at 7 days, two at 28 days and one at 56 days if 28-day compressive strength has not yet been obtained.
 - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. 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 mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- E. 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.
- F. 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 or by other methods as directed by Architect.
- G. Defective Work: Concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes, shall be corrected at the Contractor's expense without extension of time. The contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

END OF SECTION 03 30 00

SECTION 03 92 50 – CONCRETE RESURFACING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. General Contractor shall provide all labor, materials, equipment, and services necessary or incidental to the completion of all work of this section as shown on the drawings, herein specified, or otherwise required.
 - a. Complete epoxy moisture mitigation to remedy potential existing floor slab relative humidity for all areas of flooring. System shall also provide underlayment for scheduled flooring finishes.
 - b. Complete leveling floor system to remedy existing floor slab deviations in levelness for all areas of flooring. System shall also provide underlayment for scheduled flooring finishes.

B. Alternate Bid: None.

1.2 RELATED WORK

- A. Section 09 30 13 – Ceramic Tiling
- B. Section 09 65 16 – Resilient Sheet Flooring
- C. Section 09 68 13 – Tile Carpeting

1.3 QUALITY ASSURANCE

- A. Contractor's Qualifications: Installation must be performed by a contractor, specifically approved by the manufacturer, and with trained, skilled, mechanics having not less than FIVE (5) years satisfactory experience in the installation of the system as specified in this section.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship. Manufacturer's representative shall attend mock-up review and provide written approval of mock-up.
 1. Areas coordinated with the Architect
 2. Do not proceed with remaining work until accepted by Architect.
 3. Refinish mock-up area as required to produce acceptable work.

1.4 SUBMITTALS

- A. All submittals shall be in accord with 01 33 00.
- B. Product Data: Submit manufacturer's complete product literature and specifications on the specified system and all individual components, including physical properties and performance properties and all tests described in para. 2.1.B in this section. Submit all Material Safety Data Sheets
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- E. Sample Warranties: For Manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

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.

1.7 WARRANTY

- A. Five (5) years from Substantial Completion for performance as moisture mitigation and underlayment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. MAPEI Americas U.S.A.
 - 2. Ardex Group
 - 3. Laticrete Supercap, LLC

2.2 APPLICATIONS/SYSTEM

- A. Refer to drawings for scope of Work.
- B. Interior Floors:
 - 1. Reducing Moisture Vapor Emission Rate (MVER): Moisture Reduction Barrier.
 - 2. For Overall Topping: Self-leveling thin topping underlayment.

2.3 INTERIOR PRODUCTS

- A. Moisture Reduction Barrier for Concrete Substrates: Suitable moisture reduction barrier to treat substrate moisture levels that exceed the manufacturers of subsequent flooring recommendations.
 - 1. Tile and Stone: A two-component, 100 percent solids epoxy, one-coat moisture barrier for concrete slabs that exhibit moisture vapor emissions rates (MVER) up to 25 lbs per 1000 square feet (9.07 kg per 92.9 m²) per 24 hours and reduces transmission rates to less than 3 lbs (1.36 kg).

- a. "Planiseal VS" by MAPEI
 - b. "K 15" by Ardex
 - c. "Supercap" by Laticrete
 2. A two component, 100 percent solids epoxy, one-coat moisture barrier for concrete slabs that exhibit moisture vapor emissions rates (MVER) up to 20 lbs per 1000 square feet (9.07 kg per 92,9 m²) per 24 hours and reduces transmission rates to less than 3 lbs (1.36 kg).
 - a. "Planiseal LVB" by MAPEI
 - b. "MC Ultra" by Ardex
 - c. "Supervap" by Laticrete
 3. Products shall be recommended by manufacturer for applications at existing concrete floor slabs where no vapor barrier is present and humidity levels are as noted in Section 1.1 above.
- B. Self-Leveling Underlayment: Pre-blended cementitious, for thicknesses from feather edge, for use in dry interior applications.
1. Normal-setting, polymer-modified; for over existing concrete.
 - a. "Novaplan" by MAPEI
 - b. "K16" by Arex.
 - c. "Supercap Skimcoat" by Laticrete
 2. Acceptable Product: MAPEI Novoplan Easy, medium setting reduced surface preparation self-leveling underlayment 1/8 inch to 1 inch (3 mm to 25 mm), over existing concrete.
 - a. "Novaplan Easy" by MAPEI
 - b. "K13" by Arex.
 - c. "Supercap Skimcoat" by Laticrete
 3. Primer: As recommended by underlayment manufacturer.

PART 3 - EXECUTION

3.1 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.

3.2 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, including but not limited to shot blasting.

3.3 INSTALLATION

- A. Protect adjacent construction and surfaces from damage during preparation and installation. Provide dust

barriers at undersides of doors to offices and openings to rooms adjacent to areas where work will occur.

- B. Provide mock-up for Architect's review.
- C. Install products in accordance with manufacturer's instructions.
- D. Provide transitions in moisture barrier to adjacent flooring materials to prevent gaps in the moisture barrier, as required, including epoxy flooring indicated in Section 09 67 23 – Resinous Flooring. Maintain finish floor elevations at adjacent flooring materials.
 - 1. Visible ridges, edges, gaps or transitions visible after flooring installation are not acceptable.
- E. Provide manufacturer's warranty review and acceptance of final installation prior to proceeding with finishes installation.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION 03 92 50

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Building (common) brick.
 - 2. Mortar and grout.
 - 3. Masonry-joint reinforcement.
 - 4. Ties and anchors.
 - 5. Embedded flashing.
 - 6. Miscellaneous masonry accessories.
- B. Products Installed but not Furnished under This Section:
 - 1. Steel lintels in unit masonry.
 - 2. Cavity wall insulation.
- C. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
 - 2. Section 07 21 00 "Thermal Insulation" for cavity wall insulation.
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Contractor shall arrange conference at project site. Contractor, installation contractor's project manager and site foreman, and Architect shall be in attendance. If the work impacts other trades, a representative from those contractors shall also be in attendance.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:

1. Brick, in the form of straps of five or more bricks.
2. Colored mortar.
3. Weep vent material.

D. Samples for Verification: For each type and color of the following:

1. Brick, in the form of straps of five or more bricks.
2. Colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
3. Weep vents
4. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

A. 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. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements of latest version of Masonry Technical Notes and noted herein.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Mockup / Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.

1. Build sample panels for each type of exposed unit masonry construction approximately 48 inches long by 48 inches high by full thickness.
2. Build sample panels facing south.
3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
4. Clean exposed faces of panels with masonry cleaner indicated.

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 Architect specifically approves such deviations in writing.
 - b. Include a sealant-filled joint at least 16 inches.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include metal studs, sheathing, water-resistive barrier, sheathing joint-and-penetration treatment, air barrier, veneer anchors, flashing, cavity drainage material, and weep vents in exterior masonry-veneer wall mockup.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. 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. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of existing exposed faces of adjacent units:
 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Building (Norman) Brick: ASTM C 62, Grade SW
1. Size: Match size of existing Norman face brick.
 2. Application: Use where brick is indicated for exposed locations.
 3. Acceptable Manufacturer's and color:
 - a. Endicott, Dark Iron Spot, Smooth face finish
 - 1) Bricks Inc. 773.523.5718
 - b. Yankee Hill, Dark Iron Spot, Smooth face finish
 - 1) Bricks Inc. 773.523.5718
 - c. Substitutes require prior approval of Architect.

2.4 MORTAR MATERIALS

- A. Mortar shall comply with Type N classification in ASTM C270 with the following modifications:
- B. Portland Cement: ASTM C 150/C 150M, Type I. Provide natural color or white cement as required to produce mortar color to match existing.
1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Masonry Cement: Not acceptable.
- E. Colored Cement Products: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 2. Pigments shall not exceed 10 percent of portland cement by weight.
- F. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Water: Potable, clean and free of deleterious materials.

2.5 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 - 2. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.
- C. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
 - 2. Fabricate sheet metal anchor sections and other sheet metal parts from stainless-steel sheet.
 - 3. Fabricate wire ties from stainless-steel wire.
 - 4. Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified of depth required to allow for cavity indicated on documents.
 - 5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting vertical tab having a slotted hole for inserting wire tie and providing adjustment.
 - a. Heckmann, 318
 - b. Homann & Barnard, Inc, DW-10
 - c. Substitutions as approved by Architect

2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304, 0.016 inch thick.
 - 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet . Provide splice plates at joints of formed, smooth metal flashing.
 - 3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 - 4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 - 5. Fabricate through-wall flashing with drip edge. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 - 6. Fabricate through-wall flashing with sealant stop. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
 - 7. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products:
 - 1. Mesh Weep/Vent: Free-draining mesh; made from 90% polyester mesh strands, full height and width and depth of head joint; in color selected from manufacturer's standard.
- E. Cavity Drainage Material: Free-draining mesh, made from recycled nylon strands that will not degrade within the wall cavity.
 - 1. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.8 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Prosoco Sure Klean Heavy Duty Restoration Cleaner
 - 2. Diedrich 101 Masonry Restorer Super Concentrate

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.

5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. 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),) or 1/2-inch (12-mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. 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).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in **[bond pattern indicated on Drawings]**; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay **[hollow brick]** as follows:
 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in all courses of piers, columns, and pilasters.

3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
1. For glazed masonry units, use a nonmetallic jointer 3/4 inch (19 mm) or more in width.
- C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- D. Cut joints flush where indicated to receive **[waterproofing]** **[cavity wall insulation]** **[air barriers]** unless otherwise indicated.

3.6 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to **[wall framing]** masonry-veneer anchors to comply with the following requirements:
1. Fasten **[screw-attached]** anchors **[through sheathing to wall framing]** with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 2. Embed tie sections in masonry joints.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 4. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally, with not less than one anchor for each 2 sq. ft. (0.2 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 perimeter.
 5. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 25 inches (635 mm) o.c. horizontally, with not less than one anchor for each **[2.67 sq. ft. (0.25 sq. m)] [3.5 sq. ft. (0.33 sq. m)]** of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.
 6. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and horizontally. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 24 inches (610 mm), around perimeter.
- B. Provide not less than 1 inch of airspace between back of masonry veneer and face of sheathing.
1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form expansion joints in brick as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches (100 mm) in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than [3/8 inch (10 mm)] for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."

C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch (10 mm).

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.8 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. See structural drawings and details for additional information at masonry openings.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.9 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. [**Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.**]

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape [**as recommended by flashing manufacturer**].
2. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under **water-resistive barrier** lapping at least 4 inches (100 mm).
3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
5. Install metal **drip edges and sealant stops** with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.

6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
 7. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
 8. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use specified weep/cavity vent products to form weep holes.
 2. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
 4. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material.
- F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Contractor to coordinate site visits with architect to verify
1. Begin masonry construction only after Architect has verified proportions of site-prepared mortar.
 2. Place grout only after Architect has verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after Architect has verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for **mortar air content and compressive strength**.
- I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.11 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 vents at head joints, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 - 7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 8. Clean stone trim to comply with stone supplier's written instructions.
 - 9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 05 12 00 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel elements indicated on the Structural Drawings.
- B. Related Sections
 - 1. Section 05 21 00: Steel Joists
 - 2. Section 05 31 10: Steel Decking

1.2 SUBMITTALS

- A. Product Data: Submit copies of producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data as required to show compliance with these specifications (including specified standards):
 - 1. Structural steel (each type), including certified copies of mill reports covering the chemical and physical properties, when requested.
 - 2. Structural steel primer paint.
 - 3. Shrinkage-resistant grout.
 - 4. Provide a schedule of shop drawing submittals for the architect's information at least 30 days prior to the first shop drawing submittal.
- B. Shop Drawings:
 - 1. Submit Shop Drawings, including complete details and schedules for fabrication and assembly of members.
 - a. The Fabricator shall either employ or retain a Structural Engineer licensed in the State of Illinois (Fabricator's Engineer). All structural steel shop drawings shall be completed under the direct supervision and review of the Fabricator's Engineer.
 - 2. Include details of cuts, connections, camber, holes, stiffeners and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
 - 3. Provide setting drawings and directions for the installation of anchor rods and other anchorages to be installed by others.
- C. Certification:
 - 1. Submit certification that welders to be employed in the Work have satisfactorily passed AWS qualification tests.
 - a. If recertification of welders is required, retesting shall be the Contractor's responsibility.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following, except as otherwise specified.
 - 1. AISC 360-05 "Specification for Structural Steel Buildings," latest edition, including Appendices and Supplements thereto.
 - 2. AISC 303-05 "Code of Standard Practice for Steel Buildings and Bridges", latest edition, with the following modifications:
 - a. In the Glossary, the term "Owner's Designated Representative for Design" shall be defined as the Architect.

- b. In Section 3.1.1, add the following to the end of the section: "Where reaction forces are given on the design drawings, Fabricator is responsible for designing stiffeners and/or doublers if necessary."
- c. In Section 3.1.2, add the following to the end of the section: "Review of submitted connections by the Architect is limited to general conformance with the contract documents and the design intent. The Fabricator shall bear full responsibility for connection design."
- d. Delete Section 3.3 in its entirety and substitute the following: "All situations which, in the opinion of the Contractor, appear to be deficiencies, omissions, contradictions, or ambiguities in the Design Drawings and Specifications, shall be brought to the attention of the Architect. Design Drawings and Specifications will be corrected or a written interpretation of the alleged deficiency, omission, contradiction, or ambiguity shall be made by the Architect before the affected work proceeds. When discrepancies exist between the Design Drawings and the Specifications, the Architect shall be informed in writing, and the Architect shall identify what shall govern. When discrepancies exist between scale dimensions in the Design Drawings and the figures written in them, the figures shall govern. When discrepancies exist between the structural design drawings and the architectural, electrical or mechanical design drawings or Design Drawings for other trades, the Architect shall advise what shall govern."
- e. Delete Section 3.6 in its entirety and substitute the following: "Design drawings released as part of a bid package shall not be considered to be released for purchase of material or fabrication without 10 days prior notification to the Architect of intent to purchase or fabricate."
- f. Delete section 4.4 in its entirety and substitute the following:
 - 4.4 "Except as provided in Section 4.5, the Shop and Erection Drawings shall be submitted to the Architect and the Owner's Designated Representative for Construction for review and approval. Approved Shop and Erection Drawings shall be individually annotated by the Architect and the Owner's Designated Representative for Construction as either approved or approved subject to corrections noted. When so required, the Fabricator shall subsequently make the corrections noted and furnish corrected Shop and Erection Drawings to the Architect and the Owner's Designated Representative for Construction. Shop drawings submitted to the Architect shall allow for 14 calendar days for review."
 - 4.4.1 "Approval of the Shop and Erection Drawings is subject to corrections noted and similar approvals shall indicate the Fabricator has correctly interpreted the intent of the Contract Documents in the preparation of those submittals. Such approval shall not relieve the Fabricator of the responsibility for either the accuracy of the detailed dimensions in the shop and erection drawings or the general fit-up of parts that are to be assembled in the field."
- g. Revise Section 10.2.3 to read "Weld show-through of members exposed to view is not acceptable without prior written approval from Architect."
- h. Add the following to the beginning of Section 10.2.5: "Unless otherwise shown on the drawings...."
- i. Revise Section 10.2.7 to read: "Stamped or raised manufacturer's marks shall be filled or ground flush with surrounding material."
- j. Revise Section 10.2.8 to read: "Seams on Hollow Structural Sections (HSS) shall be oriented as shown on drawings, and where not shown shall be oriented away from view."
- 3. AISC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.
- 4. AWS D1.1 "Structural Welding Code - Steel".

5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
 6. AAMA TIR-A11 "Maximum Allowable Deflection of Framing for Framing Systems for Building Cladding Components at Design Wind Loads."
- B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with the AWS "Qualification" requirements.
- C. Design of Members and Connections: Unless otherwise indicated, provide standard AISC framed beam connections using high strength bolts in shear/bearing type connections with threads included in the shear plane designed for the beam reactions indicated or if not indicated, provide a least three fourths of the uniform load carrying capacity of the beam.
1. Provide a minimum of two (2) bolts at each connection.
 2. Provide connections at least one half the depth of the member.
 3. Provide slip-critical bolted connections in bolts installed in over-sized holes.
- D. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
 - a. Category: Category STD, Standard for steel building structures.
- E. Erector Qualifications: Engage a firm with a minimum of ten years experience in erecting structural steel for projects of similar type and scope and with a record of successful completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site at such intervals to ensure uninterrupted progress of the Work.
- B. Deliver anchor rods and anchorage devices in ample time to not delay that Work.
- C. Keep members off the ground. Protect steel members and packaged materials from corrosion and deterioration.
- D. Do not store materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

1.5 QUALITY CONTROL

- A. The Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- B. The Owner's Testing Agency will conduct and interpret the tests and state in each report whether the test specimens comply with the requirements, and specifically state any deviations there from.
- C. The Architect reserves the right to reject material not complying with specified requirements.
- D. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. The Owner may have additional tests performed, at Contractor's expense, as may be necessary to reconfirm any non-compliance of the original Work, and as may be necessary to show compliance of corrected Work.

E. Contractor's Responsibilities

1. Notify Owner's Testing Agency sufficiently in advance of operations to allow for his assignment of personnel and scheduling of tests.
2. Coordinate with Agencies' personnel; provide access to Work and to plant operations.
3. Furnish casual labor and facilities to provide access to Work to be tested to facilitate inspections and tests.

F. Shop and Field Testing Program By Owner's Testing Agency: The following testing program outline is for information only and may not be comprehensive.

1. Material and Welder Certification:
 - a. Review each Contractor's mill reports covering chemical and physical properties of steel for conformance with the applicable ASTM specification.
 - b. Review each Contractor's field welder certification for conformance with AWS certification requirements.
2. Bolted Connections: Bolted connections shall be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
 - a. Visually inspect bolted connections.
 - b. Perform calibrated wrench tests on all bolted, slip critical connections.
 - c. For connections not designated as slip critical, inspect connections to insure that the plies of the connected elements have been brought into snug contact.
3. Welded Connections: Welded connections shall be tested and inspected according to AWS D1.1.
 - a. Perform visual inspection of all welded connections.
 - b. Perform ultrasonic testing of all full penetration welds.
 - 1) Full penetration welds of HSS members shall meet AWS Class R Acceptance Criteria.
4. Shear Connectors: Welded shear connectors shall be tested and inspected according to AWS D1.1.
 - a. Perform visual inspection of all welded shear connectors.
 - b. Perform bend tests if visual inspection reveals a less-than-continuous 360-degree flash.

2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Provide fine-grain killed steel of structural shapes within groups 4 or 5 of AISC grouping for tensile property classification.
- C. Steel shapes: ASTM A 992, except where other type steel is shown; ASTM A 36 for plates, bars, channels, angles and miscellaneous connection materials.
- D. Hollow Structural Sections: ASTM A 500, Grade B.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B; standard weight unless otherwise shown.
- F. Stainless-Steel
 1. Stainless-Steel Bars and Shapes: ASTM A-276, Type 316L.
 2. Stainless-Steel Strip, Plate and Flat Bars: ASTM A-666, Type 316L.
 3. Stainless-Steel Pipe: ATM A-312/A-312M, Grade TP, 316L.
 4. Stainless-Steel Tubing: ASTM A-554, Grade MT, 316L.

- G. Anchor Rods: ASTM F 1554, Grade 36, unless otherwise indicated.
- H. Headed Stud Type Shear Connectors: ASTM A 108, Grade 1015 through 1020, cold-finished carbon steel; with dimensions complying with AISC Specifications.
- I. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325 unless Drawings indicate ASTM A 490.
 - 2. Direct tension indicator washers conforming to ASTM F 959, type 490 may be used at Contractor's option.
- J. Electrodes for Welding: E70XX and comply with AWS Code.
- K. Structural Steel Primer Paint (Except where specified otherwise): Lead and chromate free rust-inhibitive metal primer equal to Tnemec 10-99.
- L. Structural Steel Primer Paint for Architecturally Exposed Structural Steel: Organic Zinc-rich primer; Tnemec 90-97, Tneme-Zinc.
- M. Non-Metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C1107. Grout shall have a minimum compressive strength of 5000 psi at 28 days when tested in conformance with ASTM C 109.
- N. Masonry Anchors:
 - 1. Where secured to flanges of member, weld on anchor rods consisting of 9" overall length, ¼" bright finished wire with 3/8" offsets to provide 4" adjustment of masonry anchors. Adjustable portion by Mason.
 - 2. Where secured to webs of members, weld on anchors consisting of 8 gauge hot dipped galvanized angle, 7" high x 1/2 flange depth with 1" return for fastening. Provide 5" high slotted hole 3/4" from outer edge to receive wire tie wire tie by Mason.

2.2 FABRICATION

- A. Shop Fabrication and Assembly:
 - 1. Fabricate and assemble assemblies in the shop to the greatest extent possible. Fabricate items of steel in accordance with AISC Specifications and as indicated on the final Shop Drawings.
 - 2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence, which will expedite erection and minimize field handling of materials.
 - 3. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in the final structure free of markings, burrs, and other defects.
 - 4. Fabricate steel components exposed to view in the finished building from straightened steel elements in accordance with AISC "Code of Standard Practice for Steel Buildings and Bridges," Section 10. Fabricate built-up components with tight joints to close tolerance. Continuously weld, chip and grind joints eliminating water pocketing and entering the assembly. Provide all welded construction except where specifically shown otherwise on drawings. Remove backing bars and run-off tabs from members exposed to view.
- B. Connections:

1. Weld or bolt shop connections, as indicated.
 2. Bolt field connections, except where welded connections or other connections are indicated. Provide high-strength threaded fasteners. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts".
 3. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods, which will produce true alignment of axes without warp.
- C. Shear Connectors: Prepare steel surfaces as recommended by the manufacturer of the shear connectors. Use automatic end welding of headed stud shear connectors in accordance with the manufacturer's printed instructions.
- D. Holes for Other Work:
1. Provide holes required for securing other Work to structural steel framing, and for the passage of other Work through steel framing members, only as shown on the final Shop Drawings.
 2. Provide threaded nuts welded to framing, and other specialty items as shown to receive other Work.
 3. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- E. Masonry Anchors:
1. Weld to steel members as indicated on the Drawings.
 2. Where spacing is not shown, provide at 16" on center on columns and 16" on center on beams and girders.

2.3 SHOP FINISHING

- A. General: Shop paint all steel work, except as specified hereinafter. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.
1. Do not paint surfaces that are to be welded or high-strength bolted with slip critical connections.
 2. Do not paint steel to be covered by sprayed-on fireproofing.
 3. Portions embedded in concrete or masonry need not be painted.
- B. Surface Preparation: Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean in accordance with one of the following Steel Structures Painting Council (SSPC) Specifications. Solvent clean in accordance with SSPC SP-1 where further cleaning is required.
1. SP-2 "Hand Tool Cleaning."
 2. SP-3 "Power Tool Cleaning."
 3. SP-7 "Brush-Off Blast Cleaning."
 4. SP-6 "Commercial blasting" where section is to receive zinc-blow primer.
- C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with the manufacturer's instructions and at a rate to provide a uniform dry film thickness of 1.5 mils, except 3 mils dry for organic zinc rich primer. Use painting methods that will result in full coverage of joints, corners, edges and all exposed surfaces.
1. Provide 3 mils dry for organic zinc primer.
- D. Galvanizing: Galvanize steel members where indicated on the Drawings. Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
- E. Stainless-Steel:

1. Conformed to European Standard EN 10088 for polished finish having maximum surface roughness of Ra20 micro-inches or 0.5 microns (minimum #6 finish).

3.1 STORAGE AND HANDLING

- A. Store structural steel members at the project site above ground on platforms, skids or other supports.
- B. Store other materials in a weather-tight and dry place until ready for use in the work.
- C. Store packaged material in their original unbroken package or container.

3.2 ERECTION

- A. Surveys: Check elevations of bearing surfaces, and locations of anchor rods and similar devices, before erection work proceeds, and report discrepancies. Do not proceed with erection until corrections have been made, or until compensating adjustments to the structural steel work have been agreed upon with the Architect.
 1. Employ a State of Illinois Licensed Surveyor.
- B. Anchor Rods: Furnish anchor rods and other connectors required for securing structural steel to foundations and other in-place Work. Furnish templates and other devices as necessary for presetting rods and other anchors to accurate locations.
- C. Setting Bases and Bearing Plates:
 1. Clean bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing plates.
 2. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 3. Tighten anchor rods after the supported members have been positioned and plumbed. Do not remove wedges or shims; but, if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.
 4. Fill solidly between bearing surfaces and bases or plates with shrink-resistant grout to ensure that no voids remain. Grout only under conditions consistent with manufacturer's recommendations. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturer's instructions.
- D. Field Assembly:
 1. Set structural frames accurately to the lines and elevations. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignments.
 2. Level and plumb individual members of the structure within specified AISC tolerances.
 3. Establish required leveling and plumbing measurements on the mean operating temperature of the structure. Make allowances for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.
 4. Splice members only where indicated on shop drawings.
 5. Do not enlarge unfair holes in members by burning or by using pins. Ream holes that must be enlarged to admit bolts.
 6. Installation of drilled-in expansion and injection adhesive bolts shall be performed in strict compliance with the manufacturer's recommendations for spacing and edge distances. Verify minimum thickness of base material for anchor used.
 7. Join steel components exposed in architecturally exposed steel by continuously welding. Chip, fill with metal body putty, and grind joints smooth to eliminate water pocketing and entering the

assembly and provide smooth surface of welds. Provide all welded construction except where specifically shown otherwise on drawings. Remove backing bars and run-off tabs from members exposed to view.

E. Headed Studs:

1. Automatically end-weld headed studs in accordance with AWS D1.1
2. Surfaces to receive studs shall be free of foreign material such as rust, oil, grease, paint, etc. When mill scale is so thick as to prevent obtaining proper welds, remove by grinding or sandblasting.
3. Remove ceramic ferrules from studs and base material after welding.

F. High-Strength Bolts:

1. Install and tension high-strength bolts according to the Research Council on Structural Connections' "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
2. Bolts shall be A325 high-strength bolts, unless otherwise indicated.
3. Bolts shall be snug tight unless indicated as slip-critical, direct-tension or tensioned shear/bearing connections.

G. Weld Connections:

1. Comply with AWS D1.1 for procedures, appearance, quality of welds and methods used for correcting welded work.
2. Comply with AISC specification referenced in this section for bearing, adequacy of temporary connections, alignment and removal of paint on adjacent surfaces.

H. Erection Bolts:

1. On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
2. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to field welds.
3. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

- I. Gas Cutting: Do not use gas-cutting torches in the field for correcting fabrication errors in the structural framing. Cutting shall be permitted only on secondary members that are not under stress, as acceptable to the Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

3.3 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils (0.038 mm).
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanized repair paint according to ASTM A 780.

3.4 SUPPORT OF OTHER WORK

- A. No permanent loading, other than the weight of supported metal deck and concrete slabs, shall be imposed on floor and/or roof framing, until the concrete in such slabs has achieved 75 percent of its design strength.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: A qualified independent inspection and testing agency will be employed to inspect field welds and high strength bolted connections as outlined in Section 1.5 of this specification.

- B. Correct deficiencies in work that inspections and test reports have indicated are not in compliance with specified requirements.

END OF SECTION 05 12 00

SECTION 05 21 00 - STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Open-web K-series steel joists.
 - 2. LH-series long-span steel joists.
 - 3. Special joists designed by manufacturer.
 - 4. Joist accessories, including permanent bridging.

1.2 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's specifications and installation instructions for each type of joists and accessories.
- B. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, jointing and accessories. Include the mark, number, type, location and spacing of joists and bridging.

1.3 QUALITY ASSURANCE

- A. Standards: Provide joists fabricated in compliance with SJI "Standard Specifications.
- B. Qualification of Welding Work:
 - 1. Qualify welding processes and welding operators in accordance with the AWS "Qualification requirements".

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel joists as recommended in SJI Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with AISC and SCI Specifications.
- B. Steel Bearing Plates: ASTM A 36.
- C. High-Strength Threaded Fasteners: ASTM A 325 or A 490 heavy hexagon structural bolts with nuts and hardened washers.
- D. Steel Prime Paint: Comply with SJI Specifications, except asphalt type paint not permitted.

2.2 FABRICATION

- A. General: Fabricate steel joists in accordance with SJI Specifications.

- B. Camber: Camber joists according to SJI's Specifications, unless indicated otherwise.
- C. Holes in Chord Members: Provide holes in chord members only where shown on Shop Drawings for securing other Work to the steel joists; however, deduct the area of holes from the area of the chord when calculating the strength of the member.
- D. Extended Ends and Top Chord Extensions: Provide extended ends and top chord extensions complying with the manufacturer's standards and requirements of applicable SJI Specifications load tables.
- E. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord.
- F. Bridging:
 - 1. Provide horizontal or diagonal type bridging complying with SJI Specifications.
 - 2. Provide bridging anchors for ends of all bridging lines terminating at walls or beams.
 - 3. Provide a row of bracing at first panel point at all exterior walls and elsewhere where shown to resist wind uplift.
 - 4. Unless indicated, neither bridging nor bridging anchorage shall extend below the elevation of the joist bottom chords.
- G. End Anchorage: Provide end anchorages including steel bearing plates to secure joists to adjacent construction, complying with SJI Specifications.
- H. Shop Painting:
 - 1. Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.
 - 2. Apply shop coat of steel joist primer paint to steel joists and accessories, by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 1.00 mil.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Erector must examine the areas and conditions under which steel joists are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the Work. Start of Work will evidence acceptance.

3.2 ERECTION

- A. General: Place and secure steel joists in accordance with SJI Specifications," final Shop Drawings, and as herein specified.
- B. Anchors:
 - 1. Furnish anchor bolts and other devices to be built into the concrete. Furnish templates for the accurate location of anchors in other Work.
 - 2. Furnish unfinished, threaded fasteners for anchor bolts, unless otherwise indicated.
- C. Placing Joists:
 - 1. Do not start placement of steel joists until supporting Work is in place and secured. Place joists on supporting Work, adjust and align in accurate locations and spacing before permanently fastening.

2. Provide for temporary stability of joists as required by SJI Specifications and other applicable standards.
- D. Bridging: Install bridging simultaneously with joist erection, before any construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams. Unless indicated, do not allow bridging or bridging anchors to extend below the bottom chord of joists.
- E. Fastening Joists:
 1. Field weld joists to supporting steel framework in accordance with SJI Specifications for the type of joists used. Coordinate welding sequence and procedure with the placing of joists.

3.3 SUPPORT OF OTHER WORK

- A. Work of other trades imparting a horizontal load shall not be supported from the bottom chord of a joist without additional bracing, except as approved by the joist manufacturer.
- B. Vertical concentrated loads shall be supported at panel points unless additional web framing is provided or as allowed by the joist manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Joists welded in place are subject initially to inspection and testing by the Owner.

END OF SECTION 05 21 00

SECTION 05 31 10 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

1.2 SUBMITTALS

- A. Product Data: Include manufacturer's information as may be required to show compliance with these Specifications.
- B. Shop Drawings: Submit detailed drawings showing layout of deck panels, anchorage details and every condition requiring closure panels, supplementary framing, special jointing or other accessories.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following codes and standards, except as otherwise shown or specified to be more stringent:
1. AISI "Specification for the Design of Cold-Formed Steel Structural Members."
 2. AWS D1.3 "Structural Welding Code-Sheet Steel".
 3. SDI "Design Manual for Composite Decks, Form Decks and Roof Decks."
- B. Qualification of Welding Work:
1. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure."
 2. Decking welded in place is subject to inspection and testing. Remove Work found to be defective and provide new acceptable Work.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site at such intervals to ensure uninterrupted progress of the Work.
- B. Protect deck panels and accessories from corrosion and deterioration.
- C. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel for Galvanized Finish: ASTM A 653, Structural Quality.
- B. Galvanizing: ASTM A 924, G 60.

- C. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces.
- D. Flexible Closure Strips for Deck: Vulcanized, closed-cell, and synthetic rubber.

2.2 FABRICATION

- A. General: Form deck units in lengths to span 3 or more supports with nested 2" end laps and nesting side laps. Provide deck configurations complying with SDI "Specifications and Commentary for Steel Roof Deck" of depth and flute width indicated on Drawings and as specified herein.
 - 1. Provide galvanized steel deck, treated to receive paint where painting is scheduled.
- B. Acoustical Deck: Same configuration as roof deck units, unless otherwise shown, with perforated surfaces and sound absorption material to provide a minimum NRC rating of 0.65.
 - 1. Provide galvanized steel deck, treated to receive paint where painting is scheduled.
 - 2. Provide perforations on vertical webs of open flute roof deck units. Furnish sound absorbing material. Deliver to Roofing Installer for installation as part of this Work
- C. Roof Sump Pans: Fabricate from a single piece of not less than 14 gage galvanized sheet steel with level bottoms and sloping sides. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide.
- D. Metal Closure Strips: Fabricate of not less than 20 gage galvanized sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends and sides of decking.
- E. Mechanical Side Lap Fasteners: Manufacturer's standard, corrosion-resistant, hexagonal washer head, self-tapping, carbon steel screws, No. 10 minimum diameter, Factory Mutual approved as a method for securing steel roof deck for Class indicated above.
- F. Provide ridge and valley plates, closure plates, filler plates, sump pans, etc., necessary to perform the Work, whether shown on drawings or not.
- G. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install roof deck units and accessories in accordance with SDI.
- B. Fastening Deck Units: Unless noted otherwise, comply with the following:
 - 1. Permanently fasten deck units to steel supporting members by not less than 5/8" diameter fusion welds, or elongated welds of equal strength, not less than 12" on center at supports, unless noted otherwise.
 - 2. Comply with AWS requirements and procedures for manual shielded metal-arc welding, the appearance and quality of welds, and the methods used in correcting welding work.
 - 3. Lock side laps between adjacent deck units at maximum 3'-0" on center by screw mechanical fasteners, minimum 3 per span.

- C. Cutting and Fitting: Cut and fit roof deck units and accessories around other Work projecting through or adjacent to the roof decking. Provide neat, square and trim cuts.
- D. Reinforcement at Openings:
 - 1. Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other Work.
 - 2. Reinforce roof decking around openings greater than 6" to less than 12" in any dimension by means of a flat steel sheet placed over the opening and fusion welded to the top surface of the deck. Provide steel sheet of the same quality as the deck units, not less than 20 gage, and at least 12" wider and longer than the opening. Provide welds at each corner and spaced not more than 12" on center along each side. Openings greater than 12" across the ribs shall be suitably reinforced with angles. See Structural Drawings.
- E. Roof Sump Pans: Place roof sump pans over openings provided in the roof decking and weld to the top-decking surface. Space welds not more than 12" on center with at least one weld at each corner. Cut opening in the bottom of the roof sump to accommodate the drain size indicated.
- F. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- G. Closure Strips: Provide flexible closure strips at all open uncovered ends and edges of decking, and in the voids between decking and other construction.

3.2 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction:
 - 1. The Owner's testing service will inspect deck, deck fastening, and sidelap fastening.

END OF SECTION 05 31 10

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. All labor and materials required to design, furnish and install light gauge steel studs and tracks (in interior load bearing and shear walls and in all exterior wall and soffits), and joists, trusses, bridging, roof framing and related accessories, where shown on the Drawings and/ or required for complete installation.
- B. Provide openings and special framing required by other trades. Equipment framing, loads, openings and structure are shown for bidding purposes only. Obtain approval of other trades before proceeding with such work. Coordinate work with mechanical and electrical requirements. Review load requirements from other trades to design the metal framing accordingly (spacing thickness gauge, etc.).

1.2 RELATED DOCUMENTS

- A. Interior partition wall metal studs:
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A653 "Steel Sheet, Zinc-Coated (Galvanized) or Zinc—Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".
 - 2. ASTM C955 "Standard Specification for Load Bearing (Traverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases".
 - a. ASTM C1007 "Standard Specification for installation of Load Bearing (Traverse and Axial) Steel Studs and Accessories".
 - 3. American Welding Society (AWS):
 - a. AWS A2.4 "Symbols for Welding and Nondestructive Testing."
 - b. AWS D1.1 "Structural Welding Code - Steel."
 - c. AWS D1.3 "Structural Welding Code - Sheet Steel."
 - 4. Association of Wall and Ceiling Industries - International (AWCI) and Metal Lath/Steel Framing Association (ML/SFA):
 - a. AWCI-ML/SFA "Steel Framing Systems Manual."

1.4 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Ceiling joist framing.
4. Soffit framing
5. Parapet framing.
6. Vertical deflection clips.
7. Single deflection track.
8. Double deflection track.
9. Drift clips.
10. Post-installed anchors.
11. Power-actuated anchors.
12. Sill sealer gasket.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for masonry shelf angles and connections.
2. Section 09 22 16 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for each type of cold-formed metal framing and accessory required.
- B. Shop Drawings: Submit placement drawings for framing members showing size and gage designations, number, type, locations and spacing. Indicate supplemental strapping, bracing, bridging accessories and details required for proper installation.
1. Include fully dimensioned and detail drawings of special components not covered by Product Data.
 2. Indicate number of fasteners and/or size and length of weld.
 3. Include identification code for different gage studs, if any.
 4. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 5. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Stud sizes and details shown on Drawings indicate general installation and connection methods. Complete detailing of components for all loads and forces is to be shown on the Shop Drawings. Design of any non-standard conditions not detailed on the Drawings shall be provided by a registered professional Engineer

licensed in the State of Illinois, employed by the light gage metal framing contractor. No changes from sizes and installation methods shown will be permitted without the express written agreement of the Architect.

- D. Manufacturer's Certification: Submit written evidence of having a minimum of 5 years' experience on projects of similar type and scope, including a description of physical facilities, quality control, methods, personnel experience and erection capabilities.
- E. Delegated-Design Submittal: For cold-formed steel framing.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.8 QUALITY ASSURANCE

- A. Delegated Design: Engage a qualified engineer licensed in the State of Illinois, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.
- B. Component Design Standards: Comply with American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Structural Steel Members", except as otherwise indicated.
 - 1. Manufacturer to confirm size and gage of materials suitable for application indicated and loaded as follows:
 - a. Dead Load, Vertical: Attached materials.
 - b. Floor Live Loads
 - 1) Minimum Uniformly Distributed: 50 psf.
 - 2) Minimum Concentrated: 1,000 lbs
 - c. Roof Live Loads
 - 1) Minimum Uniformly Distributed: 50 psf
 - 2) Minimum Concentrated: 1,000 lbs..
 - d. Wind Load, horizontal (vertical for soffits), positive and negative:
 - 1) Exterior Walls: 30 psf positive and 30 psf negative (except 40 psf at corners).
 - 2) Exterior Soffits: 40 psf.

- 3) Interior: 5 psf.
- e. Deflection
 - 1) Floors: Maximum vertical deflection under live load of $1/480$ of span.
 - 2) Roofs: Maximum vertical deflection under live load of $1/240$ of span.
 - 3) Exterior Walls: Maximum horizontal deflection under wind load.
 - a) Exterior finish of full masonry brick: $1/600$ of span.
 - b) Exterior finish of thin brick or tile: $1/360$ of span.
 - c) Exterior finish of metal panel or curtain wall: $1/240$ of span.
 - 4) At interior applications with non-rigid facing: Not to exceed $L/360$.
 - 5) Soffit Applications: Not to exceed $L/360$.
- C. Welding: Comply with American Welding Society (AWS) "Structural Welding Code." Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
 - 1. All welding of lightgage metal components shall be performed only by operators qualified per AWS D1.1, for the gage of materials being used.
- D. Design framing systems to provide for movement of framing members (span/360 for beam members and interstory drift due to wind of story height/400) located outside the insulated building envelope 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 (67 deg C).
- E. Provide each type of cold-formed metal framing required produced by one manufacturer.
- F. Manufacturer: Minimum 5 years of experience on projects of similar size and scope.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and erection.
- B. Protect cold-formed steel framing and accessories from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling. Store metal framing off the ground on pallets, platform or other supports, with suitable waterproof covering. Keep metal framing free of dirt and other foreign material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ClarkDietrich Building Systems.
 - 2. MarinoWARE.
 - 3. The Steel Network, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Quality Assurance to design cold-formed steel framing.
- B. Structural Performance: see Quality Assurance
 - 1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.
 - 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Floor and Roof Systems: AISI S210.
 - 2. Wall Studs: AISI S211.
 - 3. Headers: AISI S212.
 - 4. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G90 (Z275) conforming to ASTM A653 in the following grades:
 - a. 16 gage and heavier: Grade 50, Class 1; min. $F_y = 50,000\text{psi.}$
- C. Steel Sheet for **Vertical Deflection, Drift** Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 50 (340), Class 1.
 - 2. Coating: G90 (Z275).

2.4 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: 16 gage unless otherwise indicated on drawings or recommended by manufacturer.
 - 2. Flange Width: minimum 1-5/8 inches.
 - 3. Section Properties: delegated design.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Delegated design
 - 2. Flange Width: Delegated design
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 16 gage unless otherwise indicated on drawings or recommended by manufacturer. Depth as indicated.
 - 2. Flange Width: minimum 1-5/8 inches
- D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
 - 1. Minimum Base-Metal Thickness: 16 gage
 - 2. Top Flange Width: minimum 1-5/8 inches

2.5 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: 16 gage
 - 2. Flange Width: minimum 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: 16 gage.
 - 2. Flange Width: 1-1/4 inches minimum
- C. Vertical Deflection Clips: Manufacturer's standard **bypass** and **head** clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web. As indicated by delegated design
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 16 gage
 2. Flange Width: 1 ¼ inches minimum.
- E. 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 loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 14 gage
 - b. Flange Width: 1 ¾" minimum.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 14 gage
 - b. Flange Width: 1 ¾" minimum
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, **unpunched** with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 gage
 2. Flange Width: 1-5/8 inches minimum.

2.7 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 gage
 2. Flange Width: 1-5/8 inches minimum.

2.8 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.

5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.9 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, carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified 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.

2.10 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: Minimum 79% zinc dust by weight in dried film. TNEMEC Company, Inc. No. 92 Tneme-Zinc; ZRC Cold Galvanizing Compound by ZRC.
- 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. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

- E. Sill Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.11 FABRICATION

- A. General: Framing Components may be prefabricated into panels or similar items prior to erection. Fabrication panels or items plumb, square, true to line and braced against racking with joint welded. Perform lifting of fabricated panels or items in a manner to prevent damage or distortion.
- B. Fabricate cold-formed steel 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 steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M 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 no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- C. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- D. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) 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 steel 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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 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 steel 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 steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M 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 joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal 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 approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) 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 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: per delegated design.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 - 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.
 - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 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" o.c. or as indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to **[bypassing] [infill]** studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

- a. Install solid blocking as indicated in delegated design.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 3. 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.
 - 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

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 steel 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 steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

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 01 Specification Sections, apply to this Section.
- B. Section 05 12 00 - Structural Steel
- C. Section 05 21 00 - Steel Joist Framing
- D. Section 05 31 00 - Steel Decking
- E. Section 05 40 00 - Cold Form Metal Framing
- F. Section 05 73 13 - Glazed Decorative Metal Railings
- G. Section 09 91 23 - Interior Painting

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for operable partitions.
 - 2. Steel framing and supports for countertops.
 - 3. Steel framing and supports for mechanical and electrical equipment.
 - 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 5. Metal ladders.
 - 6. Ladder safety cages.
 - 7. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
- C. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 04 20 00 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 3. Section 05 12 00 "Structural Steel Framing."

1.3 REFERENCES

- A. Steel Construction Manual: American Institute of Steel Construction (AISC).
- B. American Welding Society (AWS).
 - 1. AWS D1.1 - Structural Welding Code - Steel.
 - 2. AWS D1.3 – Structural Welding Code – Sheet Steel.
 - 3. AWS D1.2 – Structural Welding Code – Aluminum.
- C. American Society for Testing and Materials (ASTM).
 - 1. ASTM A36 - Structural Steel.
 - 2. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
 - 3. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. ASTM A283 – Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 6. ASTM A307 - Carbon Steel Bolts and Studs Externally and Internally Threaded Fasteners, 60,000 PSI Tensile Strength.
 - 7. ASTM A325 – Structural Bolts, Steel, Heat Strengthened, 120/105 KSI Minimum Tensile Strength.
 - 8. ASTM A500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 9. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 10. ASTM A510 - General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.
 - 11. ASTM A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
 - 12. ASTM A570 - Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
 - 13. ASTM A611 - Steel Sheet, Carbon, Cold-Rolled, Structural Quality.
 - 14. ASTM A780 - Practice for Repair of Damaged Hot-Dip Galvanized Coatings.
 - 15. ASTM A48 - Gray Iron Castings.
 - 16. ASTM B209 – Aluminum and Aluminum-Alloy Sheet and Plate.
 - 17. ASTM B308 – Aluminum-Alloy 6061-T6 Standard Structural Profiles.
 - 18. ASTM B429 – Aluminum-Alloy Extruded Structural Pipe and Tube.
- D. American National Standards Institute (ANSI)
 - 1. ANSI A14.3 - Safety Requirements for Fixed Ladders
 - 2. ANSI Z49.1 – Safety in Welding, Cutting and Allied Processes
- E. National Association of Architectural Metal Manufacturers, (NAAMM).
- F. Society for Protective Coatings (SSPC)
 - 1. SSPC-SP1 - Solvent Cleaning
 - 2. SSPC-SP2 - Hand Tool Cleaning
 - 3. SSPC-SP3 - Power Tool Cleaning
 - 4. SSPC-SP6 - Commercial Blast Cleaning
 - 5. SSPC-SP11 - Power Tool Cleaning to Bare Metal

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Prefabricated building columns.
 - 2. Paint products.
 - 3. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for operable partitions.
 - 2. Steel framing and supports for countertops.
 - 3. Steel framing and supports for mechanical and electrical equipment.
 - 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 5. Metal ladders.
 - 6. Ladder safety cages.
- C. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.7 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.
- B. Structural Performance of Aluminum Ladders: Aluminum ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304, A300 series.
- E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304, A300 series
- F. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

- G. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- H. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- I. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- J. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- K. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- L. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type A300 series stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Shop Primers: Provide primers that comply with Section 099123 Interior Painting.
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- G. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- J. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes as indicated and recommended by partition manufacturer with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.7 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3
 - 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 3/4-inch-diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) IKG.
 - 2) Ross Technology Corporation.
 - 3) W.S. Molnar Company.
6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
7. Galvanize and prime ladders, including brackets.
8. Prime ladders, including brackets and fasteners, with zinc-rich primer.

2.8 LADDER SAFETY CAGES

A. General:

1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners unless otherwise indicated.

B. Steel Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
4. Galvanize and prime ladder safety cages, including brackets and fasteners.
5. Prime ladder safety cages, including brackets and fasteners, with zinc-rich primer.
6. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

C. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

D. Galvanize and prime exterior steel frames.

E. Prime exterior steel frames with zinc-rich primer.

2.9 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.10 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 1. Cast Aluminum: Heavy coat of bituminous paint.
 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to, and rigidly brace from, building structure.

- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

3.3 INSTALLING 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 nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in "Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00

SECTION 05 73 13 - GLAZED DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Glass- and plastic-supported railings.
 - 2. Post-supported railings with glass infill.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood blocking for anchoring railings.

1.3 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of railings assembled from standard components.
 - 2. Grout, anchoring cement, and paint products.

- B. Shop Drawings: Include plans, elevations, sections, and attachment details.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Each type of glass required.
 - 3. Fittings and brackets.
 - 4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- D. Preconstruction test reports.
- E. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.8 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups as shown on Drawings.
 - 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Railing System: Drawings and specification are based on BLUMCRAFT RG-200E.
- B. Other Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. HDI Railing Systems
 - 2. Laurence, C. R. Co., Inc.
 - 3. Livers Bronze Co.
 - 4. Wagner, R & B, Inc.
- C. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for system's 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 structural analysis, preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. See Section 01 60 00 "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.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
 - 2. Copper Alloys: 60 percent of minimum yield strength.
 - 3. Stainless Steel: 60 percent of minimum yield strength.
 - 4. Steel: 72 percent of minimum yield strength.
 - 5. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

- C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
 - 3. Glass-Supported Railings: Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.4 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Extruded Bars and Shapes, Including Extruded Tubing: ASTM B 221, Alloy 6063-T5/T52.
- C. Extruded Structural Pipe and Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
- D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.
- E. Plate and Sheet: ASTM B 209, Alloy 5005-H32.
- F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.
- G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.5 GLASS AND GLAZING MATERIALS

- A. Infill Panel: Laminated Glass: ASTM C 1172, Condition A (uncoated), Type I (transparent flat glass), Quality-Q3 with two plies of glass and polyvinyl butyral interlayer not less than 0.060 inch thick. Tested for impact strength according to Consumer Product Safety Commission (CPSC) 16 CFR 1201, Category II.
1. Kind: LFT (laminated full tempered).
 3. Glass Color: Clear. Interlayer Color: Clear.
 4. Factory drill holes at glass butt joints to receive railing brackets as indicated. Place holes in accordance to ASTM C1048 for minimum distances required from edge of glass.
 5. Edge Treatment: Beveled polished edge of width shown.
 6. Glass Plies for Glass Infill Panels: Thickness required by structural loads, but not less than 3/8", each (13/16" total thickness).
- B. Base system: Two piece with mounting bolts with snap in cover plates each side. Cast and extruded aluminum. Provide aluminum cover in widths indicated.
- C. Fittings and Accessories: As required for a complete installation.
1. Top Rail: Equal to BLUMCRAFT 324. Clear anodized aluminum.
- B. Safety Glazing: Glazing shall comply with 16 CFR 1201, Category II.
- C. Safety Glazing Labeling: Permanently mark glass with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- D. Glazing Cement and Accessories for Structural Glazing: Glazing cement, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal subrails.
1. Glazing Cement: Nonshrinking organic cement designed for curing by passing an electric current through metal subrail holding glass panel, as standard with manufacturer.
- E. Glazing Gaskets for Glass Infill Panels: Glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.
- F. Base system: two piece with mounting bolts with snap in cover plates each side. Cast and extruded aluminum. Provide aluminum cover in widths indicated.
- G. Fitting and Accessories: As required for complete installation.
1. Top Rail: Equal to BLUMCRAFT 324. Clear anodized aluminum.

2.6 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
1. Aluminum Components: **Type 304** stainless-steel fasteners.
 2. Stainless-Steel Components: **Type 304** stainless-steel fasteners.

3. Dissimilar Metals: **Type 304** stainless-steel fasteners.

- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.
 - 1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308]
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.7 MISCELLANEOUS MATERIALS

- A. Low-Emitting Paints and Coatings: Paints and coatings applied to interior decorative metal railings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Lacquer for Copper Alloys: Clear acrylic lacquer specially developed for coating copper-alloy products.
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.8 FABRICATION

- A. General: Fabricate railings 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 railings 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. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- F. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- G. Form changes in direction as follows:
 - 1. As detailed.
 - 2. By bending to smallest radius that will not result in distortion of railing member.
- H. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- I. Close exposed ends of hollow railing members with prefabricated end fittings.
- J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work where indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.
- K. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- L. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.9 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of

approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.10 ALUMINUM FINISHES

- A. Mechanical Finish: AA-M3x; sand top rails, handrails, and intermediate rails in one direction only, parallel to length of railing, with 120- and 320-grit abrasive. After installation, polish railings with No. 0 steel wool immersed in paste wax, then rub to a luster with a soft dry cloth.
- B. Clear Anodic Finish: AAMA 611

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. 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 railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 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 railings.

- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.3 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material attached to post with set screws.
- D. Leave anchorage joint exposed with anchoring material flush with adjacent surface.
- E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum railings, attach posts as indicated using fittings designed and engineered for this purpose.
 - 2. For copper-alloy railings, attach posts as indicated using fittings designed and engineered for this purpose.
 - 3. For stainless-steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 INSTALLING GLASS PANELS

- A. Glass-Supported Railings: Install assembly to comply with railing manufacturer's written instructions.
 - 1. Attach base channel to building structure, then insert and connect factory-fabricated and -assembled glass panels if glass was bonded to base and top-rail channels in factory.
 - 2. Attach base channel to building structure, then insert glass into base channel and bond with glazing cement unless glass was bonded to base and top-rail channels in factory.
 - a. Support glass panels in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing cement. Fill remaining space in base channel with glazing cement for uniform support of glass.
 - 3. Adjust spacing of glass panels so gaps between panels are equal before securing in position.
 - 4. Erect glass railings under direct supervision of manufacturer's authorized technical personnel.

- B. Post-Supported Glass Railings: Install assembly to comply with railing manufacturer's written instructions and with requirements in other Part 3 articles. Erect posts and other metal railing components, then set factory-cut glass panels. Do not cut, drill, or alter glass panels in field. Protect edges from damage.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Owner.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.
- D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with water and soap, rinsing with clean water, and wiping dry.
- B. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 05 73 13

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Framing with engineered wood products.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Wood blocking and nailers.
 - 5. Wood sleepers.
 - 6. Utility shelving.
 - 7. Plywood backing panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Post-installed anchors.
6. Metal framing anchors.

1.5 QUALITY ASSURANCE

- A. Standards for lumber shall comply with current PS-20.
- B. Standards for plywood shall comply with current PS-1.
- C. Grading Requirements
 1. All materials with nominal thickness of 3" or less shall be kiln dried. Moisture content shall not exceed 19%.
 2. Grade and trademark will be required on each piece of lumber (or bundle in bundled stock). Use only the recognized official marks of association under whose rules it is graded. Grade and trademarks will not be required if each shipment is accompanied by certificate of inspection issued by association.
 3. Lumber shall be sound, thoroughly seasoned and free from warp that cannot be corrected in process of bridging or nailing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Immediately upon delivery to jobsite, place materials in area protected from weather.
- B. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- C. Do not store seasoned materials in wet or damp portions of the building.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness.

2.2 MISCELLANEOUS LUMBER

- A. General: Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS-20. Provide dressed lumber, S4S, unless otherwise indicated. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
- B. Non-load bearing members shall be Standard or Stud Grade, Douglas Fir, Western Larch, Western Hemlock (WWPA or WCLA) or No. 2 Dimension Southern Pine (SPIB).

2.3 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
 - 1. Plywood shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel when in contact with stainless steel materials/flashings.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.5 METAL FRAMING ANCHORS

- A. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.
- D. Stainless-Steel Sheet: ASTM A 666, **Type 304**.
 - 1. Use for exterior locations and where indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
- D. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less.
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Install shear wall panels to comply with manufacturer's written instructions.
- F. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- G. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- H. Do not splice structural members between supports unless otherwise indicated.
- I. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
 - 3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.
- K. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- L. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- M. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- N. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 3. ICC-ES evaluation report for fastener.
- O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- P. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
 3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

END OF SECTION 06 10 00

SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Base Bid:
 - a. Interior trim.
 - b. Interior wood veneer paneling.
 - c. Panel edging for prefabricated, acoustical, wood veneer wall and ceiling paneling as specified in Section 06 42 16 "Flush Wood Paneling."

- B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry."
- 2. Section 06 41 13 "Wood-Veneer-Face Architectural Cabinets."
- 3. Section 06 42 16 "Flush Wood Paneling."
- 4. Section 09 93 00 "Staining and Transparent Finishing."
- 5. Section 12 36 61.19 "Quartz Agglomerate Countertops."
- 6. Section 26 05 33 Raceways and Boxes for Electrical Systems
- 7. Section 26 09 23 Lighting Control Devices

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of products, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
 - 1. Show details full size.

2. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
3. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
4. Apply WI Certified Compliance Program label to first page of Shop Drawings.

C. Samples:

1. For each finish system and color of lumber and panel products with applied finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Fabricator.
- B. Product Certificates: For each type of product.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates or WI Certified Compliance Program certificates.
- D. Evaluation Reports: For fire-retardant-treated wood, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program or is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Fabricator of products.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups of typical paneling as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
- C. Field Measurements: Where paneling 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 paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling and wood trim.
- B. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of flush wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels or certificates from AWI or WI certification program indicating that paneling, including installation, complies with requirements of grades specified.

- C. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- D. Wood Moisture Content: 5 to 10 percent.
- E. Lumber: DOC PS 20 and the following grading rules:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
 - 2. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
 - 3. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
 - 4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
 - 5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
 - 6. WWP: Western Wood Products Association, "Western Lumber Grading Rules."
- F. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
- G. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.
 - 2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.
- H. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction, and comply with testing requirements; testing by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.
- C. For exposed items indicated to receive a stained or natural finish, use organic resin chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.

- D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
 - 2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
- F. Application: All interior lumber and plywood.

2.3 INTERIOR TRIM

- A. Trim at Acoustic and Interior Wood Veneer Paneling:
 - 1. Species and Grade: White maple; Clear; NHLA.
 - 2. Maximum Moisture Content: 10 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Gluing for Width: Not allowed.
 - 5. Veneered Material: Not allowed.
 - 6. Face Surface: Surfaced (smooth).
 - 7. Matching: Selected for compatible grain and color.
 - 8. Finish: Match Architect's samples and comply with applicable requirements in Section 09 93 00 "Staining and Transparent Finishing."

2.4 INTERIOR WOOD VENEER PANELING

- A. Grade: Custom.
- B. Veneer Paneling at Lobby #101: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1, made without urea-formaldehyde adhesive.
 - 1. Veneer Grade: A.
 - 2. Veneer Species and Cut: Maple, quarter sliced.
 - 3. Matching of Adjacent Veneer Leaves and within Panel Face: Slip, center, book match.
 - 4. Panel-Matching Method: No matching is required between panels. Select and arrange panels for similarity of grain pattern and color between adjacent panels.
 - 5. Backing Veneer Species: Any hardwood compatible with face species.
 - 6. Construction: Veneer core.
 - a. Thickness: 1/4 inch.
 - 7. Glue Bond: Type II (interior).
 - 8. Panel Size: Height as indicated on Drawings. Widths as required to create curve.
 - 9. Finish: Match Architect's samples and comply with applicable requirements in Section 09 93 00 "Staining and Transparent Finishing."

- C. Perforated Veneer Paneling at Lobby #101 and Vestibule #143: Manufacturer's stock particleboard or medium-density fiberboard panels with custom perforation pattern, made without urea-formaldehyde adhesive.
1. Manufacturers / Products:
 - a. CertainTeed / Wood Ceilings & Walls Panels
 - b. Architect approved equal
 2. Veneer Grade: A.
 3. Veneer Species and Cut: Maple, quarter sliced.
 4. Matching of Adjacent Veneer Leaves and within Panel Face: Slip, center, book match.
 5. Panel-Matching Method: No matching is required between panels. Select and arrange panels for similarity of grain pattern and color between adjacent panels.
 6. Panel Core Construction: Fire-retardant particleboard or fire-retardant, medium-density fiberboard.
 - a. Thickness: 3/4 inch.
 7. Panel Size: As indicated on Drawings.
 8. Perforation Pattern:
 - a. Type: Round Straight.
 - b. Hole Size: 6mm.
 - c. Hole Spacing Horizontally: 16mm O.C.
 - d. Hole Spacing Vertically: 16mm O.C.
 9. Finish: Match Architect's samples and comply with applicable requirements in Section 09 93 00 "Staining and Transparent Finishing."
 10. Reveal Between Panels: 1/4 inch, unless indicated otherwise on Drawings.

2.5 PANEL EDGING

- A. Grade: Custom.
- B. Exposed Panel Edges for components covered in Section 06 42 16 "Flush Wood Paneling" and in this Section: Wood-veneer matching faces finished in compliance with applicable requirements in Section 09 93 00 "Staining and Transparent Finishing."

2.6 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FABRICATION

- A. 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.
- B. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- C. Complete fabrication, including assembly and finishing, 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.
- D. 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.

2.8 SHOP FINISHING

- A. General: Finish paneling at fabrication shop as specified in Section 09 93 00 "Staining and Transparent Finishing." Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
 1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.
- C. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.3 INSTALLATION, GENERAL

- A. Grade: Install paneling to comply with same grade as paneling to be installed.
- B. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.
- C. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior 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.
 - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 INTERIOR TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install trim after gypsum-board joint finishing operations are completed.
 - 3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 INTERIOR WOOD VENEER PANELING INSTALLATION

- A. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Install with no more than 1/16 inch in 96-inch (1.6 mm in 2400-mm) vertical cup or bow and 1/8 inch in 96-inch (3 mm in 2400-mm) horizontal variation from a true plane.

1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch (0.8 mm).
- B. Anchor paneling to supporting substrate with concealed panel-hanger clips, unless indicated otherwise on Drawings. Do not use face fastening.

3.6 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

END OF SECTION 06 20 23

SECTION 06 41 13 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Base Bid:
 - a. Architectural wood cabinets.
 - b. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
- 2. Deduct Alternate Bid: None.

- B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
- 2. Section 06 20 23 "Interior Finish Carpentry."
- 3. Section 09 93 00 "Staining and Transparent Finishing."
- 4. Section 12 36 61.19 "Quartz Agglomerate Countertops."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

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

- 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 details full size.
- 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural wood cabinets.
4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
5. Apply WI Certified Compliance Program label or AWI Quality Certification Program label to Shop Drawings.

C. Samples:

1. Lumber for transparent finish, not less than 5 inches (125 mm) wide by 12 inches (300 mm) long, for each species and cut, finished on one side and one edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished cabinets.
3. Thermoset decorative panels, 8 by 10 inches (200 by 250 mm), for each color, pattern, and surface finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Fabricator.
- B. Product Certificates: For each type of product.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates or WI Certified Compliance Program certificates.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program or is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Fabricator of products.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where cabinets 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. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 CABINETS, GENERAL

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural cabinets with sequence-matched wood veneers.
- B. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels or certificates from AWI or WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

2.2 MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 WOOD-VENEER-FACED CABINETS FOR TRANSPARENT FINISH

- A. Grade: Custom.
- B. Type of Construction: Frameless.
- C. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
- D. Veneer Cladding for Exposed Surfaces:
 1. Species: Maple.
 2. Cut: Quarter cut/quarter sawn.
 3. Matching of Veneer Leaves: Slip match.
 4. Veneer Matching within Panel Face: Center-balance match.
 5. Edges: Wood-veneer matching faces.
 6. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
- E. Semiexposed Surfaces: Provide surface materials indicated below:
 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Thermoset Decorative Panel Shelves: Bio-based edge banding, 1.00 mil thick.
 2. Drawer Subfronts, Backs, and Sides: Thermoset decorative panels with bio-based edge banding, 1.00 mil thick.
 3. Drawer Bottoms: Thermoset decorative panels.
- F. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- G. Finishes: Match Architect's samples and comply with applicable requirements in Section 09 93 00 "Staining and Transparent Finishing."

2.4 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening, self-closing.
- B. Back-Mounted Pulls: BHMA A156.9, B02011.

- C. Bar Pulls: Back mounted bar, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 - 4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
 - 5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. 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.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 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 metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.6 FABRICATION

- A. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets: 1/16 inch (1.5 mm) unless otherwise indicated.

- B. 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. 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 before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, 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.

2.7 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in Section 09 93 00 "Staining and Transparent Finishing." Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
 - 1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive architectural wood cabinets, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine architectural wood cabinets 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. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.3 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.

- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
 - 1. For shop finished items use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) 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, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, 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 cabinets on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 41 13

SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Base Bid:
 - a. Plastic-laminate-faced architectural cabinets.
 - b. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
- 2. Deduct Alternate Bid: None.

B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
- 2. Section 12 36 61.19 "Quartz Agglomerate Countertops."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 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 details full size.
- 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- 3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
- 4. Apply WI Certified Compliance Program label or AWI Quality Certification Program label to Shop Drawings.

C. Samples:

1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each color, pattern, and surface finish.
2. Thermoset decorative panels, 8 by 10 inches (200 by 250 mm), for each color, pattern, and surface finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Fabricator.
- B. Product Certificates: For each type of product.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates or WI Certified Compliance Program certificates.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program or is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Fabricator of products.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where cabinets 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. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. 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 cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 CABINETS, GENERAL

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural cabinets.
- B. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels or certificates from AWI or WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

2.2 MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130 made with binder containing no urea formaldehyde.
 - 2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde. Grade M-2-Exterior Glue.
 - 3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
 - 4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 PLASTIC-LAMINATE-FACED CABINETS

- A. Grade: Custom.

- B. Type of Construction: Frameless.
- C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- D. Laminate Cladding for Exposed Surfaces:
 - 1. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 2. Horizontal Surfaces: Grade HGS.
 - 3. Postformed Surfaces: Grade HGP.
 - 4. Vertical Surfaces: Grade VGS.
 - 5. Edges: Grade HGS.
 - 6. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- E. Acceptable Manufacturers:
 - 1. Wilsonart
 - 2. Formica
 - 3. Nevamar
 - 4. Pionite
- F. Semi exposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Thermoset Decorative Panel Shelves: Bio-based edge banding, 1.00 mil 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, NEMA LD 3, Grade VGS.
 - 2. Drawer Sides and Backs: Thermoset decorative panels with Bio-based edge banding.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- I. Colors, Patterns, and Finishes:
 - 1. PLAM-1: To be selected from manufacturer's full range of laminates.
 - 2. Architect approved equal.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening, self-closing.
- B. Back-Mounted Pulls: BHMA A156.9, B02011.

- C. Bar Pulls: Back mounted bar, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 - 4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
 - 5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. 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.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 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 metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.6 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly 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. 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 before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive architectural cabinets, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine architectural cabinets 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. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.3 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, 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 cabinets on exposed and semi exposed surfaces.

END OF SECTION 06 41 16

SECTION 06 42 16 - FLUSH WOOD PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Base Bid:
 - a. Prefabricated, acoustical, wood veneer wall and ceiling paneling.
 - b. Systems and accessories for installing paneling.
- 2. Deduct Alternate Bid #3:
 - a. Remove prefabricated, acoustical, wood veneer ceiling paneling.
 - b. Systems and accessories for installing paneling.
- 3. Deduct Alternate Bid #11:
 - a. Reduced quantity of prefabricated, acoustical, wood veneer wall paneling.
 - b. Systems and accessories for installing paneling.

B. Related Requirements:

- 1. Section 06 20 23 "Interior Finish Carpentry."
- 2. Section 09 93 00 "Staining and Transparent Finishing."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 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 paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.

1. Show details full size.
2. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
3. Show finished panel sizes, set numbers, and sequence numbers within sets.
4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
5. Clearly indicate items to be custom millwork components covered in Section 06 20 23 "Interior Finish Carpentry" and items to be prefabricated components covered in this Section.

C. Samples:

1. Veneer-faced panel products with transparent finish, 8 by 10 inches (200 by 250 mm) for each species and cut.
2. Acoustical fill material.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Mounting system components.
 2. Structural members to which systems will be attached.
 3. Size and location of initial access modules for panels.
 4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Sprinklers.
 5. Perimeter moldings.
- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of product.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Panels: Full-size panels equal to 2 percent of quantity installed.
 2. Mounting System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Company that employs skilled workers and is recommended, in writing, by Manufacturer.
- B. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas.
- B. Deliver materials in manufacturer's unopened packages; suitably store to protect against exposure to moisture, sunlight, surface contamination, and other unacceptable conditions.
- C. Handle components to prevent panel edge damage or any other damage to components.
- D. If paneling must be stored in areas other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature between 50 and 86 degrees F (10 and 30 degrees C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.11 COORDINATION

- A. Coordinate sizes and locations with other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 450 or less.

2.2 PANELING, GENERAL

- A. Source Limitations: Obtain each type of panel and mounting system from single source from single manufacturer.
- B. Panel Standard:
 - 1. Provide manufacturer's standard panels of configuration indicated that comply with designated types, patterns, and acoustical ratings unless otherwise indicated.
 - 2. Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- C. Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
- D. Wood Moisture Content: 5 to 10 percent.
- E. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
- F. Fire-Retardant-Treated Materials:
 - 1. Fire-Retardant-Treated Materials, 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 as determined by testing identical products per test method indicated by a qualified testing agency.
 - a. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
 - b. 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.
 - c. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

2. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
 - a. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2070 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 and 225 lbf (1100 and 1000 N), respectively.
 3. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
- G. Adhesives: Do not use adhesives that contain urea formaldehyde.
- H. Source all items in this section from the same manufacturer. Provided they comply with the project requirements, the following Manufacturers / Products will be considered acceptable:
1. CertainTeed / Wood Ceilings & Walls Panels
 2. Architect approved equal.

2.3 ACOUSTICAL WOOD VENEER PANELING

A. Wall System at Assembly Hall room #136:

1. Veneer Grade: A.
2. Veneer Species and Cut: Maple, quarter sliced.
3. Matching of Adjacent Veneer Leaves and within Panel Face: Slip, center, book match.
4. Panel-Matching Method: No matching is required between panels. Select and arrange panels for similarity of grain pattern and color between adjacent panels.
5. Panel Core Construction: Fire-retardant particleboard or fire-retardant, medium-density fiberboard.
 - a. Thickness: 3/4 inch.
6. Panel Size: See Drawings.
7. Perforation Pattern:
 - a. Type: Round Straight.
 - b. Hole Size: 6mm.
 - c. Hole Spacing Horizontally: 16mm O.C.
 - d. Hole Spacing Vertically: 16mm O.C.
8. Finish: Manufacturer's standard clear-coated finish.
9. Exposed Panel Edges: Comply with applicable requirements in Section 06 20 23 "Interior Finish Carpentry."
10. Reveal Between Panels: 1/4 inch.

B. Ceiling System at Vestibule #143:

1. Veneer Grade: A.

2. Veneer Species and Cut: Maple, quarter sliced.
3. Matching of Adjacent Veneer Leaves and within Panel Face: Slip, center, book match.
4. Panel-Matching Method: No matching is required between panels. Select and arrange panels for similarity of grain pattern and color between adjacent panels.
5. Finish: Manufacturer's standard clear-coated finish.
6. Perforation Pattern:
 - a. Type: Round Straight.
 - b. Hole Size: 6mm.
 - c. Hole Spacing Horizontally: 16mm O.C.
 - d. Hole Spacing Vertically: 16mm O.C.
7. Panel Core Construction: Fire-retardant particleboard or fire-retardant, medium-density fiberboard.
 - a. Thickness: 3/4 inch.
8. Exposed Panel Edges: Comply with applicable requirements in Section 06 20 23 "Interior Finish Carpentry."
9. Panel Size: See Drawings.
10. Reveal Between Panels: 1/4 inch.

2.4 ACCESSORIES

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
- B. Wall System at Assembly Hall Room #136:
 1. Mounting Accessories: Manufacturer's standard metal Z-Clip and Z-Clip bar accessories for securely mounting panels of type and size indicated to substrates provided.
- C. Ceiling System at Vestibule #143:
 1. 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/C 635M.
 2. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 3. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - a. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - b. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
 4. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.

- a. Structural Classification: Heavy-duty system.
 - b. Face Design: Flat, flush.
 - c. Cap Material: Steel cold-rolled sheet.
 - d. Finish: Black.
- 5. Panel Attachment Accessories: Manufacturer's standard T-Bar hook brackets for concealed suspension, mounted to back face of panels and secured to suspension system with safety cables.
- 6. Trim Accessories: Manufacturer's standard attachment clip for solid wood trim. Solid wood trim to comply with applicable requirements in Section 06 20 23 "Interior Finish Carpentry."
 - a. Trim Height: As indicated on Drawings.
- 7. Acoustic Accessories: Manufacturer's standard acoustic infill panels that do not contain urea formaldehyde.
 - a. Size: 24 by 24 inches.
 - b. Thickness: 5/8 inch.
 - c. Color: Black.
 - d. NRC: Not less than 0.75.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which panels attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of panels.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.
- B. Examine panels before installation. Reject panels that are chipped, scratched, bowed, wet, moisture or mold damaged, or flawed in any way.

3.3 WALL INSTALLATION

- A. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Install with no more than 1/16 inch in 96-inch (1.6 mm in 2400-mm) vertical cup or bow and 1/8 inch in 96-inch (3 mm in 2400-mm) horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch (0.8 mm).

- B. Anchor paneling to supporting substrate. Do not use face fastening unless otherwise indicated.

3.4 CEILING INSTALLATION

- A. Install panels to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. 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.
 - 8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of ceiling area and where necessary to conceal edges of panels.
 - 1. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install panels with undamaged edges. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange panels as indicated on reflected ceiling plans.
 - 2. For flush paneling with revealed joints, install with variations in reveal width, alignment of, and flushness between adjacent panels not exceeding 1/32 inch (0.8 mm).

3.5 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate defects; where not possible to repair, replace paneling. Adjust for uniform appearance.

- B. Clean exposed surfaces of panels, including trim and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 06 42 16

SECTION 07 14 16 – COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold fluid-applied waterproofing, vertical and horizontal deck applications.
2. Protection course, Drainage panels, Insulation drainage panels.

1.2 RELATED REQUIREMENTS

1. Section 03 30 00 "Cast-in-Place Concrete" for moisture curing of concrete waterproofing substrate.
2. Section 04 20 00 "Unit Masonry" for compatibility with flashing components.
3. Division 0727 26 - air barrier section for wall waterproofing and interface coordination.
4. Section 07 92 00 "Joint Sealants" for joint sealants and accessories and joint preparation.
5. Section 07 95 00 "Expansion Control" for expansion joint systems.

1.3 REFERENCES

A. References, General: Versions of the following standards current as of the date of issue of the project apply to the Work of this Section.

B. ASTM International (ASTM): www.astm.org:

1. ASTM C 836 – Standard Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
2. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants
3. ASTM D 4258 - Standard Practice for Surface Cleaning Concrete for Coating
4. ASTM D 4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
5. ASTM D 4716 - Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
6. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials
7. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials

C. U. S. Environmental Protection Agency (EPA): www.epa.gov:

1. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference at Project Site.

1. Review requirements for waterproofing products and installation, including surface preparation, substrate conditions, project and manufacturer's details, installation procedures, mockups, testing and inspection requirements, protection and repairs, and coordination and sequencing of waterproofing work with work of other Sections.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of waterproofing product specified, including:
 - 1. Technical data indicating compliance with requirements.
 - 2. Substrate preparation instructions and recommendations.
- B. Shop Drawings: Show locations for waterproofing system components. Show details for each type of substrate, joints, corners, and edge conditions, including flashings, counterflashings, penetrations, transitions, and terminations.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer[, and waterproofing Inspector].
 - 1. Certification of manufacturer's approval of Installer.
- B. Low-Emitting Product Certificate: For waterproofing products specified to meet volatile organic emissions standards, submit Greenguard Children and Schools Certification or comparable certification acceptable to Architect.
- C. Product Test Reports: Test data for waterproofing products and waterproofing system, by qualified testing agency, indicating proposed waterproofing meets performance requirements, when requested by Architect.
- D. Warranty: Sample of unexecuted manufacturer and installer special warranties.
- E. Field quality control reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A manufacturer-approved firm with minimum [three] years experience in installation of specified products in successful use on similar projects, employing workers trained by manufacturer, including a full-time on-site supervisor with a minimum of [three] years experience installing similar work, and able to communicate verbally with Contractor[, Architect,] and employees.
- B. Manufacturer Qualifications: A qualified manufacturer [listed in this Section] with minimum five years experience in manufacture of waterproofing as one of its principal products.
 - 1. Manufacturer's product submitted has been in satisfactory operation on five similar installations for at least five years.
 - 2. Approval of Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Completed and signed Substitution Request form.
 - b. Product data, including certified independent test data indicating compliance with requirements.
 - c. Sample shop drawings from similar project.
 - d. Project references: Minimum of five installations of similar system not less than five years old, with Owner and Architect contact information.
 - e. Name and resume of proposed qualified Inspector.
 - f. Sample warranty.

- C. Waterproofing Inspector Qualifications: An independent party certified as a waterproofing inspector by the SWRI or other certifying organization acceptable to Architect, retained by the Contractor and experienced in the installation and maintenance of the specified waterproofing system, qualified to perform observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification.
- D. Testing Agency Qualifications: Qualified independent agency experienced in the installation of the specified waterproofing system, and qualified to perform observation and inspection specified in Field Quality Control Article to determine Installer's compliance with the requirements of this Project, acceptable to Architect, retained by the Contractor.
- E. Mockups: Provide waterproofing mockup application within mockups required in other sections, or if not specified, in an area of not less than 150 sq. ft. (14 sq. m) of surface where directed by Architect for each type of substrate condition. Include examples of surface preparation, crack and joint treatment, waterproofing application, and flashing, transition, and termination conditions, to set quality standards for execution.
 - 1. Include intersection of deck waterproofing with adjacent vertical waterproofing and moisture control system.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Accept materials on site in manufacturer's unopened original packaging.
- B. Store products in weather protected environment, clear of ground and moisture, within temperature ranges recommended by waterproofing manufacturer.
- C. Construction Waste: Store and dispose of packaging materials and construction waste in accordance with requirements of Division 01 Section "Construction Waste Management".

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer.
 - 1. Protect substrates from environmental conditions that affect waterproofing performance.
 - 2. Do not apply waterproofing during snow, rain, fog, or mist.

1.10 SCHEDULING

- A. Coordinate installation of waterproofing with completion of roofing and other work requiring interface with waterproofing.
- B. Schedule work so waterproofing applications may be inspected prior to concealment.
- C. Ensure waterproofing materials are cured before covering with other materials.

1.11 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which waterproofing manufacturer agrees to furnish waterproofing material to repair or replace those materials installed according to

manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.

1. Access for Repair: Owner shall provide unimpeded access to the Project and the waterproofing system for purposes of testing, leak investigation, and repair, and shall reinstall removed cladding and overburden materials upon completion of repair.
2. Cost Limitation: Manufacturer's obligation for repair or replacement shall be limited to the original installed cost of the work.
3. Warranty Period: 10 years date of Substantial Completion.

1.12 MANUFACTURERS

- A. Basis-of-Design Products: Provide waterproofing products manufactured by Tremco, Inc., Commercial Sealants and Waterproofing Division, Beachwood OH; (866) 321-6357; email: techresources@tremcoinc.com; www.tremcosealants.com, [or comparable products of other manufacturer approved by Architect in accordance with Instructions to Bidders and Division 01 General Requirements].
- B. Source Limitations: Provide waterproofing system materials and accessory products from single source from single manufacturer.

1.13 PERFORMANCE REQUIREMENTS

- A. General: Waterproofing system shall be capable of performing as a continuous watertight installation and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Waterproofing shall accommodate normal substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without resultant moisture deterioration.
- B. VOC Content: 250 g/L maximum per 40 CFR 59, Subpart D (EPA Method 24) and complying with requirements of authorities having jurisdiction.
- C. Compatibility: Provide waterproofing system materials that are compatible with one another and with adjacent materials under conditions of service and application required, as demonstrated by waterproofing manufacturer based on testing and field experience.

1.14 WATERPROOFING MEMBRANE

- A. Cold Fluid-Applied Waterproofing: Single component, high solids, modified aliphatic polyurethane, ASTM C 836/C 836M and coal-tar free, formulated for application to damp and green concrete.
 1. Basis of Design Product: Tremco, Inc., TREMproof 250GC.
 2. VOC Content: Less than 100 g/L, roller and self-leveling grades.
 3. VOC Content: Less than 160 g/L, trowel detailing grade.
 4. Hardness, ASTM D 2240: 70 – 80.
 5. Low Temperature Flexibility and Crack Bridging, ASTM C 1305: Pass.
 6. Adhesion in Peel, ASTM C 794: 26 lbf/in. (4553 N/m).

1.15 ACCESSORY MATERIALS

- A. General: Accessory materials as described in manufacturer's written installation instructions, recommended to produce complete waterproofing system meeting performance requirements, and compatible with waterproofing material and adjacent materials.
- B. Substrate Patching Material: Waterproofing manufacturer's standard trowel-grade filler material.
- C. Primer: Liquid primer meeting VOC limitations and recommended for substrate by waterproofing manufacturer.
- D. Elastomeric Detail Sheet: Blended thermoset elastomeric sheet reinforced with polyester woven scrim.
 - 1. Basis of Design Product: Tremco, TRA Elastomeric Sheeting.
- E. Metal Termination Bars: Waterproofing manufacturer's standard aluminum or stainless steel termination bar, with stainless steel fasteners.
- F. Termination Mastic: Waterproofing manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade, with recommended glass-fiber-mesh tape.
- G. Joint Sealant: ASTM C 719, high performance, medium-modulus, low-VOC, non-staining, UV-stable, non-sag silicone sealant approved by waterproofing manufacturer for adhesion and compatibility with waterproofing and accessories.
 - 1. Basis of Design Product: Tremco, Dymonic 100.
 - 2. Basis of Design Product: Spectrum 3 silicone Sealant to be used at window sill interface.
- H. Joint Sealant: ASTM C 719, high performance, low-modulus, low-VOC, UV-stable, non-sag polyurethane sealant approved by waterproofing manufacturer for adhesion and compatibility with waterproofing and accessories.

1.16 PROTECTION COURSE

- A. Protection Course: Waterproofing manufacturer's standard protection course material recommended for application.
 - 1. Polyethylene (PE) sheet, 40 mil (1.02 mm) thick.
 - a. Basis of Design Product: Tremco, Polyethylene Protection/Barrier Course.
 - 2. Woven glass-fiber fabric, synthetic resin-impregnated.
 - a. Basis of Design Product: Tremco, 2011.
 - 3. Extruded hollow-core copolymer mat.
 - a. Basis of Design Product: Tremco, 2450.
 - 4. UV-resistant lightweight polyester mat.
 - a. Basis of Design Product: Tremco, Protection Mat.
 - 5. Elastomeric Sheet: Blended thermoset elastomeric sheet reinforced with polyester woven scrim.
 - a. Basis of Design Product: Tremco, TRA Elastomeric Sheeting.

1.17 INSULATION DRAINAGE PANELS

- A. See Specification Section 07 21 00 – Thermal Insulation

1. Extruded Polystyrene Drainage Boards 07 21 00. 2.1, B.

1.18 INSULATION DRAINAGE PANELS

- A. Geotextile-Faced, Wall-Insulation Drainage Panels: Extruded-polystyrene board insulation, ASTM C 578, Type VI, 40-psi (276-kPa) minimum compressive strength; with tongue-and-groove edges and with one side having grooved drainage channels faced with a nonwoven-geotextile filter fabric.

1. See Specification Section 07 21 00, 2.1, B.: Extruded Polystyrene Drainage Panel.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Surface Condition: Before applying waterproofing materials, examine substrate and conditions to ensure substrates are fully cured, smooth, clean, dry, and free from high spots, depressions, loose and foreign particles and other deterrents to adhesion, and conditions comply with manufacturer's written recommendations.
 1. Verify concrete and masonry surfaces are free from release agents, curing agents, laitance, and other contaminants. Test for waterproofing adhesion per manufacturer's recommended method. Notify Architect of unsatisfactory conditions.
 2. Verify masonry joints are filled with mortar and struck flush.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 INTERFACE WITH OTHER WORK

- A. Sequencing of Work: Coordinate sequencing of waterproofing work with work of other sections that form portions of building envelope moisture control to ensure that flashings and transition materials can be properly installed and inspected.
- B. Subsequent Work: Coordinate waterproofing work with work of other sections installed subsequent to waterproofing to ensure complete inspection of installed waterproofing and sealing of waterproofing penetrations necessitated by subsequent work.

2.3 PREPARATION

- A. Clean, prepare, and treat substrates in accordance with waterproofing manufacturer's written instructions.
 1. Mask adjacent finished surfaces.
 2. Remove contaminants and film-forming coatings from substrates.
 3. Remove projections and excess materials and fill voids with substrate patching material.
 4. Prepare and treat joints and cracks in substrate per ASTM D 4258 and waterproofing manufacturer's written instructions.
- B. Detail Preparation: Prepare non-moving shrinkage cracks, large cracks, construction joints, expansion joints, projections and protrusions, penetrations, drains, and changes in plane in accordance with waterproofing manufacturer's written instructions and details, using accessory materials specified. The following are two acceptable options for detail preparation:

1. Adhere strips of elastomeric sheet to moving expansion joints on both sides in conjunction with a metal termination bar embedded in a layer of cold fluid-applied waterproofing and overlay with coat of cold fluid-applied waterproofing.
 2. Apply single-component urethane within moving expansion joints and overlay with a coat of cold fluid-applied waterproofing.
- C. Transitions to Adjacent Materials: Apply Tremco Approved Primer to transition cold fluid-applied waterproofing membrane to adjacent components of the building envelope.

2.4 WATERPROOFING INSTALLATION

- A. General: Apply waterproofing material to form a seal with strips and transition strips and to achieve a continuous waterproofing according to waterproofing manufacturer's written instructions. Apply waterproofing material within manufacturer's recommended application temperature ranges.
- B. Primer: Apply primer to substrates at required rate, using roller, brush, or airless spray. Allow to dry. Reprime areas not covered within 24 hours.
- C. Start application with manufacturer's authorized representative present.
- D. Cold Fluid-Applied Waterproofing: Apply waterproofing in total wet film thickness and with methods recommended in writing by waterproofing manufacturer.
- E. Standard Application: Vertical or Horizontal:
1. Apply using roller or squeegee.
 2. Apply in single pass at minimum thickness of 60 mils (1.5 mm) wet.
- F. Terminations: Install terminations of waterproofing membrane in accordance with ASTM C 898 Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Separate Wearing Course and ASTM C 1471 Standard Guide for Use of High Solids Content Cold Liquid-Applied Elastomeric Waterproofing Membrane on Vertical Surfaces, as applicable to application, at not less than minimum height recommended by waterproofing manufacturer.
- G. Coordination of Testing:
1. Coordinate application of waterproofing membrane with installation of membrane leak detection system specified in Section 07 72 73 "Membrane Leak Detection System."
 2. Do not cover waterproofing until it has been tested and inspected by Owner's testing agency.
- H. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates and reapply waterproofing components.

2.5 PROTECTION INSTALLATION

- A. Protection Course: Cover waterproofing with protection course following curing of waterproofing and prior to backfilling or subjecting installation to traffic. Overlap protection course joints.

Insulation Drainage Panel: Place and secure drainage panels using methods that do not penetrate waterproofing. Face geotextile away from deck substrate. Lap edges or abut ends of geotextile. Install one layer of board insulation as required, staggering joints. Fit within 1/2 inch (12 mm) of projections and penetrations.

1. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

2.6 FIELD QUALITY CONTROL

- A. Contractor's Inspector: Contractor shall engage manufacturer's qualified Inspector full-time during the Work to perform tests and inspections, including documenting of waterproofing prior to concealment.
 1. Contractor's Inspector shall measure membrane thickness with a wet film gauge during the application process at least once for every 100 sq. ft. (10 sq. m).
 2. Provide written report of tests and inspections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, waterproofing application, protection, and drainage components, and to furnish reports to Architect.
 1. Testing includes EFVM inspection prior to concealing deck waterproof membrane.
- D. Coordination of Inspection: Cooperate with testing agency. Allow access to work areas and staging. Notify testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection.
 1. Do not cover Work until testing and inspection is completed and accepted.
- E. Reporting: Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed.
- F. Correction of Work: Correct deficient applications not passing tests and inspections, make necessary repairs, and retest as required to demonstrate compliance with requirements.

2.7 CLEANING AND PROTECTING

- A. Clean spills, stains, and overspray resulting from application utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.
- B. Protect waterproofing from damage from subsequent work. Protect waterproofing materials from exposure to UV light for period in excess of that acceptable to waterproofing manufacturer; replace overexposed materials and retest.

END OF SECTION 07 14 16

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Perimeter and under slab insulation.
- B. Spray foam insulation; includes all spray foam insulation used at wall cavity, see drawings for locations..
- C. Waterproofing protection board, when used as combination protection board/perimeter insulation.
- D. Glass fiber blanket wall and ceiling insulation.
- E. Sound attenuation blankets in stud/gypsum board walls.
- F. Semi rigid mineral wool insulation in rainscreen applications.

1.2 RELATED DOCUMENTS

- A. Rough Carpentry section 06 10 00
- B. Cold Formed Metal Framing Section 05 40 00.
- C. Factory Applied Fluid Membrane Air Barrier: Section 07 27 26
- D. Cold Applied Modified Bituminous Membrane Roofing: section 07 52 16.11
- E. Hot Applied Modified Bituminous Membrane Roofing: section 07 52 16.12
- F. Penetration Firestopping: section 07 84 13

1.3 REFERENCES

- A. Standards
 - 1. American Society for Testing and Materials (ASTM)
 - a. ASTM C578 Preformed, Cellular Polystyrene Thermal Insulation.
 - b. ASTM C665 Mineral-fiber Blanket Thermal Insulation for Light Frame Construction.
 - c. ASTM C612 Specification for Miner Fiber Block and Board Thermal Insulation.

1.4 ACTION SUBMITTALS

- A. Shop Drawings and Product Data: For each type of product.
- B. Low-emitting product certification.

- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Store insulation materials at the site storage trailers or the building in a dry, ventilated place. Exterior storage not permitted. Comply with manufacturer's recommendations for handling and protection during installation.
- C. Remove fibrous batt insulation that has become wet before or after installation. Replace with new, dry insulation.
- D. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

1.6 QUALITY ASSURANCE

- A. Insulation Thermal Properties: Thermal conductivity k-factors and thermal resistance R-values are values at 75 degrees F., mean temperature.
 - 1. Where insulation is identified by R-value, provide thickness required to achieve indicated R-value. Foam Insulation R-values are "aged" thermal values in accordance with PIMA Bulletin #101 and RIC/TIMA Bulletin #281-1 conditioning procedures.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Extruded Polystyrene Board, Type IV, Drainage Panels ASTM C 578, Type IV, 40-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84; fabricated with shiplap or channel edges and with one side having grooved drainage channels and geo-filtration fabric.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Dow Chemical Company (The).
- b. Owens Corning.

2.2 GLASS-FIBER BLANKET

- A. Type: Glass fiber blanket designed to friction fit with metal. Manufacturers standard lengths; widths as required to fit framing conditions; density not less than .75 pounds per cubic foot.
- B. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
 - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
 - 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.
- C. Glass-Fiber Blanket, Kraft Faced. ASTM C 665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.
- D. Glass-Fiber Blanket, Reinforced-Foil Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.
- E. Glass-Fiber Blanket, Foil Faced ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.
 - 2. Tape: Type as approved by insulation manufacturer.

2.3 SOUND ATTENUATION BLANKETS

- A. Type: Unfaced semi-rigid mineral fiber or glass fiber blankets. Conform to ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- B. Thickness: 3 inch, unless otherwise indicated.
- C. Manufacturer: Sound-Shield by JOHNS MANVILLE; THERMAFIBER, OWENSCORNING

2.4 FIBERGLAS, CERTAINTEED, ROXUL or FIBREX.MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced. ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Rockwool International.
 - c. Thermafiber, Inc.; an Owens Corning company.

2.5 SPRAY FOAM INSULATION

- A. CLOSED-CELL SPRAY POLYURETHANE FOAM
 - 1. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 2.0 lb/cu. ft. and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Chemical Series, CM 2045 spray foam
 - b. Icynene Inc. Proseal (MDC200V3) spray foam
 - c. STAY CELL ONE STEP 255, Stayflex, 7819 Broadview Road, Cleveland, OH 44131, ph. (216) 642-1200.
 - 3. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - 5. Where foam product does not meet ASTM E84 or NFPA 285 a manufacturer approved thermal is to be applied over exposed spray cell foam.
 - a. DC 315, International Fireproof Technology, Inc., 17528 Von Karmen Ave., Irvine, CA 92614, ph. (949) 724-5056.
 - b. Architect approved alternate Thermal and Ignition Barrier shall be manufacturer approved.

6. Thickness:
 - a. As indicated or as required to fill voids where applicable.
 - b. 2" minimum thickness at interior of exterior stud walls.
 - c. Full stud width at parapet where indicated on drawings.
- 2.6 LOW PRESSURE LOW EXPANSION WINDOW AND DOOR FOAM –for cracks and spaces around window jambs:
- A. Available Manufacturers:
1. Dow Chemical, Great Stuff Pro Window & Door Insulating Foam
 2. Hilti, CF 812 Window & Door Pro Low Pressure Filler Foam
 3. DuPont, Window & Door Foam
 4. Surface-Burning Characteristics: Comply with UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less
- 2.7 SEMI RIGID MINERAL-WOOL INSULATION
- A. Description: Non-combustible, semi-rigid mineral wool insulation board that is water repellent and resist temperatures above 2,000 degrees F, Types iVB, Unfaced. ASTM C 612.
1. Thickness as indicated on the drawings.
 2. R-value: 4.2 per inch
 3. Facing: unfaced
 4. Density:
 - a. Outer Layer: 6.2 pcf
 - b. Inner Layer: 3.4 pcf
 5. Surface Characteristics per ASTM E84:
 - a. Flame Spread: 0
 - b. Smoke Developed: 0
 6. Moisture Resistance: Absorbs less than 0.03% by volume, ASTM C1104.
 7. Non-corrosive: ASTM C665
 8. Fiber Color: Darkened color at rainscreen applications.
 9. Manufacturers: Basis of Design is Roxul CavityRock DD. Subject to compliance with requirements, provide products by one of the following:
 - a. Rockwool International- ROXUL CavityRock DD.
 - b. Thermafiber, Inc.; an Owens Corning company – THERMAFIBER Rainbarrier HD.
- 2.8 INSULATION FASTENERS
- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.
- B. Composite Framing Support Clips (CFS) - Thermal Insulation Spacers: Are to be coordinated with section 074213 Aluminum Metal Plate Wall Panels. Design of the support system is to be a delegated design which includes performance design requirements outlined in section 074213 Aluminum Metal Plate Wall System in addition to this section. System comprised of fiberglass or FRP standoff spacers and galvanized steel Z-girts. Composite Framing Support Clips are to be coordinated with section
1. Depth: As indicated. Coordinate with thickness of insulation.
 2. Steel Z-girts plate inserts: 18 gauge, Galvalume AZM 150 Coating 1.5" x 1" x 1.25"
 3. Fasteners: Type and size as recommended by spacing manufacturer.
 4. Spacing: Continuous girts 16" o.c. horizontally tied to metal framing
 5. Approved manufacturers:
 - a. SMARTci GreenGirt Clips Composite Framing (CFS) System
 - b. Cascadia Clips by CASCADIA Windows

2.9 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- C. Asphalt Coating for Cellular-Glass Block Insulation: Cutback asphalt or asphalt emulsion of type recommended by manufacturer of cellular-glass block insulation.
- D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.
- E. See part 2.7 of this specification section for Insulation Fasteners.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.
- B. Examine substrates and installation conditions. Do not proceed with insulation

- C. work until unsatisfactory conditions have been corrected.
- D. Verify substrate surfaces are dry and free of irregularities or substances harmful to insulation. Remove projections that interfere with insulation placement.
- E. Verify mechanical and electrical services within walls have been installed and tested.
- F. Fill miscellaneous voids and spaces in wall framing and at window and door framing with batt insulation loosely stuffed in place.
- G. Spray-On and Spray Foam Insulations: Provide masking, drop cloths or other satisfactory coverings for all materials/ surfaces which are not to receive insulation.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SEMI-RIGID INSULATION

- A. Place insulation horizontally within cavity between metal panels and metal stud/sheathing or concrete block substrate. Place on exterior surface of substrate.
- B. Coordinate insulation placement with installation of thermal insulation spacers. Place to ensure tight joints between all insulation panels installed and between insulation panels and adjacent materials.

3.4 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.5 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Install blanket type insulation with tight fitting butt joints. Provide supplementary support at vertical and horizontal installations when required to maintain insulation in permanent proper location.
 - 1. Spot adhere insulation to inside face of exterior sheathing or similar back- up material as required to maintain insulation in its proper location.
 - 2. Fit insulation between members.
 - 3. Locate facing to room side, where applicable.
 - 4. Install interior wall sound attenuation at interior partitions where indicated on the floor panels or wall types.
- B. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

- a. Exterior Walls: Set units with facing placed
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.7 SPRAY FOAM INSULATION

- A. Prepare surfaces as recommended by insulation manufacturer. Remove substances from metal deck or other metal surfaces that will prohibit insulation/metal bond. Apply primer where required by manufacturer.
- B. Install as recommended by manufacturer. Install in areas where indicated on the drawings. Fill all voids for a complete solid installation.
- C. Provide manufacturer's recommended fire-rated barrier at exposed conditions.
- D. Clean-up all overspray from adjacent surfaces and floor.

3.8 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 26 00 - UNDER-SLAB VAPOR BARRIER

PART 1 – GENERAL

1.1 SUMMARY

- A. Products supplied under this section:
 - 1. Vapor barrier and installation accessories for installation under concrete slabs.
- B. Related sections:
 - 1. Section 03 30 00 Cast-in-Place Concrete

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E1745-17 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - 2. ASTM E1643-11 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- B. Technical Reference - American Concrete Institute (ACI):
 - 1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
 - 2. ACI 302.1R-15 Guide to Concrete Floor and Slab Construction.

1.3 SUBMITTALS

- A. Quality control/assurance:
 - 1. Summary of test results per paragraph 9.3 of ASTM E1745.
 - 2. Manufacturer's samples and literature.
 - 3. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
 - 4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Vapor barrier shall have all of the following qualities:
 - 1. Maintain permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
 - 2. Other performance criteria:
 - a. Strength: ASTM E1745 Class A.
 - b. Thickness: 15 mils minimum
 - 3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1
- B. Vapor barrier products:
 - 1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.

2. All products and accessories are to be from one manufacturer.

2.2 ACCESSORIES

- A. Seams:
 1. Basis of Design is Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- B. Sealing Penetrations of Vapor barrier:
 1. Basis of Design is Stego Mastick by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
 2. Basis of Design is Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- C. Perimeter/edge seal:
 1. Basis of Design is Stego Crete Claw by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
 2. Basis of Design is Stego Term Bar by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
 3. Basis of Design is StegoTack Tape (double-sided sealant tape) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- D. Penetration Prevention:
 1. Basis of Design is Beast Foot by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- E. Vapor Barrier-Safe Screed System
 1. Basis of Design is Beast Screed by Stego Industries, LLC, (877) 464-7834 www.stegoindustries.com.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
 1. Level and compact base material.

3.2 INSTALLATION

- A. Install vapor barrier in accordance ASTM E1643.
 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.

- a. Seal vapor barrier to the entire slab perimeter using Stego Crete Claw, per manufacturer's instructions.
 - OR
 - b. Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
3. Overlap joints 6 inches and seal with manufacturer's seam tape.
 4. Apply seam tape/Crete Claw to a clean and dry vapor barrier.
 5. Seal all penetrations (including pipes) per manufacturer's instructions.
 6. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use blunt-end and/or threaded nail stakes (screed pad posts) and insert them into Beast Foot. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier
 7. If non-permanent stakes must be driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
 8. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
 9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
 10. For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.

END OF SECTION 07 26 00

SECTION 07 27 26 – FACTORY APPLIED FLUID MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Vapor-permeable, fluid-applied air barriers:
 - a. Combination of wall sheathing with factory fluid-applied, vapor-permeable, air and water resistive membrane.
 - b. Fluid-applied, vapor-permeable, air and water resistive membrane applied onsite to exterior, exposed side of the sheathing.

B. Related Requirements:

- 1. Section 07 62 00 "Sheet Metal Flashing"
- 2. Section 07 92 00 "Joint Sealants"

1.3 REFERENCES

A. Definitions:

- 1. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- 2. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- 3. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
- 4. Factory Fluid-Applied Air and Water Barrier Panel: A glass mat-faced, moisture and mold-resistant gypsum panel. The panel features a non-combustible core integrated with a factory fluid-applied permeable air and water barrier membrane applied to the exterior, exposed side of the sheathing.

B. Reference Standards:

- 1. The date of the standard is that in effect as the date of receipt of the bids for the project.
- 2. ASTM International (ASTM).
- 3. International Code Council (ICC).
- 4. National Fire Protection Association (NFPA).

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Conduct conference at PROJECT SITE.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Sustainable Design Submittals:

1. Product Data: For coatings, indicating VOC content.
2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: Installer trained by the manufacturer of factory fluid applied air barrier panels for system installation.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: NFPA 285 tested assembly for each air-barrier assembly, tests performed by a qualified testing agency

C. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be trained by the manufacturer in the installation of the factory fluid applied air barrier sheathing panel system. Installer will maintain trained installers and supervisors on site for the duration of the project.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.

1. Build integrated mockups of exterior wall assembly. Coordination size with description of mock-up and components outlined in specification section, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition,] [and] [foundation wall intersection.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
4. Mock-ups maybe integrated into the final wall assembly upon Architect's approval.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.
- B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
 1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
 2. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate according to ASTM E 2357.
 3. Adhesion Testing: Mockups will be tested for required air-barrier and accessory material adhesion to substrate according to ASTM D 4541.
 4. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packaging and store in an enclosed shelter providing protection from damage and exposure to the elements.
 1. Store within temperature limits required by manufacturer.
 2. Store factory fluid-applied air and water barrier panels flat.
 3. Comply with manufacturer's requirements for safety and handling.
- B. Discard liquid sealants and adhesives that cannot be applied within their stated shelf life.
- C. Store accessory materials in a location with constant ambient temperatures of 40 to 110 degrees Fahrenheit (15 to 27 degrees Celsius).

1.10 FIELD CONDITIONS

A. Cold Weather Conditions:

1. Fluid-Applied Air and Water Barrier Panel: Comply with manufacturer's cold weather application instructions when atmospheric temperatures or substrate surface temperatures are less than 40 degrees Fahrenheit (4 degrees Celsius).
2. Accessories and Sealants: Comply with manufacturer's cold weather application instructions when atmospheric temperatures or substrate surface temperatures are less than 40 degrees Fahrenheit (4 degrees Celsius).
3. Do not apply fluid-applied air and water barrier accessories to a damp or wet substrate or during snow, rain, fog, or mist.

B. Exposure: Comply with manufacturer's limitations on exposure of applied product.

1. Protect adjacent substrates from environmental conditions that affect air barrier performance.

C. Coordinate installation of fluid-applied air and water barrier panel assembly with completion of roofing, below grade, fluid-applied membrane portion to site fluid-applied membrane portion and other work requiring interface with air barrier.

D. Schedule work for inspection of fluid-applied air and water barrier panel assembly applications prior to concealment.

E. Ensure fluid-applied air and water barrier panel accessories are cured before covering with other materials.

1.11 WARRANTY

A. Manufacturer's Warranty for Fluid-Applied Air and Water Barrier Sheathing Panel & Accessory Products: Manufacturer's standard form in which manufacturer agrees to, at its option, replace each nonconforming product or refund the purchase price of the quantity of product shown to be nonconforming.

1. Manufacturer is not responsible for loss resulting from warranty-excluded limitations, outlined deterioration, or failure of air-barrier materials from the following:
 - a. Movement of the structure caused by structural settlement or stresses on the air and water barrier exceeding manufacturer's written specifications for elongation.
 - b. Mechanical damage caused by others.
2. Access for Repair: Manufacturer to be provided with unimpeded post-occupancy access to the project facility and air-barrier system for purposes of testing, leak investigation, and repair.
3. Warranty Period for Fluid-Applied Air and Water Barrier Sheathing Panel Products: Five years from date of Substantial Completion.

B. Air and Water Barrier Sheathing Panel Warranty: Provide manufacturer's warranty that when at least one component from each of the categories of components constituting manufacturer's system is applied to an above-grade concrete block or poured concrete or to a metal stud and sheathing wall assembly to prevent air and water vapor from penetrating the building walls and entering the interior of the building for a period of five years beginning on the date of Substantial Completion.

C. Air and Water Barrier Accessories Warranty: Provide accessory manufacturer's warranty for period of five years beginning on the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum [0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa)] Pass, when tested according to ASTM E 2357.

2.3 MEDIUM-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. Medium Build, Vapor-Permeable Fluid-Applied Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 15 to 35 mils (0.38 to 0.9 mm) over smooth, void-free substrates.
 - 1. Basis-of-Design Product: Factory-Applied, Air and Water Resistive Sheathing Panel with Factory, Fluid-Applied Medium-Build, Vapor-Permeable Air Barrier. Subject to compliance with requirements, provide USG Corporation and Tremco Incorporated; Securock ExoAir 430 Panel or a comparable field applied fluid-applied, air barrier on glass fiber reinforced sheathing product by one of the following:
 - a. USG Corporation and Tremco Incorporated; Securock Exoair 430
 - b. Georgia Pacific and Prosoco; DensElement
 - 2. Physical and Performance:
 - a. Panel Thickness: 5/8 inch (15.9 mm) thick.
 - b. Panel Type: Type X.
 - c. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) 8 perms pressure difference; ASTM E 2178.
 - d. Vapor Permeance: Minimum 5 perms (580 ng/Pa x s x sq. m); ASTM E 96/E 96M, Desiccant Method, Procedure A.
 - e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - f. UV Resistance: Basis-of-Design Securock ExoAir 430 Panel can be exposed to sunlight for 365 days. For other air barrier products refer to manufacturer's written instructions for UV exposure times.
 - I – Air Shield LMP
 - II – Tyvek Fluid Applied WB

2.1 AIR-BARRIER ACCESSORY MATERIALS

- A. General: Provide compatible air-barrier accessory materials furnished or recommended by factory fluid-applied air and water barrier panel manufacturer as required by Project conditions to produce a complete air-barrier assembly identical to tested assemblies meeting performance requirements.
- B. Primer: Liquid primer recommended by air-barrier manufacturer for substrates requiring field application of air-barrier materials.
 - 1. Basis-of-Design Product: Tremco, Inc., ExoAir Primer.
- C. Fluid-Applied Air-Barrier Membrane: Site-applied synthetic polymer membrane for application to adjacent substrates, detailing, and repairs.
 - 1. Basis-of-Design Product: Tremco, Inc., ExoAir 230.
 - 2. Volatile Organic Compound (VOC) Content: 35 g/L or less.
 - 3. Volatile Organic Emissions (VOE): GREENGUARD certified, it has met the world's most difficult and complete standards for low emissions of VOC's into indoor air.
 - 4. Adheres to California Department of Public Health (CDPH) Standard Method V1.1-2010.
- D. High- and Low-Temperature Flashing and Transition Strip: Self-adhering strip 22 mils (0.61 mm) thick, consisting of butyl laminated to an aluminized facer with a release liner.
 - 1. Basis-of-Design Product: Tremco, Inc., ExoAir 110AT.
- E. Wall Opening Transition Assembly: Cured low-modulus extruded silicone sheet, with reinforcing ribs, sized to fit opening widths, with aluminum race configured for insertion into aluminum framing extrusions, compatible with specified silicone joint sealant and fluid-applied membrane air-barrier.
 - 1. Basis-of-Design Product: Tremco, Inc., Proglaze ETA Engineered Transition Assembly.
- F. Wall Opening Transition Sheet: Cured low-modulus extruded silicone sheet, compatible with specified silicone sealant and fluid-applied membrane air-barrier.
 - 1. Basis-of-Design Product: Tremco, Inc., Proglaze ETA Connections Single-Ribbed Sheet.
- G. Reinforcing Mesh: Self-adhering fiberglass mesh, not less than 6 inches (152 mm) wide.
 - 1. Basis-of-Design Product: Securock ExoAir Reinforcing Mesh.
- H. Joint Sealant for Exposed Air-Barrier Components: Single-Component, Nonsag, Non-Staining, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, Use NT; SWRI validated.
 - 1. Basis-of-Design Product: Tremco, Inc., Spectrum 1.
 - 2. Volatile Organic Compound (VOC) Content: 1 g/L or less.
 - 3. Volatile Organic Emissions (VOE): GREENGUARD certified, it has met the world's most difficult and complete standards for low emissions of VOC's into indoor air.
 - 4. Adheres to California Department of Public Health (CDPH) Standard Method V1.1-2010.
- I. Joint Sealant for Exposed or Concealed Air-Barrier Components: Single-Component, Nonsag, Moisture-Cure, Polyurethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, Use NT; SWRI validated.

1. Basis-of-Design Product: Tremco, Inc., Dymonic 100.
 2. Volatile Organic Compound (VOC) Content: 40 g/L or less.
 3. Volatile Organic Emissions (VOE): GREENGUARD certified, it has met the world's most difficult and complete standards for low emissions of VOC's into indoor air.
 4. Adheres to California Department of Public Health (CDPH) Standard Method V1.1-2010.
- J. Preformed Silicone seal: For transitions between curtain wall and exterior opaque wall, parapets and curtain wall systems. Manufacturer's standard seal consisting of precured low-modulus silicone extrusion, in sizes to fit applications indicated on Drawings, combined with a neutral-curing liquid silicone sealant for bonding seals to substrates.
1. Basis of Design Product: Tremco, Inc.; Spectrem Simple Seal
 2. DOW Corning 123 Silicone Seal System

2.2 FASTENERS

- A. Screws for Fastening Factory Fluid-Applied Air and Water Barrier Panels to Cold-Formed Metal Framing: Steel drill-screws, ASTM C 1002, in length recommended by sheathing manufacturer for sheathing thickness, with organic-polymer corrosion-protective coating having a salt-spray resistance of more than 48 hours according to ASTM B 117.
- B. Screws for Fastening Factory Fluid-Applied Air and Water Barrier Panels to Wood Framing: Wood screws, ASTM C 1002, in length recommended by sheathing manufacturer for sheathing thickness, with organic-polymer corrosion-protective coating having a salt-spray resistance of more than 48 hours according to ASTM B 117.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Framing Examination: Examine framing to determine if work is ready to receive factory fluid-applied air and water barrier panels.
1. Verify surface flatness tolerances and framing spacing comply with Project requirements.
 2. Verify adequate support is provided for factory fluid-applied air and water barrier panel edges.
 3. Proceed with work once conditions meet manufacturer's written recommendations.

3.2 PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous.
- G. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. General: Install factory fluid-applied air and water barrier panels, transition strips, and accessory materials according to factory fluid-applied air and water barrier manufacturer's written instructions. Install strips and transition strips to form, connect, and seal membrane air-barrier material to adjacent components of building air-barrier system, including, but not limited to, roofing system air-barrier, exterior fenestration systems, door framing, and other openings.
- B. Sealants: Apply sealants in accordance with manufacturer's installation instructions on a per-assembly basis.
- C. Seal punctures, voids, and seams. Patch with membrane strips extending 6 inches (150 mm) beyond repaired areas.
- D. Connect and seal exterior wall air-barrier membrane continuously to subsequently installed roofing-membrane air-barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- E. Wall Openings Transition Assembly Installation: Apply opening transition assembly so that a minimum of 3 inches (75 mm) of coverage is achieved over factory fluid-applied air and water barrier panels.
- F. Rough Openings: Treat rough openings with sealant or accessory products according to manufacturer installation instructions.
- G. Flashings: Seal top of through-wall flashings to factory fluid-applied air barrier air and water barrier panels with continuous transition strips of type recommended by sheet air barrier manufacturer for type of flashing.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Discard each factory fluid-applied air and water barrier panel with damage that compromises membrane continuity or impairs performance as an air-barrier, and is unable to be repaired according to manufacturer's repair instructions.
 - 1. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Comply with ASTM C 1280, GA-253, and manufacturer's written instructions.
 - 1. Fasten factory fluid-applied air and water barrier panels to wood framing with screws.
 - 2. Fasten factory fluid-applied air and water barrier panels to cold formed metal framing with screws.
 - 3. All penetration through fluid applied air and water barrier panels must be sealed per manufacturer requirements.
 - 4. Install panels with 3/8-inch (9.5 mm) gap where non-load-bearing construction abuts structural elements.
 - 5. Install panels with 1/4-inch (6.4 mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- C. Cut factory fluid-applied air and water barrier panels at penetrations, edges, and other obstructions of work to allow for application of air-barrier accessory materials. Fit factory fluid-applied air and water barrier panels closely against abutting construction.
- D. Install factory fluid-applied air and water barrier panels with long dimension perpendicular or parallel to framing. Abut ends and edges of factory fluid-applied air and water barrier panels centered over face of framing members. Offset factory fluid-applied air and water barrier panel joints by not less than one stud spacing.
 - 1. Apply factory fluid-applied air and water barrier panels in pieces sized to provide minimum number of joints and optimum sheathing board arrangement. Arrange joints so that panels do not span between fewer than three support members.
 - 2. Do not bridge building expansion joints; cut and space edges of factory fluid-applied air and water barrier panels to match spacing of structural support elements.
- E. Fasteners: Space fasteners maximum 8 inches (203 mm) on center and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of factory fluid-applied air and water barrier panels and as required in indicated fire-resistance-rated designs.
 - 1. Apply fasteners so heads are seated flush to the board product air-barrier membrane surface without breaking or punching through the surface.
 - 2. Securely attach sheathing boards to substrate by fastening as indicated, complying with the following:
 - a. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - b. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - c. ICC-ES evaluation report for fastener.
 - 3. Use fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections.

- F. Coordinate factory fluid-applied air and water barrier panel installation with flashing, joint-sealant, and air-barrier accessory material installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- G. Coordinate factory fluid-applied air and water barrier panel installation with materials installed over panels such that factory fluid-applied air and water barrier panels are not exposed to precipitation or left exposed at end of the workday when rain is forecast.
- H. Do not cover factory fluid-applied air and water barrier panels until sealants and accessory trims have cured and tested by Owner's testing agency.
- I. Correct deficiencies in or remove factory fluid-applied air and water barrier panels that do not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.
 - 1. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements and photo documentation of conditions to be concealed by subsequent Work.
- B. Tests: As determined by Owner's testing agency from among the following tests:
 - 1. Qualitative Air-Leakage Testing: Test air-barrier assemblies for evidence of air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization or ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
 - 2. Quantitative Air-Leakage Testing: Test air-barrier assemblies for air leakage according to ASTM E 783.
 - 3. Testing: Refer to Section 01 91 13 "General Commissioning Requirements" for additional testing and inspection requirements.
- C. Factory fluid-applied air and water barrier panels will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Coordinate installation of joint sealants with cleaning of joint sealant substrates and other operations that may impact installation or finished joint sealant work.
- B. Clean spills, stains, and overspray resulting from application, utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.
- C. Protect factory fluid-applied air and water barrier panels from damage from subsequent work. Protect membrane materials from exposure to UV light for period in excess of that acceptable to membrane air-barrier manufacturer; Contractor shall replace overexposed materials at their expense and retest.

END OF SECTION 07 27 26

SECTION 07 42 13.16 – ALUMINUM METAL PLATE WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aluminum metal plate wall panels.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Cold-Formed Metal Framing – Wall panel substrates support framing. Section 05 40 00.
- C. Fluid-Applied Membrane Air Barriers: Air and moisture barrier required as part of the metal wall panel assembly Section 07 27 26.
- D. Sheet Metal Flashing and Trim: Field formed flashing and other sheet metal work. Section 07 62 00.
- E. Joint Sealants: Section 07 92 00.
- F. Thermal Insulation and Mounting Spacers: Section 07 21 00.
- G. Metal Composite Materials: Section 07 42 44.
- H. General Commissioning Requirements 01 91 13

1.3 SUMMARY

- A. Section includes metal plate wall panels.

1.4 DEFINITIONS

- A. Metal Plate Wall Panel Assembly: Metal plate wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weather tight wall system based on AAMA CW-RS-1.

1.5 REFERENCE STANDARDS

- A. A. AAMA - American Architectural Manufacturers Association
 - 1. AAMA CW-RS-1 – The Rain Screen Principle and Pressure Equalized Wall Design; 2012
 - 2. AAMA 501.1 – Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure; 2005

3. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2009
 4. AAMA 508 – Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems; 2014 [Testing based on 2007 Edition]
 5. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014
 6. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013 [Testing based on 2005 Edition]
- B. ASTM International (American Society for Testing and Materials)
1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2011
 2. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015
 3. ASTM D523 - Standard Test Method for Specular Gloss; 2014
 4. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2015
 5. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; 2011
 6. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 07(2015)
 7. ASTM E8/E8M - Standard Test Methods for Tension Testing of Metallic Materials; 2013a
 8. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 04(2012)
 9. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014
 10. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 00(2009)
 11. ASTM E1233/E1233M – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Cyclic Air Pressure Differential; 2014 [Testing based on 2006 Edition]
- C. NAAMM – National Association of Architectural Metal Manufacturers
- D. SMACNA – Sheet Metal and Air Conditioning Contractor's National Association
- 1.6 PREINSTALLATION MEETINGS
- A. Preinstallation Conference: Conduct conference at Project site.
1. Attendees:
 1. Owner
 2. Architect
 3. Installer
 4. Panel Manufacturer's representative
 5. Structural Support Installer
 6. Installers whose work interface with or affect wall panels including installers of doors, windows and louvers.
 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 ACTION SUBMITTALS

- A. Product Data: Submit for each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.
- B. Shop Drawings:
 1. Submit fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
 - a. Provide distinction between factory assembled, shop assembled and field assembled work.
 - b. Provide details of the following items at full scale
 - 1) Manufacturers standard sheet metal trims.
 - 2) Components of wall panel construction, anchorage methods, and hardware.
- C. Structural Calculations: Submit structural calculations for the design and performance of the metal panel system, including specified and building code windloads, deflections, in-place stresses, and capacity of fasteners. Calculations and submittal drawings shall be stamped by a Professional Engineer licensed in the State of Illinois.
- D. Coordination Drawings: Submit exterior elevations, drawn to scale, that have the following items shown and coordinated with each other, using input from installers of these items as follows:
 1. Metal plate wall panels and attachments.
 2. Girts.
 3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 4. Penetrations of wall by pipes and utilities.
- E. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 1. Include similar Samples of trim and accessories involving color selection.
- F. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 1. Aluminum Metal Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.10 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least five years of documented experience.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Installer: Company specializing in performing work of this section and approved by manufacturer.
 - 1. Install system in strict compliance with manufacturer's installation instructions.
- D. Anodized Finish Applicator: Provide either caustic (traditional) or eco-friendly (acid) etching technologies.
 - 2. Use fully automated, computer-controlled process lines for consistency of finish throughout project.
 - 3. Use documented production line quality control protocols in accordance with AAMA 611 test procedures.
- E. Source Limitations: Obtain each type of metal plate wall panel from single source and from single manufacturer.
- F. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical metal panel assembly as shown on Drawings, including corner, soffits, supports, attachments, and accessories.
 - a. Include at least four panels to represent a four-way panel joint and showing full thickness.
 - 4. Water-Spray Test: Conduct water-spray test of mockup of metal panel assembly, testing for water penetration according to AAMA 501.2.
 - 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Handle panels in strict compliance with manufacturer's instructions and recommendation, and in a manner to prevent bending, warping, twisting, and surface damage.
 - 1. Store panels vertically with top of panel down, storage of panels horizontally is not permitted.
- D. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- E. Retain strippable protective covering on metal panels during installation.

1.12 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written installation instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before panel fabrication and indicate measurements on Shop Drawings.
 - 1. Coordinate with construction schedule.

1.13 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, stud back-up, air barrier sheathing, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.14 WARRANTY

- A. Wall System Warranty: Provide wall panel manufacturer's warranty, in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within three year period after Date of Substantial Completion.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering of wall system metals and other materials.
 - 2. Warranty Coverage: In accordance with AAMA 2605 for 70 percent PVDF resin on aluminum finish requirements.
 - a. Fading, Loss of Color Retention: Loss of 5 Delta E units (Hunter) or less, in accordance with ASTM D2244.
 - b. Chalking, Chalky White Powder on Panel Surface: Chalking at No. 8 or less for colors, or No. 6 for white, in accordance with ASTM D4214.
 - c. Loss of Adhesion: Loss of 10 percent due to cracking, checking or peeling, or failure to adhere to bare metal.
 - d. Gloss Retention: 50 percent or less in accordance with ASTM D523.
 - e. Salt Spray, Accelerated: At least 4,000 hours in accordance with ASTM B117.
 - f. Humidity Testing, Accelerated: At least 4,000 hours in accordance with ASTM D2247.
 - 3. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Dri-Design – Aluminum Wall Panel System.
 - 1. Address: 12480 Superior Ct., Holland, Michigan 49424.
 - 2. P.O. Box 1286 Holland, Michigan 49422-1286.
 - 3. Phone: (616) 355-2970; Fax: (616) 355-2972; Website: www.dri-design.com

2.2 PERFORMANCE REQUIREMENTS

- A. Metal Plate Wall Panel Assemblies: Comply with performance requirements without failure due to defective manufacturing, fabrication, installation, or other construction defects.
- B. Delegated Design: Design wall panels, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Design, fabricate and erect a dry joint, pressure equalize rainscreen aluminum wall panel system without use of sealants, gaskets, or butyl tape, tested as installed in compliance with AAMA 508, and as follows.
- D. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592 AND ATM E330:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Deflection Limits: For wind loads, no greater than **1/240** of the span.
- E. Design, fabricate, and erect a dry joint, pressure equalized rainscreen aluminum wall panel system without use of sealants, gaskets, or butyl tape, tested as installed in compliance with AAMA 508, and as follows:
 - 1. Cyclic Static Air Pressure Differential: Pass cycled pressure loading at 25 psf in 100 three-second cycles in accordance with ASTM E1233/E1233M.
 - 2. Air Infiltration: Pass when tested at 1.57 psf (25 mph) in accordance with ASTM E283.
 - 3. Water Penetration:
 - a. Static: Pass water penetration test under 25.0 psf positive static air pressure difference for at least 15 minutes with 5 gallons per sf per hour of water applied in accordance with ASTM E331.
 - b. Dynamic: Pass water penetration test under 15.0 psf dynamic pressure difference for at least 15 minutes with 5 gallons per sf per hour of water applied in accordance with AAMA 501.1.
 - 4. Structural: Provide systems tested in accordance with ASTM E330/E330M and certified to be without permanent deformation or failure of structural members.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces
- G. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 METAL PLATE WALL PANELS AND SOFFITS

- A. Aluminum Plate: Alloy and temper as recommended by manufacturer for application and in compliance with manufacturers design requirements.

1. Aluminum Material: Tension-leveled, fluoropolymer PVDF painted finish
 2. Thickness: 0.080 inch.
 3. Weight: Less than 2 lbs per sf.
 4. Finish: Three-Coat Fluoropolymer.
- B. Panel Depth: 1-1/4 inch, nominal.
- C. Panel Size: As indicated on Drawings.
- D. Panel Joints: As indicated on Drawings.
- E. Attachment Assembly: Clip and girt.

2.4 FABRICATION

- A. Fabricate and finish wall panels within manufacturer's facilities and fulfill indicated performance requirements demonstrated by laboratory testing.
1. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide aluminum wall panels with welded inside corners to backside, typically at corner locations where metal plate is bent to form reveals.
- C. Provide post-finishing of panels, paint aluminum wall panels only after completion of panel fabrication and ensure exposed edges are coated.

2.5 FINISHES

- A. Comply with NAAMM's - Metal Finishes Manual for Architectural and Metal Products, for recommendations of designating finishes.
- B. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride (PVDF) resin system.
1. Three-Coat Fluoropolymer: AAMA 2605, fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' installation instructions.
 2. Color: Muskett Gray and SW7622, provide samples for final selection.
 3. Finish: Mica
- C. Field Touch-Up Materials: As recommended by coating manufacturer for field application.

2.6 ACCESSORIES

- A. Metal Plate Wall Panel Accessories: Provide components required for a complete metal plate wall panel assembly including trim, copings, fascia, mullions, sills, corner units, flashings, and similar items. Match material and finish of panels unless otherwise indicated.
- B. Provide integral drainage system and manufactures standard extrusions at termination of dissimilar materials.
- C. Flashing and Trim: Match material, finish, and color of adjacent wall panels.
1. Thickness: At least 0.040 inch.
 2. Refer to Section 07 62 00.

- D. Panel Fasteners: Designed to withstand design loads, with at least 7/16 inch diameter head and neoprene washer.
 - 1. Aluminum Wall Panel Material: Provide stainless steel fasteners, or coated fastener approved by panel manufacturer or project wall consultant.
- E. Sub-Girts: Galvanized, provide size and gage in accordance with project requirements.
 - 1. Furring Channel: Provide Hat, C, U or Z type as recommended by manufacturer.
 - a. See drawings for locations.
 - 2. Flat Strap: At least 14 gage, 0.0747 inch (1.90 mm) thick.
 - 3. Refer to Section 05 40 00.
- F. Wall Clips: Thermally broken Fiberglass wall panel clip and girt system. Basis of Design: Cascadia Clip.
 - 1. www.Cascadiaclip.com
 - 2. Sub-framing Thermal Spacer: 100 % Pultruded glass fibre and thermoset polyester resin insulation clip.
 - a. Thermal Spacer thickness for top, base and web: 3/16 inches nominal.
 - b. Thermal Spacer depth 4", to match thickness of exterior semi-rigid insulation.Spacer Fasteners: High hex head washer head with sharp twin lead threaded design of heat treated corrosion resistant steel.
 - c. Fastener for steel framing 1/4"14x6 inches long with hex head.
 - 1) Acceptable material: Leland Industries Inc., Master Drillre No. 2 Minim Drill Point with DT200 Coating.
 - d. Fastener for wood framing 1/4 10x6 inches long with hex head.
 - 1) Acceptable material: Leland Industries Inc., Master Gripper with Dt200 Coating.
 - e. Fastener for cast-in-place concrete and concrete masonry units 1/4 15x5 5/8" inch long concrete screw with hex head.
 - 1) Acceptable material: Leland Industries Inc. Concrete Screw with DT200 coating.
 - 2) Embedment depth: 1-1/2 inches, except when into hollow concrete masonry unit, not less than 1 inch.
 - 3. Thermal Spacer Installation: Clip thermal spacer to Z-girt and fasten girt directly to substrate [[at 26 inches maximum on center vertically and 16 inches maximum on center horizontally] [or as directed by Cladding Engineer].
 - 1. Installation sequence for spacers, sub-framing, and insulation - Option 1:
 - 1) Pre-punch or pre-drill holes in Z-girts and tracks to accommodate fasteners.
 - 2) Position Z-girts directly over thermal spacer before installation of fasteners.
 - 3) Completely install spacers, screws and sub-framing, prior to installing insulation.
 - 4) Friction fit insulation in place as follows:
 - a) For semi-rigid insulation batts or boards, score or cut insulation down its centreline to 50 % maximum of its depth to enable fitting insulation in correct position.
 - b) Fold edges of insulation board back to enable friction fitting in correct position. Position edges of partially folded board into space between girts and thermal spacers, and flatten partially folded board against substrate.
 - c) Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
 - 5) Install corrosion resistant stick pins or other mechanical insulation retention devices 16 inches maximum on center along centerline of insulation batts or boards and in accordance with insulation manufacturer's written recommendations.
 - a) Use sufficient number of stick pins or retention devices to ensure insulation remains flat and in correct position.
 - b) Use 3 minimum stick pins or retention devices for each 4 feet long batt or board.

- 6) Ensure insulation pieces are in contact with no linear gaps between spacers.
4. Wall clips fasteners are to be coordinate with semi-rigid insulation, see section 07 21 00.

- G. Substrate Wall Sheathing: Section 07 27 26 Factory Applied Fluid Air Barrier.
- H. Weather Barriers: Provide climate specific weather barrier with performance characteristics for air penetration, water vapor transmission, and water penetration resistance. Section 07 27 26 Factory Applied Fluid Air Barrier.
- I. Sealants: As recommended by metal panel manufacturer for openings within wall panels and perimeter conditions.
 1. Refer to Section 07 92 00 for requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install sub girt, base angles, sills, furring, and other wall panel support members and provide anchorage in accordance with ASTM C754 for gypsum panel type substrates and panel manufacturer's installation instructions.

3.3 INSTALLATION

- A. Install wall panels in accordance with manufacturer's installation instructions, including pressure equalized rainscreen installation method and installation guidelines.
 1. Wall panels consist of single sheets of metal formed with interlocking gutter and drainage system integral to the panel with single horizontal attachment for dry-joint rainscreen assembly.
 2. Use of secondary drainage channels, brackets, support pins, joint sealants or gaskets to manage the drainage of wall panel system is not permitted.
 3. Attach wall panels using progressive interlocking method, engaging bottom of panel in top of previous panel working bottom up, and left to right.
 4. Install wall panels with single top attachment in pre-punched holes to allow individual panels to move due to thermal expansion.
 5. Do not compromise internal gutter.

- B. Install wall panels for orientation, sizes, and locations as indicated on Drawings.
- C. Install wall panels with proper anchorage and other components for this Work securely in place.
- D. Install wall panels with provisions for thermal and structural movement.
- E. Install shims to plumb substrates as necessary for installation of wall panels.
- F. Install weather tight seals at perimeter of wall panel openings.
 - 1. Test for proper adhesion on small unexposed area of solid surfacing prior to use.
 - 2. Refer to Section 07 92 00.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA - Architectural Sheet Metal Manual.
 - 1. Provide concealed fasteners where possible and set units true to line and level as indicated.
 - 2. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 3. Install flashing and trim as wall panel Work proceeds.
- H. Install weather tight escutcheons for pipe and conduit penetrating exterior walls.
- I. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by wall panel manufacturer.
- J. Install attachment system to support wall panels and with provisions to provide a complete weather tight wall system, including sub girts, extrusions, flashings and trim.
 - 1. Include attachment to supports and trims at locations using dissimilar materials.
 - 2. Do not apply sealants to joints, unless noted otherwise on Drawings or Shop Drawings.
 - 3. Install starter extrusion at base course and at cut panel locations.
- K. Install accessories with positive anchorage to building and weather tight mounting and provisions for thermal expansion, and coordinate installation with flashings and other components.
 - 1. Install components required for a complete wall panel assembly including trim, copings, flashings and other accessory items.
- L. Weather Barrier: Install weather barrier behind wall panels and over substrate in accordance with requirements.
- M. Fasteners:
 - 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- N. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- O. Attachment Assembly, General: Install attachment assembly required to support metal plate wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
 - 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

- P. Installation: Attach metal plate wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.
1. Rainscreen Systems: Do not apply sealants to joints unless otherwise indicated.
- Q. Flange-Attachment Installation: Attach metal plate wall panels, formed with extended perimeter flanges, to supports at locations, spacings, and with fasteners recommended by manufacturer.
1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."
 2. Seal horizontal and vertical joints between adjacent panels with manufacturer's standard gaskets.
- R. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach flanges of metal plate wall panels to panel clips with fasteners as recommended by manufacturer.
- S. Subgirt-and-Spline Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use manufacturer's standard subgirts and splines that provide support and complete secondary drainage assembly, draining to the exterior at horizontal joints. Attach metal plate wall panels by interlocking perimeter extrusions attached to panels with subgirts and splines. Fully engage integral subgirt-and-spline gaskets and leave horizontal and vertical joints with open reveal. Terminate edge of panels flush with perimeter extrusions.
1. Install metal plate wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
 2. Do not apply sealants to joints unless otherwise indicated.
- T. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.16

SECTION 07 52 16.11 - COLD APPLIED MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. BASE SCOPE

1. 2ply SBS modified bituminous membrane roofing with 20 year warranty.

1.2 SECTION INCLUDES

- A. Configuration of a typical cold applied SBS modified bituminous membrane roofing system is to be assembled as follows:

1. Roofing Field Area:
 - a. Field-applied reflective coating (as specified), over;
 - b. One layer of granulated modified bituminous cap sheet in cold adhesive, over;
 - c. Two layers of reinforced field base ply sheets in cold adhesive, over;
 - d. Gypsum cover board in low rise foam adhesive, over;
 - e. Flat stock and/or tapered polyisocyanurate insulation (as specified), in low rise foam adhesive, over;
 - f. The underlying deck assemblies with associated preparations (including vapor barriers/temporary roofs), as specified in Sections 3.06 thru 3.08 of this Specification.
2. Base Flashing Areas:
 - a. Field-applied reflective coating (as specified), over;
 - b. One layer of granulated modified bitumen flashing cap sheet in cold adhesive, over;
 - c. One layer of reinforced base ply sheet (backer sheet) in cold adhesive.

1.3 REFERENCE STANDARDS

- A. ANSI/SPRI/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.
- B. ASCE 7-10 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2010.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2017.
- D. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- F. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2016).
- G. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2016a.
- H. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).

- I. ASTM D4601/D4601M - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing; 2004, with Editorial Revision (2012).
- J. ASTM D4897/D4897M - Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing; 2016.
- K. ASTM D6162/D6162M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements; 2016.
- L. ASTM D6163/D6163M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements; 2016.
- M. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2017.
- N. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011.
- O. ITS (DIR) - Directory of Listed Products; current edition.
- P. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- Q. UL (FRD) - Fire Resistance Directory; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Ensure required submittals have been provided with sufficient time for review prior to scheduling the Preinstallation Meeting.
 - 2. Review the detailed requirements for the work of this section and to review the drawings and specifications for this work
 - 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 4. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - 5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 6. Review structural loading limitations of roof deck during and after roofing.
 - 7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 8. Review governing regulations and requirements for insurance and certificates if applicable.
 - 9. Review temporary protection requirements for roofing system during and after installation.
 - 10. Review roof observation and repair procedures after roofing installation.
 - 11. Require attendance by all affected installers including but not limited to
 - a. Contractor's Superintendent
 - b. Installer (roofer)
 - c. Installer of substrate construction (roof decks)
 - d. Manufacturer/Fabricator Representative
 - e. Other affected Subcontractors
 - f. Architect/Engineer of Record

- g. Board's Representative
 - h. Board's Testing and Inspecting Agency
 - i. Other entities directly concerned with performance of roofing system including (as applicable) Board's insurers
 - 12. Record minutes and distribute copies within 5 days after meeting to participants as well as Architect/Engineer of Record, Board and those affected by decisions made.
- 1.5 SUBMITTALS
- A. See Section 01 33 00 – Submittal Procedures
 - B. Product Data: Provide manufacturer's catalog data for membrane and bitumen materials, base flashing materials, insulation, and vapor retarder.
 - C. Shop Drawings: Submit fully dimensioned layout drawings for:
 - 1. Joints, base flashings built-up termination condition and interface with other materials.
 - a. Indicate details that meet wind related requirements of NRCA as required by this Section.
 - 2. Tapered insulation layout, crickets, saddles, and tapered edge strips, including slopes and perimeter thicknesses.
 - 3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations, where mechanical fastening of components is required.
 - 4. For pre-engineered systems provide drawings and calculations signed and sealed by an Illinois licensed structural engineer (including wind pressure testing results).
 - D. Samples: Submit two samples 8 inches by 10 inches in size illustrating:
 - 1. Vented base sheet.
 - 2. Fastened base sheet.
 - 3. Reinforced field base ply sheet (Vapor Barrier/Temporary Roof).
 - 4. SBS-modified granulated cap sheet.
 - 5. Walkway pad.
 - 6. Roof insulation and cover board.
 - 7. Substrate board.
 - 8. Six base sheet and substrate board fasteners of each type, length and finish.
 - 9. Sample of manufacturer's standard pre-engineered, factory fabricated, prefinished aluminum ANSI/SPRI/ES-1 Coping / Roof Edge Flashing Profile and related mounting accessories.
 - E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements, including the following:
 - 1. Submit a letter on the letter head of the producer of the modified bitumen roofing system proposed for use, signed by a technical representative of the producer, stating the following:
 - a. The system meets the specification and warranty requirements.
 - b. The system will meet the Solar Reflectance Index (SRI) requirements.
 - c. Any topcoat proposed for use will not void the UL requirements specified.
 - d. Any topcoat proposed for use will not delaminate or deteriorate to the point of requiring replacement for a period of five (5) years after application.
 - F. Installer Certificates: Submit certificate signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

- G. Maintenance Data: Submit complete maintenance data for roofing system to include in maintenance manuals.
- H. Manufacturer's Field (Inspection) Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given. Provide weekly inspection reports.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Board's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Roofing Inspector Qualifications: A full time Technical Representative of manufacturer (non-sales) experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection as required to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification.
 - 1. The presence and activity of the manufacturer's Technical Representative, Independent Representative and/or Board's Representative shall in no way relieve the contractor of contract responsibilities or duties.
 - 2. It is the sole responsibility of the installing Contractor to contact the roofing manufacturer's inspector by phone on the morning of each day that roofing materials are being installed.
 - 3. The Manufacturer's Roofing Inspector shall be one of the following:
 - a. An authorized full-time technical employee of the manufacturer with 10 years of experience in commercial roofing.
 - b. If manufacturer does not employ full time technical personnel, inspection personnel shall be certified as a Registered Roof Observer by the Roof Consultants Institute, and shall be experienced in the installation and maintenance of the specified roofing system and qualified to determine Installer's compliance with the requirements of this Project.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience, eligible to receive manufacturer's warranty, and approved by manufacturer.
- C. General Performance: Installed hybrid cold applied SBS modified bitumen membrane roofing and cold applied SBS modified bitumen base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Hybrid cold applied SBS modified bitumen membrane roofing and cold applied SBS modified bitumen base flashings shall remain watertight.
- D. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- E. No torch-down or self-adhering roofing products are acceptable on this project.
- F. Solar Reflectance Index (SRI): Provide a hybrid modified bitumen roofing system that meets or exceeds: An initial reflectance value of 0.72 or a three-year installed value of 0.5 as determined by the Cool Roof Rating Council or Energy Star. Any product that has been rated by the Cool Roof Rating Council or by Energy Star shall display a label verifying the rating of the product.

- G. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressures calculated according to ASCE 7-10. The Minimum Recommended Design Uplift-Resistance Capacities (Uplift Pressures) below include a safety factor of 2.0.
 - 1. All Zones (Roof Area Field, Roof Area Perimeter and Roof Area Corners) Uplift Pressures: As indicated on Drawings and as identified below:
 - a. Zone 1 (Roof Area Field) Uplift Pressure: 25.9 lbf/sq. ft. (kPa).
 - b. Zone 2 (Roof Area Perimeter) Uplift Pressure: 43.5 lbf/sq. ft. (kPa), located within 5.8 feet of roof perimeter edge.
 - c. Zone 3 (Roof Area Corners) Uplift Pressure: 65.4 lbf/sq. ft. (kPa), located within 5.8 feet of roof corner edge.
 - H. ANSI/SPRI Wind Design Standard: Manufacture and install pre-engineered perimeter aluminum coping and roof edge systems tested according to ANSI/SPRI/ES-1 and capable of resisting the following design pressures:
 - 1. No field fabricated metal copings or roof edge systems will be accepted.
 - 2. Minimum Recommended Design Wind-Resistance Loads, Roof Edge Gravel Stops or Fascias:
 - a. Zone 4 (Wall Edge Perimeter, Horizontal (Outward) Load Direction): 33.7 lbf/sq.ft. (kPa) Design Pressure.
 - b. Zone 5 (Wall Edge Corners, Horizontal (Outward) Load Direction): 41.6 lbf/sq.ft. (kPa) Design Pressure.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
 - B. Store products in weather protected environment, clear of ground and moisture; ballast materials may be stored outdoors.
 - C. Protect foam insulation from direct exposure to sunlight, moisture, soiling, and other sources.
 - D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
 - E. Store modified bitumen rolls on end with selvage ends up.
 - F. Roll out the modified bitumen sheet and allow to relax for ten to fifteen minutes prior to installation.
 - 1. Cut into appropriate lengths.
 - 2. Install sheets parallel to slope as much as possible.
- 1.8 FIELD CONDITIONS
- A. Do not apply roofing membrane when environmental conditions are outside the ranges recommended by manufacturer.
 - B. Do not apply roofing membrane during unsuitable weather.
 - C. Do not apply roofing membrane when ambient temperature is below 40 degrees F.

- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Consider effects of wind chill on adhesives, and ensure they will not prematurely set before proper adhesion takes place.
- G. Prevent all products from freezing. Store all materials prior to application at temperatures between 60 and 90 deg. F.
- H. Board will occupy portions of building immediately below roofing area. Conduct roofing so Board's operations will not be disrupted. Provide Board with not less than 72 hours' notice of activities that may affect Board's operations.
- I. Prevent dust, vapors, gases, and odors from entering into the building during roof installation. When shutting down or blocking air intakes, provide makeup air or additional intake air from sources away from the work area. Coordinate these procedures with Board's Representative.
- J. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing 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 and insulation with a course of coated roofing sheet set in urethane mastic with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove temporary plugs from roof drains at end of each day.
 - 4. Remove and discard temporary seals before beginning work on adjoining roofing.
 - 5. Provide protection in roof-related traffic, staging and storage areas consisting of 45 mil EPDM, 1" extruded polystyrene insulation, and 3/4" plywood ballasted with sandbags. Remove protection materials upon completion of work.
 - 6. Roofing Contractor to coordinate with General Contractor to provide protection for the installed vapor barrier/temporary roof and/or modified bituminous roofing system during all non-modified bituminous roofing system related construction activities.

1.9 WARRANTY

- A. See Section 01 78 39 – Project Record Documents, 01 77 00 Closeout Procedures, additional warranty requirements.
- B. Manufacturer's Warranty: Provide warranty, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system, including but not limited to, vapor retarder roofing plies, modified membrane, adhesives, roof insulation, cover board, substrate board, wood components, fasteners, walkway products and all roof system metal caps and counter flashing, that fail in materials or workmanship within specified warranty period . Failure includes roof leaks.
 - 1. Warranty Period: 20 years from date of Preliminary acceptance.
 - 2. Indicate a wind speed warranty of up to 74 M.P.H., as reported by the certified weather reporting station nearest to the site for the Chicago IL region.

3. Contractor to provide a sample copy of standard roofing manufacturer's warranty, stating obligations, remedies, limitations, and exclusions of warranty as specified, with bid.
 4. Warranty shall run for a continuous 20 years.
 - a. Warranty will not be accepted that contains any requirement(s) for Board to renew the warranty at any time during the 20 year period.
 - b. In year(s) number 2, 5, 10 and 15 of this warranty, manufacturer shall provide roof inspections with a written report, and limited housekeeping services, at no later additional charge to the Board.
 - c. Lack of a written record that Board performed regularly scheduled maintenance shall not void the warranty.
- C. Installer's Warranty : Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, and all components of roofing system, including but not limited to, vapor retarder roofing plies, modified membrane, base flashings, adhesives, roof insulation, cover board, substrate board, wood components, fasteners, walkway products and all roof system metal caps and counterflashing, for the following warranty:
1. Warranty Period: Two years from date of Preliminary Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Listed Manufacturers: The manufacturers listed below have demonstrated an ability to comply with the specified performance attributes for hybrid cold applied SBS modified bituminous membrane roofing assemblies. If one of the listed manufacturers chooses to use an acceptable product from another manufacturer, as listed in Sections 2.02 thru 2.12 of this Specification, the listed manufacturer must confirm in writing that the product is part of a RoofNav approved assembly and will be warranted by the manufacturer. Subject to compliance with requirements, provide a hybrid cold applied SBS modified bituminous membrane roofing system warranted by one of the following:
1. Garland.
 2. Johns Manville.
 3. Siplast.
 4. Soprema.
 5. Tremco.

2.2 SBS-MODIFIED ASPHALT SHEET MATERIALS (FOR ROOFING FIELD)

- A. Granulated Cap Sheet: Meeting or exceeding ASTM D6162/D6162M, Grade G, Type II glass-fiber-reinforced, containing SBS-modified granulated surface (manufacturer's standard ceramic granules) with field-applied reflective roof coating as specified OR meeting or exceeding ASTM D6162/D6162M, Grade G, Type II composite of polyester and glass reinforcement containing SBS modified granulated surface (manufacturer's standard ceramic granules) with field-applied reflective roof coating as specified.
1. Acceptable glass-fiber reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade G, Type II:
 - a. Garland StressPly FR Mineral
 - b. Garland VersiPly Mineral
 - c. Johns Manville DynaGlas FR XT
 - d. Siplast Paradiene 30 HT FR

- e. Soprema Elastophene HR FR GR
- f. Soprema Elastophene HR FR GR WH
- g. Tremco Powerply Plus HT FR
- 2. Acceptable composite polyester and glass reinforced SBS modified products, meeting or exceeding ASTM D6162/D6162M, Grade G, Type II:
 - a. Siplast Parafor 30
 - b. Soprema Elastophene HS FR GR

2.3 BASE-PLY SHEET MATERIALS (FOR ROOFING FIELD)

- A. Reinforced Base Ply Sheet: Composite of polyester and glass reinforcement coated with waterproofing asphalt, dusted with fine mineral surfacing on both sides, meeting or exceeding ASTM D4601/D4601M Type II OR glass reinforced SBS modified, meeting or exceeding ASTM D6162/D6162M, Grade S, Type II smooth, min. thickness 115 mils.
 - 1. Acceptable composite polyester and glass reinforced asphalt coated products, meeting or exceeding ASTM D4601/D4601M, Type II:
 - a. Johns Manville Glastite Flexible
 - b. Tremco Composite Ply HT
 - 2. Acceptable glass reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II, with a minimum sheet thickness of 115 mils:
 - a. Garland StressBase 120
 - b. Johns Manville DynaBase XT-134 mil
 - c. Siplast Paradiene 20 EG
 - d. Soprema Elastophene HR sanded 3.0 (118 mils)
- B. Fastened Base Sheet: Glass ply sheet, meeting or exceeding ASTM D4601/D4601M, Type I, as described in Section 3.06 of this specification.
 - 1. Acceptable glass base sheet products, meeting or exceeding ASTM D4601, Type I:
 - a. GAF Glas #75 Base, (Only if identified to be included in the system warranty by one of the Listed Manufacturers)
 - b. Johns Manville Perma Ply 28
 - c. Siplast Parabase
 - d. Soprema Modified Sopra G
 - e. Tremco BURmastic Glass Ply
- C. Vented Base Sheet: Meeting or exceeding ASTM D4897/D4897M, Type II, as described in Section 3.06 of this specification.
 - 1. Acceptable vented base sheet products, meeting or exceeding ASTM D4897/D4897M, Type II:
 - a. GAF Glas Stratavent, (Only if identified to be included in the system warranty by one of the Listed Manufacturers)
 - b. Johns Manville Ventsulation Felt
 - c. Soprema Sopra 4897
- D. Reinforced Field Base Ply Sheet (Vapor Barrier/Temporary Roof): Composite of polyester and glass reinforcement coated with waterproofing asphalt, dusted with fine mineral surfacing on both sides, meeting or exceeding ASTM D4601/D4601M Type II OR glass reinforced SBS modified, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II smooth, with a minimum sheet thickness of 115 mils, as described in Section 3.08 of this specification.

1. Acceptable composite polyester and glass reinforced asphalt coated products, meeting or exceeding ASTM D4601/D4601M, Type II:
 - a. Johns Manville Glastite Flexible
 - b. Tremco Composite Ply HT
2. Acceptable glass reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II, with a minimum sheet thickness of 115 mils:
 - a. Garland StressBase 120
 - b. Johns Manville DynaBase XT-134 mil
 - c. Siplast Paradiene 20 EG
 - d. Soprema Elastophene HR sanded 3.0 (118 mils)

2.4 BASE FLASHINGS (FOR ROOF FLASHING AREAS)

- A. Reinforced Base Ply Sheet (Backer Sheet): Composite of polyester and glass reinforcement coated with waterproofing asphalt, dusted with fine mineral surfacing on both sides, meeting or exceeding ASTM D4601/D4601M Type II OR glass reinforced SBS modified, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II smooth, min. thickness 115 mils.
 1. Acceptable composite polyester and glass reinforced asphalt coated products, meeting or exceeding ASTM D4601/D4601M, Type II:
 - a. Johns Manville Glastite Flexible
 - b. Tremco Composite Ply HT
 2. Acceptable glass reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II, with a minimum sheet thickness of 115 mils:
 - a. Garland StressBase 120
 - b. Johns Manville DynaBase XT-134 mil
 - c. Siplast Paradiene 20 EG
 - d. Soprema Elastophene HR sanded 3.0 (118 mils)
- B. Granulated Flashing Cap Sheet: Meeting or exceeding ASTM D6163/D6163M, Grade G, Type II glass- fiber-reinforced, containing SES-modified granulated surface (manufacturer's standard ceramic granules) with field-applied reflective roof coating as specified OR meeting or exceeding ASTM D6162/D6162M, Grade G, Type II composite of polyester and glass reinforcement containing SBS modified granulated surface (manufacturer's standard ceramic granules) with field-applied reflective roof coating as specified.
 1. Acceptable glass-fiber reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade G, Type II:
 - a. Garland StressPly FR Mineral
 - b. Garland VersiPly Mineral
 - c. Johns Manville DynaGlas FR XT
 - d. Siplast Paradiene 30 HT FR
 - e. Soprema Elastophene HR FR GR
 - f. Soprema Elastophene HR FR GR WH
 - g. Tremco Powerply Plus HT FR
 2. Acceptable composite polyester and glass reinforced SBS modified products, meeting or exceeding ASTM D6162/D6162M, Grade G, Type II:
 - a. Siplast Parafor 30
 - b. Soprema Elastophene HS FR GR

2.5 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. Primer: ASTM D41/D41M, asphalt type.
 - 1. Asphalt primer products:
 - a. Garland Garlaprime VOC
 - b. Johns Manville Asphalt Primer
 - c. Siplast PA1125 Asphalt Primer
 - d. Soprema Elastacol 500
 - e. Tremco Tremprime LV
- B. Asphalt Mastic: ASTM D4586/D4586M, Type I, Class I or Type II, Class I.
 - 1. Acceptable asphalt mastic products:
 - a. Garland Flashing Bond
 - b. Johns Manville MBR Utility Cement
 - c. Siplast PA 1021 for Flat/Low Slope Application
 - d. Siplast PA 828 for Vertical Application
 - e. Soprema Sopramastic SBS Elastic Cement
 - f. Tremco ELS Mastic
- C. Fluid-Applied Liquid Flashing: Roofing system manufacturer's standard single component, two-coat, cold, fluid-applied, moisture triggered, aliphatic polyurethane reinforced flashing membrane OR two-coat, reinforced PMMA (polyurethane methyl methacrylate) fluid applied products.
 - 1. Acceptable aliphatic polyurethane products:
 - a. Tremco Alphaguard MT BC Polyurethane Base Coat / Tremco Alphaguard MT TC Polyurethane Top Coat
 - 2. Acceptable PMMA (polyurethane methyl methacrylate) products:
 - a. Johns Manville SeamFree PMMA Flashing Resin (with Johns Manville SeamFree PMMA Catalyst & Johns Manville SeamFree PMMA Scrim)
 - b. Siplast Parapro 123 Liquid Flashing System
 - c. Soprema Alsan RS 230 Flash
- D. Cold-Applied Adhesive : Roofing system manufacturer's standard asphalt-based, one- or two- part, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
 - 1. Acceptable cold-applied adhesive products:
 - a. Garland Weatherking Flashing Adhesive
 - b. Johns Manville MBR Cold Application Adhesive
 - c. Siplast PA-311 R
 - d. Soprema Colply Adhesive
 - e. Soprema Colply Modified Adhesive
 - f. Tremco POWERply Cold Adhesive
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer. Use stainless steel fasteners where there is fastener contact with treated wood.
- F. Field-Applied Reflective Roof Coating: White semi-gloss reflective coating acceptable to roofing system producer as required to produce the Solar Reflectance Index (SRI) specified under "QUALITY ASSURANCE" requirements and certified as required under "SUBMITTALS".

1. Acceptable field-applied reflective roof coating products:
 - a. Garland Pyramic
 - b. Garland White Knight
 - c. Johns Manville Topguard 5000
 - d. Siplast PC227 Elastomeric Coating
 - e. Soprema R Nova Plus
 - f. Tremco T-24 Coating
- G. Drain Flashing Metal: 4 lb. (min.) lead sheet.
- H. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.
- I. Fasteners : Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions, designed for fastening substrate panel to roof deck. Use stainless steel fasteners where there is fastener contact with treated wood.

2.6 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class I, Grade 2, 20 psi, felt or glass- fiber mat facer on both major surfaces. Continuous R-30 flat stock insulation, specified tapered layout, or other flat stock R value as indicated on drawings. 2.6" maximum flat board thickness. Filler insulation for tapered insulation systems may be greater than 2.6" thickness, where required. 48" x 48" maximum board size.
 1. Where 1/2" thick reinforced gypsum board or gypsum fiber board is used for an insulation cover board within a cold applied modified bitumen roofing system:
 - a. The insulation field is to be comprised of 2 layers of 2.6" thickness insulation board.
 2. At drain locations with a drainage slope of 1/4" per foot:
 - a. The tapered insulation shall meet the R-30 minimum thickness at a distance of 4'-0" away from the drain.
 3. At drain locations with a drainage slope of 1/8" per foot:
 - a. The tapered insulation shall meet the R-30 minimum thickness at a distance of 8'-0" away from the drain.
 4. Acceptable polyisocyanurate board insulation products:
 - a. GAF Energy Guard Poly Iso Insulation
 - b. Hunter H-Shield
 - c. Johns Manville Energy 3 Polyisocyanurate
 - d. Siplast Paratherm
 - e. Soprema Sopra ISO
 - f. Tremco Trisotech

2.7 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Low Rise Foam Insulation Adhesive: Manufacturer's recommended low rise foam insulation adhesive. Two component (1:1 ratio), solvent free, asbestos free, elastomeric urethane adhesive.
 1. Acceptable low rise foam insulation adhesive products:
 - a. GAF OlyBond 500 Adhesive Fastener

- b. Garland Insulock II
 - c. Johns Manville Two-Part Urethane Insulation Adhesive (UIA)
 - d. Siplast Parafast Insulation Adhesive (Large Areas)
 - e. Siplast Parafast C (Small Areas)
 - f. Soprema Duotack 365
 - g. Tremco Low Rise Foam Insulation Adhesive Green
- C. Insulation Cant Strip: Fiberboard, asphalt coated, ASTM C208, Type II, Grade I, Cellulosic- Fiber Insulation Board, 48 inches. Thickness: 2 inches Face: 4 inches.
- D. Insulation Cover Board: 1/2" thick reinforced gypsum board :
- 1. A product recommended by the roofing system manufacturer.
 - 2. Must be compatible with cold applied systems.
 - 3. Acceptable insulation cover board products:
 - a. Georgia Pacific Dens Deck Prime Roof Board
 - b. Johns Manville Dens Deck Prime Roof Board
 - c. Johns Manville Securock Gypsum Fiber Board
 - d. National Gypsum Dexcel Glass Matt Board
 - e. Siplast / USG Securock Gypsum Fiber Board
 - f. USG Securock Gypsum Fiber Roof Board
 - g. Tremco / USG Securock Fiber Reinforced, Moisture Resistant Gypsum Roof Board
- E. Batt Insulation: ASTM C665, Type I, preformed glass fiber batt.
- 1. For filling acoustical steel deck flutes: 1.5 pcf inert, non-organic fiberglass batts, supplied by acoustical deck manufacturer.

2.8 PERIMETER METAL COPING AND ROOF EDGE SYSTEM

- A. Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System: Tested and certified to meet ANSI/SPRI/ES-1 Wind Design Standards for Edge Systems.
- 1. Parapet copings and roof edge profiles (including fascia / gravel stop profiles) shall be manufactured from 0.050" (minimum thickness) mill finished aluminum in 12'-0" maximum lengths.
 - a. Provide factory mitered and welded corners, transitions and end caps. Coping profiles to be precision saw cut and continuously welded to produce a watertight joint.
 - 1) Inside and outside corners. No joints within 18 inches of corners. Maximum leg length is 30 inches.
 - 2) Transition miters.
 - 3) Offset miters.
 - 4) End caps. No joints within 18 inches of ends. Maximum leg length is 30 inches.
 - b. High Performance Coating: Two-coat, shop applied, 70% Polyvinylidene Fluoride (PVFD) coating. Color to be selected by architect from manufacturer's full range of colors.
 - 2. Concealed coping splice plates to be installed at all coping joints.
 - a. Coping splice plates shall be manufactured from 0.050" (minimum thickness) aluminum, 6 inch lengths, formed to fit the inside of the coping profile.
 - b. Splice plates to be sealed factory applied, dual, non-hardening sealant strips.
 - c. Splice plate finish to match coping or roof edge profile finish.
 - 3. Coping profiles to be snapped onto compression cleats manufactured from galvanized steel, 12 inch widths, with factory mounted stainless steel spring clips.

- a. Cleats to be fastened with stainless steel fasteners, sized per manufacturer's recommendation.
 4. No exposed fasteners permitted.
- B. Miscellaneous metal components and ancillary accessories to interface with the Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System: Including, but not limited to, gutters, scuppers, counterflashings, expansion joint covers, etc.
 1. All miscellaneous metal components and ancillary accessories not requiring welding shall be manufactured from 0.040" (minimum thickness) mill finished aluminum in 12'-0" maximum lengths.
 - a. Finished to match the Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System.
 2. All slip metal components to be manufactured from 0.040" (minimum thickness) mill finished aluminum in 12'-0" maximum lengths.
 - a. Finished to match the Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System.
 3. ONLY where new slip metal is to be used at existing non-aluminum metal flashing components to remain in place, the new slip metal component is to match the metal type of the existing metal component. If galvanized steel is used, provide 24 ga. Minimum thickness.
 - a. Finished to match the Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System.
 4. Acceptable Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System products:
 - a. Garland R-Mer Edge
 - b. Hickman
 - c. Johns Manville Presto Lock Coping System
 - d. Johns Manville Presto Tite Fascia System
 - e. Metal Era
 - f. Siplast Paraguard
 - g. Soprema Sopraedge
 - h. Soprema Sopraguard
 - i. Soprema Sopracap
 - j. Soprema Soprabond
 - k. Tremco Tremlock

2.9 WALKWAYS

- A. Walkway Pads: Mineral-granule-surfaced , reinforced asphaltic composition , slip-resisting pads, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer , minimum 1/3" thick, 30" x 30" pad size.
 1. Acceptable walkway products;
 - a. Johns Manville Dynatred Plus
 - b. Tremco Tremtred

2.10 CONCRETE SPLASH BLOCKS

- A. Precast Concrete Splash Blocks: Install one reinforced, precast concrete splash block at all downspouts terminating at bituminous membrane roofing areas, 12" x 24" x 3" block size.
 1. Install one 30" x 30" walkway pad beneath each precast concrete splash block.

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.
 - a. Check roof drains prior to starting the roofing in each drainage area to determine if the drain is plugged , or if the drain bowl, clamping ring, dome, etc. are damaged. These items shall be brought to the attention of the Board or Architect/Engineer of Record prior to starting work, and will be the Board's responsibility for correction . Plugged or damaged drains brought to the attention of the Board or Architect/Engineer of Record after work has begun shall be the responsibility of the Contractor to correct.
 - 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. At Concrete Decks and Concrete Topped Clay Tile / Book Tile Decks:
 - a. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
 - b. Verify that concrete substrate is visibly dry and free of moisture . Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - 1) Test for moisture by taping an 18-inch (460mm) square of polyethylene film onto a concrete slab and waiting at least 16 hours. Afterward, the underside of the sheet is examined for signs of moisture. Any moisture condensation or observable darkening of the color of the concrete underneath the sheet suggests excessive moisture and means the slab is not ready.

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 ROOF INSPECTION AND TESTING.

- A. The Board will employ the services of a roofing consultant to perform the following services:
 - 1. Attend the roofing preinstallation conference.
 - 2. Provide full time observation of the Work and enforcement of the Contract Documents in accordance with good construction practice the first two days of installation and periodically thereafter.
 - 3. Direct the roofing installer to cut and patch one foot square samples as the installed roofing system minus the coating system and perform tests to determine such items as bitumen weight, interply mopping and moisture encapsulated within the roofing system at the site while Work is in progress one for 5,000 square foot of roof.
 - 4. If the test indicates failure to comply with Contract Documents, direct the roofing installer to make additional cut and conduct additional tests.
 - 5. Direct corrective action to obtain acceptance including removal and replacement if necessary.
 - 6. Insert the completed roofing system after application of coating system.
- B. The roofing installer shall, as part of the Contract Work, perform the following:

1. Make all cuts as directed.
2. Immediately patch all cuts as required to obtain the specified warranty.
3. Perform all corrective work as directed.
4. Extend full cooperation.

3.4 VAPOR BARRIER INSTALLATION

A. AT STRUCTURAL CEMENT BOARD ROOF DECK:

1. Over fastened substrate board, install one reinforced base ply sheet vapor barrier lapping each sheet minimum 4 inches over preceding sheet in shingle fashion. Embed each sheet in a solid application of roofing system manufacturer's standard cold adhesive at a minimum rate of 2.0 gallons per 100 square feet.
 - a. Installation.
 - b. Turn ply up at penetrations, walls and curbed units a minimum of eight inches (8") and seal with asphalt mastic.
 - c. Use roofing system manufacturer's standard mastic for vapor barrier seal where roofing system manufacturer's standard adhesive is used at steel and wood decks.
- B. Completely seal vapor barrier at terminations, obstructions, and penetrations to prevent air and moisture movement into roofing system.

3.5 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- C. Install tapered or flat stock insulation as shown on drawings to provide positive drainage.
- D. At areas where flat stock insulation is specified, provide a continuous R-Value of 30 unless the roof is an existing roof that has been granted a special exception by the City of Chicago for a lower R-Value.
- E. Nailer Strips: Mechanically fasten 4-inch nominal- width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
 1. 20 feet apart for roof slopes greater than 12 inch per 12 inches (2:12) but less than 3 inches per 12 inches (3:12).).
 - a. Backnail 3 inches o.c. from the back edge of each ply along nailer to ensure that the nails are covered by a minimum of two plies of sheet. The nails shall be staggered.
 2. 48 inches apart for roof slopes greater 3 inches per 12 inches (3:12).
 3. Backnail 3 inches o.c. from the back edge of each ply along nailer to ensure that the nails are covered by a minimum of two plies of sheet. The nails shall be staggered.
- F. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips in cold adhesive at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- G. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

- H. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- I. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- J. Sump insulation at roof drains and scuppers to provide a 48 inch by 48 inch sump.
- K. Install adhered crickets between drains, at walls and perimeters between drains, and at other locations indicated on drawings.
- L. Adhered Insulation: Install each layer of insulation and adhere as follows unless roofing system manufacturer requires otherwise. Comply with such requirements:
 - 1. Set each layer of insulation in low rise foam insulation adhesive.
 - 2. Apply in low rise foam insulation adhesive. Apply 1/2 inch wide adhesive beads to substrate or insulation board in ribbons spaced 12 inches apart. Install insulation board immediately into wet adhesive. Do not allow adhesive beads to skin over before placing the boards. Walk on boards to fully press them into wet adhesive.
- M. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing system manufacturer.
 - 1. Apply in low rise foam insulation adhesive.
- N. Install adhered tapered edge strips (heights vary) at perimeter edges of roof to ensure no 90 degree bends exist in roofing.

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. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- D. 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.
- E. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.7 BASE-PLIES INSTALLATION

- A. Install two reinforced base ply sheets according to roofing system manufacturer's written instructions starting at low point of roofing system. Align reinforced ply sheets without stretching. Extend sheets over and terminate beyond cants.
1. Shingle side laps of reinforced base ply sheets uniformly to ensure that required number of base ply sheets covers substrate at any point. Shingle in direction to shed water.
 2. Embed each reinforced base ply sheet in cold-applied membrane adhesive applied at a minimum rate of 2.00 gallons per 100 square feet, to form a uniform membrane without base ply sheets touching.
 3. Avoid walking on plies until adhesive has set.

3.8 SBS-MODIFIED BITUMINOUS CAP SHEET INSTALLATION

- A. Install granulated SBS-modified bituminous roofing membrane cap sheet over reinforced base ply sheets 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. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
 2. Embed each base ply sheet in cold-applied membrane adhesive applied at rate of 2.0 gallons per 100 square feet.
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.
1. Repair tears and voids in laps and lapped seams not completely sealed.
 2. Allow membrane a minimum 30 day cure before applying reflective white surface coating.
- C. Immediately after installation, to ensure complete and continuous seal and contact between adhesive and base ply sheets, including ends, edges and all laps without wrinkles, fish-mouths, or blisters:
1. Minimum 75-pound weighted roller shall be applied over entire adhered base ply sheet at all areas including field of base ply, side laps and end laps.
- D. Install modified bituminous membranes with side laps shingled with slope of roof deck. Nail off all roof plies into wood cants with 1 " nails fastened 12" on center.
- E. Seal all edges of new roofing at top of cants with asphalt mastic.

3.9 FLASHING AND STRIPPING INSTALLATION

- A. Install two-ply (one base ply sheet plus one granulated cap ply, each adhered in a full bed of asphalt mastic) stripping where metal flanges and edgings are set on membrane roofing. Extend plies minimum of 4" beyond edge of metal flange or beyond edge of previous installed ply and embed each ply in a full bed of asphalt mastic.

1. Lap ends 6-inches minimum, and stagger end laps 18-inches minimum.
 2. Set all metal flanges on roof in full bed of mastic.
 3. Prime flanges before stripping.
- B. Extend adhered base flashings vertically to allow for a minimum eight inch height and extend 6-inches onto field of roof membrane. Lap ends 6-inches minimum, and stagger end laps 18-inches minimum.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
1. Set butyl tape behind base flashing.
 2. Seal top termination of base flashing with a flat metal termination bar.
 3. Fasten through termination bar, flashing membrane, and butyl tape (8 inches on center, minimum).
 4. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.
 5. Install new metal counter flashings to cover flashing termination.
- D. Roof Drains: Set 30-by-30-inch lead sheet drain flashing in bed of asphalt roofing mastic on completed roofing membrane. Cover lead sheet drain flashing with roofing membrane cap-sheet stripping and extend a minimum of 4 inches beyond edge of lead sheet drain flashing onto field of roofing membrane. Clamp roofing membrane, lead sheet drain flashing, and cap sheet stripping into roof-drain clamping ring. Retap existing clamping ring bolt holes and provide new bolts at all existing drain bowl locations.
1. Install cap sheet stripping according to roofing system manufacturer's written instructions.

3.10 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads using units of size indicated (30" x 30" pad size minimum) to surround rooftop units, door entrances, and hatches, to form a walkway path between serviceable units, beneath all conduit or cable runs, beneath all sleeper supports, at ladder access points, and where additionally indicated on drawings, according to walkway pad manufacturer's written instructions.
- B. Set walkway pads in asphalt mastic or manufacturer's recommended cold-applied adhesive.

3.11 REFLECTIVE ROOF COATING

- A. After entire roof system and flashing details are completed and roof system/laps/flashings have cured for 30 days, apply a uniform coating of the white semi-gloss reflective roof coating to roofing membrane, base flashings and walkway pads according to manufacturer's written instructions by roller or other suitable application method.
- B. Apply two coats to roofing field and flashings in a neat and uniform manner.

3.12 FINAL FIELD INSPECTION

- A. Manufacturer must provide a photo summary report, showing installation methods and conditions, to the Board's Representative at the completion of the project.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect/Engineer of Record.

1. Notify Architect/Engineer of Record or Board 48 hours in advance of date and time of final inspection.
 2. Results will be made available to Board's Representative in written form. Any defects or entrapped moisture found within the new roofing system installation will be removed and replaced at the installing contractor's expense.
- C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Contractor to repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

3.13 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/Engineer of Record and Board.
- 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 Preliminary Acceptance and according to warranty requirements.
- C. Sequence operations to avoid excessive or concentrated foot traffic and storage over roof areas while they cure.
- D. Clean all overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- E. Contractor shall rod all drains to ensure that a free flowing condition exists and all drains are functioning properly.

3.14 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS NAME of COMPANY, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: City Colleges of Chicago
 2. Address: 180 N. Wabash Ave. Chicago, IL 60601
 3. Building Name/Type: Malcolm X West Side Learning Center
 4. Address: 4624 W. Madison Ave. Chicago IL 606044
 5. Area of Work:
 6. Acceptance Date:
 7. Warranty Period:
 8. Expiration Date:

- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding 90 mph;
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the

Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

- E. IN WITNESS THEREOF, this instrument has been duly executed this XX day of XXXXXXX, 20XX.
1. Authorized Signature:
 2. Name:
 3. Title:

END OF SECTION 07 52 16.11

SECTION 07 52 16.12 - HOT APPLIED MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. BASE SCOPE

1. 2ply SBS modified bituminous membrane roofing with 20 year warranty.

1.2 SECTION INCLUDES

- A. Configuration of a typical hot applied SBS modified bituminous membrane roofing system is to be assembled as follows:

1. Roofing Field Area:

- a. Field-applied reflective coating (as specified), over;
- b. One layer of granulated modified bitumen cap sheet in hot asphalt OR in cold adhesive, in lieu of hot asphalt, (at roofing manufacturer's option and per roofing manufacturer's recommendation - FOR CAP SHEET ONLY), over;
- c. One layer of reinforced base ply sheet in hot asphalt adhesive, over;
- d. One layer of Type VI glass-fiber ply sheet in hot asphalt, over;
- e. Gypsum fiber or coated wood fiber cover board in hot asphalt adhesive, over;
- f. Flat and/or tapered polyisocyanurate insulation (as specified), in hot asphalt adhesive, over;
- g. The underlying deck assemblies with associated preparations (including vapor barriers/temporary roofs), as specified in Sections 3.06 thru 3.08 of this Specification.
- h. Base Flashing Areas:
 - 1) Field-applied reflective coating (as specified), over;
 - 2) One layer of granulated modified bitumen cap sheet in hot asphalt OR in cold adhesive, in lieu of hot asphalt, (at roofing manufacturer's option and per roofing manufacturer's recommendation - FOR FLASHING CAP SHEET ONLY), over;
 - 3) One layer of Type VI glass-fiber ply sheet (backer sheet) in hot asphalt.

1.02 REFERENCE STANDARDS

- A. ANSI/SPRI/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 20
- B. ASCE 7-10 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2010.
- C. ASTM C1278/C1278M – Standard Specification for Fiber-Reinforced Gypsum Panel; 2017.
- D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2017.
- E. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012.
- F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- G. ASTM D2178/D2178M - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2015a.
- H. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2016).
- I. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2016a.
- J. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method; 1983 (Reapproved 2012).

- K. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).
- L. ASTM D4601/D4601M - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing; 2004, with Editorial Revision (2012).
- M. ASTM D4897/D4897M - Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing; 2016.
- N. ASTM D6162/D6162M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements; 2016.
- O. ASTM D6163/D6163M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements; 2016.
- P. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2017.
- Q. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011.
- R. ITS (DIR) - Directory of Listed Products; current edition.
- S. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- T. UL (FRD) - Fire Resistance Directory; current edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Ensure required submittals have been provided with sufficient time for review prior to scheduling the Preinstallation Meeting.
 - 2. Review the detailed requirements for the work of this section and to review the drawings and specifications for this work
 - 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 4. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - 5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 6. Review structural loading limitations of roof deck during and after roofing.
 - 7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 8. Review governing regulations and requirements for insurance and certificates if applicable.
 - 9. Review temporary protection requirements for roofing system during and after installation.
 - 10. Review roof observation and repair procedures after roofing installation.
 - 11. Require attendance by all affected installers including but not limited to
 - a. Contractor's Superintendent
 - b. Installer (roofer)
 - c. Installer of substrate construction (roof decks)
 - d. Manufacturer/Fabricator Representative
 - e. Other affected Subcontractors
 - f. Architect/Engineer of Record
 - g. Board's Representative
 - h. Board's Testing and Inspecting Agency
 - i. Other entities directly concerned with performance of roofing system including (as applicable) Board's insurers.

- j. Record minutes and distribute copies within 5 days after meeting to participants as well as Architect/Engineer of Record, Board and those affected by decisions made.

1.04 SUBMITTALS

- A. See Section 01 33 00 – Submittal Procedures
- B. Product Data: Provide manufacturer's catalog data for membrane and bitumen materials, base flashing materials, insulation, and vapor retarder.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work. Submit fully dimensioned layout drawings for:
 - 1. Joints, base flashings built-up termination condition and interface with other materials.
 - a. Indicate details that meet wind related requirements of NRCA as required by this Section.
 - 2. Tapered insulation layout, crickets, saddles, and tapered edge strips, including slopes and perimeter thicknesses.
 - 3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations, where mechanical fastening of components is required.
 - 4. For pre-engineered systems provide drawings and calculations signed and sealed by an Illinois licensed structural engineer (including wind pressure testing results).
- D. Samples: Submit two samples 8 inches by 10 inches in size illustrating:
 - 1. Vented base sheet.
 - 2. Fastened base sheet.
 - 3. Reinforced field base ply sheet (Vapor Barrier/Temporary Roof).
 - 4. SBS-modified granulated cap sheet.
 - 5. Walkway pad.
 - 6. Roof insulation and cover board.
 - 7. Substrate board.
 - 8. Six base sheet and substrate board fasteners of each type, length and finish.
 - 9. Sample of manufacturer's standard pre-engineered, factory fabricated, prefinished aluminum ANSI/SPRI/ES-1 Coping / Roof Edge Flashing Profile and related mounting accessories.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements, including the following:
 - 1. Submit a letter on the letter head of the producer of the modified bitumen roofing system proposed for use, signed by a technical representative of the producer, stating the following:
 - a. The system meets the specification and warranty requirements.
 - b. The system will meet the initial and aged solar reflectance requirements.
 - c. Any topcoat proposed for use will not void the UL requirements specified.
 - d. Any topcoat proposed for use will not delaminate or deteriorate to the point of requiring replacement for a period of five (5) years after application.
- F. Installer Certificates: Submit certificate signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- G. Maintenance Data: Submit complete maintenance data for roofing system to include in maintenance manuals.
- H. Manufacturer's Field (Inspection) Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given. Provide weekly inspection reports.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Board's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer's Roofing Inspector Qualifications: A full time Technical Representative of manufacturer (non-sales) experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection as required to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification.
 - 1. The presence and activity of the manufacturer's Technical Representative, Independent Representative and/or Board's Representative shall in no way relieve the contractor of contract responsibilities or duties.
 - 2. It is the sole responsibility of the installing Contractor to contact the roofing manufacturer's inspector by phone on the morning of each day that roofing materials are being installed.
 - 3. The Manufacturer's Roofing Inspector shall be one of the following:
 - a. An authorized full-time technical employee of the manufacturer with 10 years of experience in commercial roofing.
 - b. If manufacturer does not employ full time technical personnel, inspection personnel shall be certified as a Registered Roof Observer by the Roof Consultants Institute, and shall be experienced in the installation and maintenance of the specified roofing system and qualified to determine Installer's compliance with the requirements of this Project.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience, eligible to receive manufacturer's warranty, and approved by manufacturer.
- C. General Performance: Installed hybrid hot applied SBS modified bitumen membrane roofing and hot applied SBS modified bitumen base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Hybrid hot applied SBS modified bitumen membrane roofing and hot applied SBS modified bitumen base flashings shall remain watertight.
- D. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- E. No torch-down or self-adhering roofing products are acceptable on this project.
- F. Solar Reflectance Index (SRI): Provide a hybrid modified bitumen roofing system that meets or exceeds: An initial reflectance value of 0.72 or a three-year installed value of 0.5 as determined by the Cool Roof Rating Council or Energy Star. Any product that has been rated by the Cool Roof Rating Council or by Energy Star shall display a label verifying the rating of the product. VTo meet solar reflectance requirements, field applied reflective roof coating is required over the granulated field cap sheet and granulated flashing cap sheet, following a 30 day roofing system curing period.
- G. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressures calculated according to ASCE 7-10. The Minimum Recommended Design Uplift-Resistance Capacities (Uplift Pressures) below include a safety factor of 2.0.
 - 1. All Zones (Roof Area Field, Roof Area Perimeter and Roof Area Corners) Uplift Pressures: As indicated on Drawings and as identified below:
 - a. Zone 1 (Roof Area Field) Uplift Pressure: 25.9 lbf/sq. ft. (kPa).
 - b. Zone 2 (Roof Area Perimeter) Uplift Pressure: 43.5 lbf/sq. ft. (kPa), located within feet (m) of roof perimeter edge.
 - c. Zone 3 (Roof Area Corners) Uplift Pressure: <65.4lbf/sq. ft. (kPa), located within feet (m) of roof corner edge.

- H. ANSI/SPRI Wind Design Standard: Manufacture and install pre-engineered perimeter aluminum coping and roof edge systems tested according to ANSI/SPRI/ ES-1 and capable of resisting the following design pressures:
 - 1. No field fabricated metal copings or roof edge systems will be accepted.
 - 2. Minimum Recommended Design Wind-Resistance Loads, Roof Edge Gravel Stops or Fascias:
 - a. Zone 4 (Wall Edge Perimeter, Horizontal (Outward) Load Direction): 33.7lbf/sq.ft. (kPa) Design Pressure.
 - b. Zone 5 (Wall Edge Corners, Horizontal (Outward) Load Direction: lbf/sq.ft. (kPa) Design Pressure.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture; ballast materials may be stored outdoors.
- C. Protect foam insulation from direct exposure to sunlight, moisture, soiling, and other sources.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
- E. Store modified bitumen rolls on end with selvage ends up.
- F. Roll out the modified bitumen sheet and allow to relax for ten to fifteen minutes prior to installation.
 - 1. Cut into appropriate lengths.
 - 2. Install sheets parallel to slope as much as possible.

1.07 FIELD CONDITIONS

- A. Do not apply roofing membrane when environmental conditions are outside the ranges recommended by manufacturer.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is below 40 degrees F.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Consider effects of wind chill on adhesives, and ensure they will not prematurely set before proper adhesion takes place.
- G. Prevent all products from freezing. Store all materials prior to application at temperatures between 60 and 90 deg. F.
- H. Board will occupy portions of building immediately below roofing area. Conduct roofing so Board's operations will not be disrupted. Provide Board with not less than 72 hours' notice of activities that may affect Board's operations.
- I. Prevent dust, vapors, gases, and odors from entering into the building during roof installation. When shutting down or blocking air intakes, provide makeup air or additional intake air from sources away from the work area. Coordinate these procedures with Board's Representative.
- J. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing 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 and insulation with a course of coated roofing sheet set in urethane mastic with joints and edges sealed.

2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 3. Remove temporary plugs from roof drains at end of each day.
 4. Remove and discard temporary seals before beginning work on adjoining roofing.
 5. Provide protection in roof-related traffic, staging and storage areas consisting of 45 mil EPDM, 1" extruded polystyrene insulation, and 3/4" plywood ballasted with sandbags. Remove protection materials upon completion of work.
 6. Roofing Contractor to coordinate with General Contractor to provide protection for the installed vapor barrier/temporary roof and/or modified bituminous roofing system during all non-modified bituminous roofing system related construction activities.
- K. Provide thermostatic controls and visual thermometer on bitumen kettle, maintain in working order, and keep calibrated.

1.08 WARRANTY

- A. See Section 01 78 39 – Project Record Documents, 01 77 00 Closeout Procedures, for additional warranty requirements.
- B. Manufacturer's Warranty: Provide warranty, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system, including but not limited to, vapor retarder roofing plies, modified membrane, adhesives, roof insulation, cover board, substrate board, wood components, fasteners, walkway products and all roof system metal caps and counter flashing, that fail in materials or workmanship within specified warranty period . Failure includes roof leaks.
 1. Warranty Period: 20 years from date of Preliminary Acceptance.
 2. Indicate a wind speed warranty of up to 74 M.P.H., as reported by the certified weather reporting station nearest to the site for the Chicago IL region.
 3. Contractor to provide a sample copy of standard roofing manufacturer's warranty, stating obligations, remedies, limitations, and exclusions of warranty as specified, with bid.
 4. Warranty shall run for a continuous 20 years.
 - a. Warranty will not be accepted that contains any requirement(s) for Board to renew the warranty at any time during the 20 year period.
 - b. In year(s) number 2, 5, 10 and 15 of this warranty, manufacturer shall provide roof inspections with a written report, and limited housekeeping services, at no later additional charge to the Board.
 - c. Lack of a written record that Board performed regularly scheduled maintenance shall not void the warranty.
- C. Installer's Warranty : Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, and all components of roofing system, including but not limited to, vapor retarder roofing plies, modified membrane, base flashings, adhesives, roof insulation, cover board, substrate board, wood components, fasteners, walkway products and all roof system metal caps and counterflashing, for the following warranty:
 1. Warranty Period: Two years from date of Preliminary Acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Listed Manufacturers: The manufacturers listed below have demonstrated an ability to comply with the specified performance attributes for hybrid hot applied SBS modified bituminous membrane roofing assemblies. If one of the listed manufacturers chooses to use an acceptable product from

another manufacturer, as listed in Sections 2.02 thru 2.12 of this Specification, the listed manufacturer must confirm in writing that the product is part of a RoofNav approved assembly and will be warranted by the manufacturer. Subject to compliance with requirements, provide a hybrid hot applied SBS modified bituminous membrane roofing system warranted by one of the following:

1. Garland.
2. Johns Manville.
3. Siplast.
4. Soprema.
5. Tremco.

2.02 SBS-MODIFIED ASPHALT SHEET MATERIALS (FOR ROOFING FIELD)

- A. Granulated Cap Sheet: Meeting or exceeding ASTM D6163/D6163M, Grade G, Type II glass-fiber-reinforced, containing SBS-modified granulated surface (manufacturer's standard ceramic granules) with field-applied reflective roof coating as specified OR meeting or exceeding ASTM D6162/D6162M, Grade G, Type II composite of polyester and glass reinforcement containing SBS modified granulated surface (manufacturer's standard ceramic granules) with field-applied reflective roof coating as specified.
1. Acceptable glass-fiber reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade G, Type II:
 - a. Garland StressPly FR Mineral
 - b. Garland VersiPly Mineral
 - c. Johns Manville DynaGlas FR XT
 - d. Siplast Paradiene 30 HT FR
 - e. Soprema Elastophene HR FR GR
 - f. Soprema Elastophene HR FR GR WH
 - g. Tremco Powerply Plus HT FR
 2. Acceptable composite polyester and glass reinforced SBS modified products, meeting or exceeding ASTM D6162/D6162M, Grade G, Type II:
 - a. Siplast Parafor 30
 - b. Soprema Elastophene HS FR GR

2.03 BASE-PLY SHEET MATERIALS (FOR ROOFING FIELD)

- A. Reinforced Base Ply Sheet: Composite of polyester and glass reinforcement coated with waterproofing asphalt, dusted with fine mineral surfacing on both sides, meeting or exceeding ASTM D4601/D4601M Type II OR glass reinforced SBS modified, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II smooth, min. thickness 115 mils.
1. Acceptable composite polyester and glass reinforced asphalt coated products, meeting or exceeding ASTM D4601/D4601M, Type II:
 - a. Johns Manville Glastite Flexible
 - b. Tremco Composite Ply HT
 2. Acceptable glass reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II, with a minimum sheet thickness of 115 mils:
 - a. Garland StressBase 120
 - b. Johns Manville DynaBase XT-134 mil
 - c. Siplast Paradiene 20 EG
 - d. Soprema Elastophene HR sanded 3.0 (118 mils)

- B. Fastened Base Sheet: Glass ply sheet, meeting or exceeding ASTM D4601/D4601M, Type I, as described in Section 3.06 of this specification.
 - 1. Acceptable glass base sheet products, meeting or exceeding ASTM D4601/D4601M, Type I:
 - a. GAF Glas #75 Base, (Only if identified to be included in the system warranty by one of the Listed Manufacturers)
 - b. Johns Manville Perma Ply 28
 - c. Siplast Parabase
 - d. Soprema Modified Sopra G
 - e. Tremco BURmastic Glass Ply
- C. Vented Base Sheet: Meeting or exceeding ASTM D4897/D4897M, Type II, as described in Section 3.06 of this specification.
 - 1. Acceptable vented base sheet products, meeting or exceeding ASTM D4897/D4897M, Type II:
 - a. GAF Glas Stratavent, (Only if identified to be included in the system warranty by one of the Listed Manufacturers)
 - b. Johns Manville Ventsulation Felt
 - c. Soprema Sopra 4897
- D. Reinforced Field Base Ply Sheet (Vapor Barrier/Temporary Roof): Composite of polyester and glass reinforcement coated with waterproofing asphalt, dusted with fine mineral surfacing on both sides, meeting or exceeding ASTM D4601/D4601M Type II OR glass reinforced SBS modified, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II smooth, with a minimum sheet thickness of 115 mils, as described in Section 3.08 of this specification.
 - 1. Acceptable composite polyester and glass reinforced asphalt coated products, meeting or exceeding ASTM D4601/D4601M, Type II:
 - a. Johns Manville Glastite Flexible
 - b. Tremco Composite Ply HT
 - 2. Acceptable glass reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade S, Type II, with a minimum sheet thickness of 115 mils:
 - a. Garland StressBase 120
 - b. Johns Manville DynaBase XT-134 mil
 - c. Siplast Paradiene 20 EG
 - d. Soprema Elastophene HR sanded 3.0 (118 mils)

2.04 PLY SHEET MATERIALS (FOR ROOFING FIELD)

- A. Glass-Fiber Base-Ply Sheet: Meeting or exceeding ASTM D2178/D2178M, Type VI, asphalt-impregnated, glass-fiber felt.
 - 1. Acceptable asphalt-impregnated glass-fiber ply sheet products meeting or exceeding ASTM D2178/D2178M, Type VI:
 - a. GAF FlexPly 6, (Only if identified to be included in the system warranty by one of the Listed Manufacturers)
 - b. Garland HPR Premium Glasfelt (Type VI)
 - c. Johns Manville Glas Ply Premier VI
 - d. Soprema Sopra VI
 - e. Tremco Thermaglass Premium VI

2.05 BASE FLASHINGS (FOR ROOF FLASHING AREAS)

- A. Glass-Fiber Ply Sheet (Backer Sheet): Meeting or exceeding ASTM D2178/D2178M, Type VI, asphalt- impregnated, glass-fiber felt.

1. Acceptable asphalt-impregnated, glass-fiber felt products meeting or exceeding ASTM D2178/D2178M, Type VI.
 - a. GAF FlexPly 6, Only if identified to be included in the system warranty by one of the Listed Manufacturers)
 - b. Garland HPR Premium Glasfelt (Type VI)
 - c. Johns Manville Glas Ply Premier VI
 - d. Soprema Sopra VI
 - e. Tremco Thermaglass Premium VI
- B. Granulated Flashing Cap Sheet: Meeting or exceeding ASTM D6163/D6163M, Grade G, Type II glass- fiber-reinforced, containing SBS-modified granulated surface (manufacturer's standard ceramic granules) with field-applied reflective roof coating as specified OR meeting or exceeding ASTM D6162/D6162M, Grade G, Type II composite of polyester and glass reinforcement containing SBS modified granulated surface (manufacturer's standard ceramic granules) with field-applied reflective roof coating as specified.
 1. Acceptable glass-fiber reinforced SBS modified products, meeting or exceeding ASTM D6163/D6163M, Grade G, Type II:
 - a. Garland StressPly FR Mineral
 - b. Garland VersiPly Mineral
 - c. Johns Manville DynaGlas FR XT
 - d. Siplast Paradiene 30 HT FR
 - e. Soprema Elastophene HR FR GR
 - f. Soprema Elastophene HR FR GR WH
 - g. Tremco Powerply Plus HT FR
 2. Acceptable composite polyester and glass reinforced SBS modified products, meeting or exceeding ASTM D6162/D6162M, Grade G, Type II:
 - a. Siplast Parafor 30
 - b. Soprema Elastophene HS FR GR

2.06 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. Primer: ASTM D41/D41M, asphalt type.
 1. Acceptable asphalt primer products:
 - a. Garland Garlaprime VOC
 - b. Johns Manville Asphalt Primer
 - c. Siplast PA1125 Asphalt Primer
 - d. Soprema Elastacol 500
 - e. Tremco Tremprime LV
- B. Asphalt Mastic: ASTM D4586/D4586M, Type I, Class I or Type II, Class I.
 1. Acceptable asphalt mastic products:
 - a. Garland Flashing Bond
 - b. Johns Manville MBR Utility Cement
 - c. Siplast PA 1021 for Flat/Low Slope Application
 - d. Siplast PA 828 for Vertical Application
 - e. Soprema Sopramastic SBS Elastic Cement
 - f. Tremco ELS Mastic
- C. Fluid-Applied Liquid Flashing: Roofing system manufacturer's standard single component, two-coat, cold, fluid-applied, moisture triggered, aliphatic polyurethane reinforced flashing membrane OR two-coat, reinforced PMMA (polyurethane methyl methacrylate) fluid applied products.

1. Acceptable aliphatic polyurethane products:
 - a. Tremco Alphaguard MT BC Polyurethane Base Coat / Tremco Alphaguard MT TC Polyurethane Top Coat
2. Acceptable PMMA (polyurethane methyl methacrylate) products:
 - a. Johns Manville SeamFree PMMA Flashing Resin (with Johns Manville SeamFree PMMA Catalyst & Johns Manville SeamFree PMMA Scrim)
 - b. Siplast Parapro 123 Liquid Flashing System
 - c. Soprema Alsan RS 230 Flash
- D. Hot Applied Roofing Asphalt: ASTM D312/D312M, Type III, or IV as recommended by roofing system manufacturer for application.
 1. Acceptable hot-applied roofing asphalt products:
 - a. Owens Corning Trumbull Asphalt, Trulo Odor 3
 - b. Owens Corning Trumbull Asphalt, Trulo Odor 4
 - c. Tremco Premium III
 - d. Tremco Premium IV
- E. Cold Adhesive Option: At the roofing manufacturer's option, ONLY the granulated modified bitumen cap sheets in the roofing field or in the base flashing areas can be adhered in cold adhesive, in lieu of hot asphalt, per the roofing manufacturer's recommendations.
 1. Roofing system manufacturer's standard asphalt-based, one- or two-part, cold applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
 2. Acceptable cold-applied adhesive products:
 - a. Garland Weatherking Flashing Adhesive
 - b. Johns Manville MBR Cold Application Adhesive
 - c. Siplast PA-311 R
 - d. Soprema Colply Adhesive
 - e. Soprema Colply Modified Adhesive
 - f. Tremco POWERply Cold Adhesive
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer. Use stainless steel fasteners where there is fastener contact with treated wood.
- G. Field-Applied Reflective Roof Coating: White semi-gloss reflective coating acceptable to roofing system producer as required to produce the Solar Reflectance Index (SRI) specified under "QUALITY ASSURANCE" requirements and certified as required under "SUBMITTALS".
 1. Acceptable field-applied reflective roof coating products:
 - a. Garland Pyramic
 - b. Garland White Knight
 - c. Johns Manville Topguard 5000
 - d. Siplast PC227 Elastomeric Coating
 - e. Soprema R Nova Plus
 - f. Tremco T-24 Coating
- H. Drain Flashing Metal: 4 lb. (min.) lead sheet.
- I. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.07 SUBSTRATE BOARDS

- A. Substrate Board (Wood Decks, Metal Decks and Clay Tile / Book Tile Decks (without Concrete Topping)): A product recommended by the roofing system manufacturer, that is part of the manufacturer's tested assembly, and that is acceptable to the City of Chicago as providing a 15 minute thermal barrier between the interior of the building and the insulation.
 - 1. Board: 1/2" thick reinforced gypsum fiber substrate board, ASTM C1278/C1278M.
 - 2. Must be compatible with hot asphalt systems.
 - 3. Acceptable substrate board products meeting ASTM C1278/C1278M:
 - a. Johns Manville Securock Gypsum Fiber Board
 - b. Siplast / USG Securock Gypsum Fiber Board
 - c. USG Securock Gypsum Fiber Roof Board
 - d. Tremco / USG Securock Fiber Reinforced, Moisture Resistant Gypsum Roof Board
- B. Fasteners : Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions, designed for fastening substrate panel to roof deck. Use stainless steel fasteners where there is fastener contact with treated wood.

2.08 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class I, Grade 2, 20 psi, felt or glass- fiber mat facer on both major surfaces. Continuous R-30 flat stock insulation, specified tapered layout, or other flat stock R value as indicated on drawings. 2.6" maximum flat board thickness. Filler insulation for tapered insulation systems may be greater than 2.6" thickness, where required. 48" x 48" maximum board size.
 - 1. Where 1/2" thick reinforced gypsum fiber board is used for an insulation cover board within a hot applied modified bitumen roofing system:
 - a. The insulation field is to be comprised of 2 layers of 2.6" thickness insulation board.
 - 2. Where 1/2" thick wood fiber board is used for an insulation cover board within a hot applied modified bitumen roofing system:
 - a. The insulation field is to be comprised of 2 layers of 2.5" thickness insulation board.
 - 3. At drain locations with a drainage slope of 1/4" per foot:
 - a. The tapered insulation shall meet the R-30 minimum thickness at a distance of 4'-0" away from the drain.
 - 4. At drain locations with a drainage slope of 1/8" per foot:
 - a. The tapered insulation shall meet the R-30 minimum thickness at a distance of 8'-0" away from the drain.
 - 5. Acceptable polyisocyanurate board insulation products:
 - a. GAF Energy Guard Poly Iso Insulation
 - b. Hunter H-Shield
 - c. Johns Manville Energy 3 Polyisocyanurate
 - d. Siplast Paratherm
 - e. Soprema Sopra ISO
 - f. Tremco Trisotech

2.09 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Hot Roofing Asphalt Insulation Adhesive: ASTM D312/D312M, Type III, or IV as recommended by roofing system manufacturer for application.
 - 1. Acceptable hot roofing asphalt insulation adhesive products:

- a. Owens Corning Trumbull Asphalt, Trulo Odor 3
 - b. Owens Corning Trumbull Asphalt, Trulo Odor 4
 - c. Tremco Premium III
 - d. Tremco Premium IV
- C. Low Rise Foam Insulation Adhesive: Manufacturer's recommended low rise foam insulation adhesive. Two component (1:1 ratio), solvent free, asbestos free, elastomeric urethane adhesive.
- 1. Acceptable low rise foam insulation adhesive products:
 - a. GAF OlyBond 500 Adhesive Fastener
 - b. Garland Insulock II
 - c. Johns Manville Two-Part Urethane Insulation Adhesive (UIA)
 - d. Siplast Parafast Insulation Adhesive (Large Areas)
 - e. Siplast Parafast C (Small Areas)
 - f. Soprema Duotack 365
 - g. Tremco Low Rise Foam Insulation Adhesive Green
- D. Insulation Cant Strip: Fiberboard, asphalt coated, ASTM C208, Type II, Grade I, Cellulosic- Fiber Insulation Board, 48 inches. Thickness: 2 inches Face: 4 inches.
- E. Insulation Cover Board: 1/2" thick reinforced gypsum fiber roof board , ASTM C1278/C1278M OR 1/2" thick coated wood fiber board ASTM C208, Type II, Grade I or Grade II:
- 1. A product recommended by the roofing system manufacturer.
 - 2. Must be compatible with hot asphalt and cold adhesive systems.
 - 3. Acceptable insulation cover board products meeting ASTM C1278/C1278M:
 - a. Johns Manville Securock Gypsum Fiber Board
 - b. Siplast / USG Securock Gypsum Fiber Board
 - c. USG Securock Gypsum Fiber Roof Board
 - d. Tremco / USG Securock Fiber Reinforced, Moisture Resistant Gypsum Roof Board
 - 4. Acceptable insulation cover board products meeting ASTM C208, Type II, Grade I or Grade II:
 - a. Blue Ridge Structodek HD Fiberboard
 - b. Celotex / Blue Ridge Structodek HD Fiberboard
 - c. Siplast / Blue Ridge Structodek HD Fiberboard
 - d. Tremco / Blue Ridge Structodek HD Fiberboard
- F. Batt Insulation: ASTM C665, Type I, preformed glass fiber batt.
- 1. For filling acoustical steel deck flutes: 1.5 pcf inert, non-organic fiberglass batts, supplied by acoustical deck manufacturer.

2.10 PERIMETER METAL COPING AND ROOF EDGE SYSTEM

- A. Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System: Tested and certified to meet ANSI/SPRI/ES-1 Wind Design Standards for Edge Systems.
- 1. Parapet copings and roof edge profiles (including fascia / gravel stop profiles) shall be manufactured from 0.050" (minimum thickness) mill finished aluminum in 12'-0" maximum lengths.
 - a. Provide factory mitered and welded corners, transitions and end caps. Coping profiles to be precision saw cut and continuously welded to produce a watertight joint.
 - 1) Inside and outside corners. No joints within 18 inches of corners. Maximum leg length is 30 inches.
 - 2) Transition miters.
 - 3) Offset miters.
 - 4) End caps. No joints within 18 inches of ends. Maximum leg length is 30 inches.

- b. High Performance Coating: Two-coat, shop applied, 70% Polyvinylidene Fluoride (PVFD) coating. Color to be selected by architect from manufacturer's full range of colors.
 - 2. Concealed coping splice plates to be installed at all coping joints.
 - a. Coping splice plates shall be manufactured from 0.050" (minimum thickness) aluminum, 6 inch lengths, formed to fit the inside of the coping profile.
 - b. Splice plates to be sealed factory applied, dual, non-hardening sealant strips.
 - c. Splice plate finish to match coping or roof edge profile finish.
 - 3. Coping profiles to be snapped onto compression cleats manufactured from galvanized steel, 12 inch widths, with factory mounted stainless steel spring clips.
 - a. Cleats to be fastened with stainless steel fasteners, sized per manufacturer's recommendation.
 - 4. No exposed fasteners permitted.
- B. Miscellaneous metal components and ancillary accessories to interface with the Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System: Including, but not limited to, gutters, scuppers, counterflashings, expansion joint covers, etc.
 - 1. All miscellaneous metal components and ancillary accessories not requiring welding shall be manufactured from 0.040" (minimum thickness) mill finished aluminum in 12'-0" maximum lengths.
 - a. Finished to match the Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System.
 - 2. All slip metal components to be manufactured from 0.040" (minimum thickness) mill finished aluminum in 12'-0" maximum lengths.
 - a. Finished to match the Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System.
 - 3. ONLY where new slip metal is to be used at existing non-aluminum metal flashing components to remain in place, the new slip metal component is to match the metal type of the existing metal component. If galvanized steel is used, provide 24 ga. Minimum thickness.
 - a. Finished to match the Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System.
 - 4. Acceptable Pre-engineered, Manufactured Perimeter Metal Coping and Roof Edge Flashing System products:
 - a. Garland R-Mer Edge
 - b. Hickman
 - c. Johns Manville Presto Lock Coping System
 - d. Johns Manville Presto Tite Fascia System
 - e. Metal Era
 - f. Siplast Paraguard
 - g. Soprema Sopraedge
 - h. Soprema Sopraguard
 - i. Soprema Sopracap
 - j. Soprema Soprabond
 - k. Tremco Tremlock

2.11 WALKWAYS

- A. Walkway Pads: Mineral-granule-surfaced, reinforced asphaltic composition, slip-resisting pads, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, minimum 1/3" thick, 30" x 30" pad size.

1. Acceptable walkway products;
 - a. Johns Manville Dynatred Plus
 - b. Tremco Tremtred

2.12 CONCRETE SPLASH BLOCKS

- A. Precast Concrete Splash Blocks: Install one reinforced, precast concrete splash block at all downspouts terminating at bituminous membrane roofing areas, 12" x 24" x 3" block size.
 1. Install one 30" x 30" walkway pad beneath each precast concrete splash block.

PART 3 EXECUTION

3.01 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.
 - a. Check roof drains prior to starting the roofing in each drainage area to determine if the drain is plugged , or if the drain bowl, clamping ring, dome, etc. are damaged. These items shall be brought to the attention of the Board or Architect/Engineer of Record prior to starting work, and will be the Board's responsibility for correction. Plugged or damaged drains brought to the attention of the Board or Architect/Engineer of Record after work has begun shall be the responsibility of the Contractor to correct.
 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. At Concrete Decks and Concrete Topped Clay Tile / Book Tile Decks:
 - a. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
 - b. Verify that concrete substrate is visibly dry and free of moisture . Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - i. Test for moisture by taping an 18-inch (460mm) square of polyethylene film onto a concrete slab and waiting at least 16 hours. Afterward, the underside of the sheet is examined for signs of moisture. Any moisture condensation or observable darkening of the color of the concrete underneath the sheet suggests excessive moisture and means the slab is not ready.

2.02 REMOVAL OF EXISTING EQUIPMENT

- A. Examine substrate at location of removal/relocation/modification of mechanical units and mechanical lines (i.e. conduit and piping) :
 1. Verify with Architect/Engineer of Record before temporary removal of mechanical units. Perform a test run to ensure equipment is working properly before disconnection and temporary removal. Document all test results in writing.
 2. Remove and reset rooftop units as required. Coordinate downtime of the unit with the Board. Provide work in stages or phases to accommodate the Board's occupancy requirements. Keep existing mechanical equipment and services in operation as much as possible during construction .
 3. Reconnect mechanical equipment (on a daily basis if required), even when the disconnection of the equipment, or any portion thereof, is inadvertent.

4. Electrical and/or mechanical extensions/connections found necessary shall be the Contractor's responsibility. Proper mechanical/electrical and ductwork extensions shall be provided where necessary by a licensed contractor to meet all state and local code requirements and to meet licensing requirements regarding the handling of chlorofluorocarbons (CFC's).
5. Obtain and pay for all licenses and permits. Coordinate and request all inspections from authority having jurisdiction and submit certificates of inspection and final approval of the local inspection authority to the Architect/Engineer of Record.
6. Verify with Architect/Engineer of Record before permanent reinstallation of mechanical units. Perform a test run to ensure equipment is working properly after reinstallation. Document all test results in writing.

2.03 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.

2.04 ROOF INSPECTION AND TESTING.

- A. The Board will employ the services of a roofing consultant to perform the following services:
 1. Attend the roofing preinstallation conference.
 2. Provide full time observation of the Work and enforcement of the Contract Documents in accordance with good construction practice the first two days of installation and periodically thereafter.
 3. Direct the roofing installer to cut and patch one foot square samples as the installed roofing system minus the coating system and perform tests to determine such items as bitumen weight, interply mopping and moisture encapsulated within the roofing system at the site while Work is in progress one for 5,000 square foot of roof.
 4. If the test indicates failure to comply with Contract Documents, direct the roofing installer to make additional cut and conduct additional tests.
 5. Direct corrective action to obtain acceptance including removal and replacement if necessary.
 6. Insert the completed roofing system after application of coating system.
- B. The roofing installer shall, as part of the Contract Work, perform the following:
 1. Make all cuts as directed.
 2. Immediately patch all cuts as required to obtain the specified warranty.
 3. Perform all corrective work as directed.
 4. Extend full cooperation.

2.05 VAPOR-BARRIER

- A. AT STRUCTURAL CEMENT BOARD ROOF DECK:
 1. Over fastened substrate board, install one reinforced base ply sheet vapor barrier lapping each sheet minimum 4 inches over preceding sheet in shingle fashion. Embed each sheet in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.

2.06 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- C. Install tapered or flat stock insulation as shown on drawings to provide positive drainage.
- D. At areas where flat stock insulation is specified, provide a continuous R-Value of 30 unless the roof is an existing roof that has been granted a special exception by the City of Chicago for a lower R-Value.
- E. Nailer Strips: Mechanically fasten 4-inch nominal- width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
 - 1. 20 feet apart for roof slopes greater than 2 inch per 12 inches (2:12) but less than 3 inches per 12 inches (3:12).
 - a. Backnail 3 inches o.c. from the back edge of each ply along nailer to ensure that the nails are covered by a minimum of two plies of sheet. The nails shall be staggered.
 - 2. 48 inches apart for roof slopes greater 3 inches per 12 inches (3:12).
 - 3. Backnail 3 inches o.c. from the back edge of each ply along nailer to ensure that the nails are covered by a minimum of two plies of sheet. The nails shall be staggered.
- F. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips in hot asphalt at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- G. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- H. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- I. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- J. Sump insulation at roof drains and scuppers to provide a 48 inch by 48 inch sump.
- K. Install adhered crickets between drains, at walls and perimeters between drains, and at other locations indicated on drawings.
- L. Adhered Insulation: Install each layer of insulation and adhere as follows unless roofing system manufacturer requires otherwise. Comply with such requirements:
 - 1. Set each layer of insulation in solid mopping of hot roofing asphalt.
- M. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing system manufacturer.
 - 1. Apply in hot roofing asphalt.
- N. Install adhered tapered edge strips (heights vary) at perimeter edges of roof to ensure no 90 degree bends exist in roofing.

2.07 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. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- D. 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.
- E. Asphalt Heating: Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt within 25 deg F of flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.
 - 1. Apply hot roofing asphalt within plus or minus 25 deg F of equiviscous temperature and adhere components to asphalt heated to not less than 425 deg F.
- F. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

2.08 BASE-PLY SHEET AND PLY SHEET INSTALLATION

- A. Install one layer of reinforced base ply sheet over one layer of Type VI glass-fiber ply sheet according to roofing system manufacturer's written instructions starting at low point of roofing system. Align reinforced base ply sheets and glass-fiber base-ply sheets without stretching. Extend base ply sheet and ply sheet over and terminate beyond eaves.
 - 1. Shingle side laps of glass-fiber base-ply sheets uniformly to ensure required base sheet and ply sheets covers substrate at any point. Shingle in direction to shed water.
 - 2. Embed ply sheet and base ply sheet in a continuous mopping of hot roofing asphalt, to form a uniform membrane.

2.09 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install granulated SBS modified bituminous roofing membrane cap sheet over reinforced base ply sheet and Type VI glass-fiber ply sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond eaves, installing as follows:
 - 1. Adhere to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F OR at the roofing manufacturer's option, ONLY the modified bitumen cap sheet can be adhered in cold adhesive, in lieu of hot asphalt, per the roofing manufacturer's recommendations.
 - 2. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.
 - 1. Repair tears and voids in laps and lapped seams not completely sealed.
 - 2. Allow membrane a minimum 30 day cure before applying reflective white surface coating.

- C. Immediately after installation of cap sheet, to ensure complete and continuous seal and contact between adhesive and base ply and ply sheets, including ends, edges and all laps without wrinkles, fish-mouths, or blisters:
 - 1. Minimum 75-pound weighted roller shall be applied over entire adhered base ply and ply sheets at all areas including field of base ply and ply sheets, side laps and end laps.
- D. Install modified bituminous membranes with side laps shingled with slope of roof deck. Nail off all roof plies into wood cants with 1" nails fastened 12" on center.
 - 1. Seal all edges of new roofing at top of cants with asphalt mastic.

2.10 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:
 - 1. Prime substrates if required by roofing system manufacturer.
 - a. Backer Sheet Application: Install backer sheet and adhere to substrate in a solid mopping of hot roofing asphalt.
 - b. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F OR at the roofing manufacturer's option, ONLY the modified bitumen flashing cap sheet can be adhered in cold adhesive, in lieu of hot asphalt, per the roofing manufacturer's recommendations. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer OR at the roofing manufacturer's option, apply cold adhesive to the backside of ONLY the modified bitumen flashing cap sheet, in lieu of hot asphalt, per the roofing manufacturer's recommendations.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above built-up roofing and 6 inches onto field of built-up roofing.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 - 1. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.
- D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.
- E. Roof Drains: Set 30-by-30-inch lead sheet drain flashing in bed of asphalt roofing mastic on completed roofing membrane. Cover lead sheet drain flashing with roofing membrane cap-sheet stripping and extend a minimum of 4 inches beyond edge of lead sheet drain flashing onto field of roofing membrane. Clamp roofing membrane, lead sheet drain flashing, and cap sheet stripping into roof-drain clamping ring. Retap existing clamping ring bolt holes and provide new bolts at all existing drain bowl locations.
- F. Install cap sheet stripping according to roofing system manufacturer's written instructions.

2.11 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads using units of size indicated (30" x 30" pad size minimum) to surround rooftop units, door entrances, and hatches, to form a walkway path between serviceable units, beneath all conduit or cable runs, beneath all sleeper supports, at ladder access points, and where additionally indicated on drawings, according to walkway pad manufacturer's written instructions.
 - 1. Set walkway pads in asphalt mastic or manufacturer's recommended cold-applied adhesive.

2.12 REFLECTIVE ROOF COATING

- A. For a hot applied modified bitumen membrane roofing system with hot applied cap sheets and hot applied flashing sheets: After entire roof system and flashing details are completed, and roof system/laps/flashings have cured per manufacturer's recommended period, apply a uniform coating of the white semi-gloss reflective roof coating to roof membrane, base flashings and walkway pads according to manufacturer's written instructions by roller or other suitable application method.
 - 1. Apply two coats to roofing field and flashings in a neat and uniform manner.
- B. For a hot applied modified bitumen membrane roofing system with cold applied cap sheets and cold applied flashing sheets (Cold Adhesive Option): After entire roof system and flashing details are completed and roof system/laps/flashings have cured for 30 days, apply a uniform coating of the white semi-gloss reflective roof coating to roofing membrane, base flashings and walkway pads according to manufacturer's written instructions by roller or other suitable application method.
 - 1. Apply two coats to roofing field and flashings in a neat and uniform manner.

2.13 FINAL FIELD INSPECTION

- A. Manufacturer must provide a photo summary report, showing installation methods and conditions, to the Board's Representative at the completion of the project.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect/Engineer of Record.
 - 1. Notify Architect/Engineer of Record or Board 48 hours in advance of date and time of final inspection.
 - a. Results will be made available to Board's Representative in written form. Any defects or entrapped moisture found within the new roofing system installation will be removed and replaced at the installing contractor's expense.
- C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Contractor to repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

2.14 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/Engineer of Record and Board.
- 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 Preliminary Acceptance and according to warranty requirements.
- C. Sequence operations to avoid excessive or concentrated foot traffic and storage over roof areas while they cure.
- D. Clean all overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- E. Contractor shall rod all drains to ensure that a free flowing condition exists and all drains are functioning properly.

2.15 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS NAME of COMPANY, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: City Colleges of Chicago
 2. Address: 180 N. Wabash Ave. Chicago, IL 60601
 3. Building Name/Type: Malcolm X West Side Learning Center
 4. Address: 4624 W. Madison Ave. Chicago IL 606044
 5. Area of Work:
 6. Acceptance Date:
 7. Warranty Period:
 8. Expiration Date:
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding 90 mph;
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other

use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.
- E. IN WITNESS THEREOF, this instrument has been duly executed this XX day of XXXXXXXX, 20XX.
1. Authorized Signature:
 2. Name:
 3. Title:

END OF SECTION 07 52 16.12

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Flashing and sheet metal not specifically described in other Sections of these Specifications but required to prevent penetration of water through the exterior shell of the building.
- B. Related Requirements:
 - 1. Section 04 20 00 – Unit Masonry
 - 2. Section 06 10 00 – Rough Carpentry for wood nailers, curbs, and blocking.
 - 3. Section 07 92 00 – Joint Sealants

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.6 WARRANTY

- A. All warranties shall begin at the date of Substantial Completion of the project.
- B. Fluoropolymer Paint Warranty: The materials stock manufacturer shall provide a twenty (20) year warranty of the paint finish on all components of flashing and sheet metal against:
 - 1. Cracking, checking, and peeling of the surface.
 - 2. Fading of the color not to exceed 5 Hunter Units, per ASTM D2244.
 - 3. Chalking of the surface not to exceed No. 8 per ASTM D659.

PART 2 - PRODUCTS

2.1 MATERIALS AND THICKNESS

- A. Where sheet metal is required, and no material or gauge is indicated on the Drawings, provide the highest quality and gauge commensurate with the referenced standards.
- B. Metals:
 - 1. Metal fascia (coping caps, roof edge fascia and gravel stops only):
 - 2. Stepped in wall flashing, counter flashing, and through wall flashing: 24 gauge stainless steel.
 - 3. Base flashing and below grade insulation protection, as indicated on drawings. .0125 powder coated aluminum, color to match curtain wall system. Profile to match exposed flashing at curtain wall system see drawings.

2.2 NAILS, RIVETS AND FASTENERS

- A. Use only stainless steel components.

2.3 STAINLESS STEEL AND ALUMINUM FLASHING THROUGH WALL FLASHING

- A. Through wall flashing shall be stainless steel 24 gauge. Powder coated aluminum. 0125" thick where indicated on drawings at base flashing with profile extension over exposed insulation.
- B. Manufacturer flat, sheet metal, through wall flashing for embedment in masonry with rib at approx. 3" intervals, along the length of the flashing to provide an integral bond with the mortar.
- C. Fabricate flashings in sections at least 96", but not more than, 144". Provide splice plates at all end joints of smooth metal flashing.
- D. Profile of flashings shall be fabricated in one piece from exterior drip edge to top of vertical leg.
- E. Where indicated on the drawings fabricate with a receiver for an interlocking counterflashing. Counterflashing to be fabricated of the same material / weight as flashing.
- F. Flashing shall fit tightly into the corner created between sill / lintel and the backup material.
- G. Extend flashing vertically from the sill or lintel a distance not less than eight (8) inches.

- H. Fabricate through wall flashing with an outer drip edge, unless otherwise indicated. Uniformly extend flashing beyond the vertical face of the wall by ½" and then bend outer drip edge down uniformly at 30°.
- I. At all discontinuous flashings, provide tightly formed and sealed end dams per standard SMACNA details. No flashing installation shall be left open ended, without an end dam. End dams must be shop fabricated and set to allow one splice location centered on the opening.
- J. Anchor flashings only as required to maintain positioning. Seal all anchorage locations to make completely watertight.
- J. Materials:
 - 1. 24 gauge, type 304, stainless steel, complying with ASTM A240A / A240M.
 - 2. Powder coated aluminum, .0125" thick.
- K. Manufacturer:
 - 1. Cheney Flashing Company, 623 Prospect St Trenton, NJ 08618. (609) 394-8175
 - 2. Hohmann & Barnard, Inc., 30 Rasons Ct Hauppauge, New York 11788. (631) 234-0600
 - 3. Keystone Flashing Company, Inc 5119 N. 2nd St. Philadelphia, PA 19120. (800) 526-8348
 - 4. Sandell Manuf'ing Company, Inc. 310 Wayto Rd Schenectady, NY 12303. (518) 357-9757

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. 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, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. Do not use graphite pencils to mark metal surfaces.

- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over

base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.5 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 72 00 - ROOF ACCESSORIES – ROOF HATCH

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Roof Hatches.
 - a. Personnel Series metal, single door hatches used by personnel.
 - 2. Accessory Products for Roof Hatches
 - a. Safety Railings for all roof hatches
 - b. Safety posts for vertical ladder access roof hatches
- B. Related Requirements:
 - 1. Division 05 50 00 "Metal Fabrications" for metal vertical ladders, ships' ladders and stairs for access to roof hatches

1.2 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leak proof, watertight, secure and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.3 ACTION SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected Work.
 - a. Hatch Units: Show types, elevations, thickness of metals, and full-size profiles.
 - b. Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.
 - c. General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of unit.
- B. Product Data: Manufacturer's technical data for each type of hatch assembly, including setting drawings, templates, finish requirements, and details of anchorage devices.
 - 1. Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.

1.4 CLOSEOUT SUBMITTALS

- 1. Installation, Operating and Maintenance manuals

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. OSHA 29 CFR 1910.23 Guarding floor and wall openings and holes
 - 2. OSHA 29 CFR 1926.502 Fall protection systems criteria

3. International Building Code (IBC) Section 1013.6 Roof Access
4. International Building Code (IBC) Section 1009.11 Means of Egress, Stairways, Stairway to Roof

1.6 WARRANTY

- A. Provide manufacturer's standard 5-year warranty. Roof hatches shall be free from manufacturing defects in materials and fabrication for a period of 5 years from the date of shipment. Should a product fail to function in normal use within this period, manufacturer shall furnish a replacement or new part at Nystrom's discretion.

PART 2 - PRODUCTS

2.1 PERSONNEL ROOF HATCH

- A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or approved equal:
 1. Nystrom, Model G3636 (basis of design)
 2. Bilco Co
 3. Babcock-Davis
- B. Type and Size: Personnel Single-leaf metal lid, G3636, 36 by 36 inches
 1. Loads: Cover stiffened to withstand a live load of 40-lb/sq. ft. with a maximum deflection of 1/150 of the span and 20-lb/sq. ft. internal uplift load.
 2. Hatch Material
 - a. Cover: 11 GAGE ALUMINUM cover with 4-inch rigid insulation covered by 11 GAGE ALUMINUM cover liner.
 - b. Curb: 11 GAGE ALUMINUM with a single wall curb with integral railing ready EZ tabbed counterflash mounting flange. Mounting flange continuous around base of frame.
 - 1) Fabricate curbs to a height of 12 inches above roofing surface unless otherwise indicated.
 - c. Finish: MILL FINISHED ALUMINUM
 - d. Insulation: 1-inch Polyisocyanurate R-6 (5.6 LTTR) in Curb and 4 inch polystyrene in Cover
 - e. Hardware: Zinc plated steel
 - 1) Hinge Assembly: Pintle hinge with stainless steel hinge pin
 - 2) Spring: Gas spring with integrated damper
 - 3) Hold open device: Automatic zinc plated steel hold open arm with red vinyl grip handle.
 - 4) Latch: Zinc plated steel spring type slam latch with inside and outside operating turn handles and padlock hasp provisions.
 - 5) Pull handle: Interior pull down handle, powder coated safety yellow
 - 6) Gasket: Extruded EPDM adhesive back seal, continuous around cover

2.2 ACCESSORY PRODUCTS

- A. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
 1. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or approved equal:
 - a. Nystrom model: SRC

- b. Bilco Co.
 - c. Babcock-Davis
- 2. Height: Height: 42 inches above finished roof deck.
- 3. Rails:
 - a. Material: Aluminum pipe, 1-1/4 inch, (1.66 inch outside diameter) schedule 40 pipe
 - b. Fittings: Cast aluminum alloy with set screw hold
 - c. Mounting brackets: 3/16 inch steel, zinc plated with nut backing plate
 - d. Exit: Self closing gate, Galvanized steel 1 1/4 inch (32 mm) tubular steel self closing with coil spring
- B. Ladder Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
 - 1. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or approved equal: Nystrom model: SP
 - 2. Height: Height: [42 inches (1060 mm)] above finished roof deck.
 - 3. Materials: [Steel tube].
 - 4. Post: 1 1/2" x 1 1/2" x 1/8".
 - 5. Finish : STEEL YELLOW POWDER COAT (Model SPY)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine site conditions under which work of this Section will be performed.
 - 1. Identify conditions detrimental to providing proper quality and timely completions of work.
 - 2. Do not proceed with installation until detrimental conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's recommendations.
- B. Securely anchor roof accessories in compliance with manufacturer's instructions and capable of resisting indicated loads.
- C. Set units plumb, level, and true to line without warp or rack.
- D. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
- E. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- F. Incompatible Materials: Apply protective coating to separate aluminum from incompatible materials.
- G. Verify that roof hatch operates properly. Clean, lubricate and adjust operating mechanism and hardware.
- H. Attach safety railing system to roof-hatch curb.

3.3 ADJUSTING

- A. Adjust movable parts for smooth operation.

- B. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.4 CLEANING

- A. Clean exposed surfaces per manufacturer's written instructions. Touch up damaged metal coatings.
- B. Clean off excess sealants.
- C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 07 81 23 – INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Requirements:
 - 1. Section 07 81 00 "Applied Fireproofing" for sprayed fire-resistive materials (SFRM).

1.2 SUMMARY

- A. Section includes mastic and intumescent fire-resistive coatings and topcoat protective decorative finish.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- C. Samples: For each exposed product and for each color and texture specified, 4 inches square in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.

- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockup encompassing existing structural steel, new steel, concrete adjacency and each required finish.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Applied topcoat products shall comply with VOC content limits of authorities having jurisdiction.
- E. Asbestos: Provide products containing no detectable asbestos.

2.2 PRIMER AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Primer and Intumescent Fire-Resistive Coating:
1. Acceptable Manufacturers:
 - a. Isolatek WB 5 or WB3 (basis of design)
 - b. PPG
 - c. Carboline
 - d. Or Approved Equivalent
 2. Application: Designated for "conditioned interior space purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
 4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 0.
 - b. Smoke-Developed Index: 20.
 5. Hardness: Not less than 65, Type D durometer, according to ASTM D 2240.
 6. Finish: Topcoat Rolled, spray-textured finish.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing 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. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
 - 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- I. Cure fireproofing according to fireproofing manufacturer's written instructions.
- J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Finishes: Where indicated, apply fireproofing to produce the following finish:
1. Topcoat Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 23

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency. CLOSEOUT SUBMITTALS
- C. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:
 1. Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 1. Permanent forming/damming/backing materials.
 2. Substrate primers.
 3. Collars.
 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- D. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- E. 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.
- F. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- G. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.

- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under "Firestop Systems."
- C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."
- D. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing:
 - 1. UL-Classified Systems: [C-AJ-] [W-L-] 2001-2999.
 - 2. F-Rating: 1 hour and 2 hours.
 - 3. T-Rating: 1 hour and 2 hours.
 - 4. W-Rating: No leakage of water at completion of water leakage testing.
 - 5. Type of Fill Materials: As required to achieve rating.

END OF SECTION 07 84 13

SECTION 07 91 00 - PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Preformed, foam joint seals.
 - 2. Precured, extruded-silicone joint seals.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for liquid sealants applied over preformed seals in dual seal systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each preformed joint seal product.
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of preformed joint seal required, provide Samples with joint seals 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 seals.
- D. Preformed Joint Seal Schedule: Include the following information:
 - 1. Joint seal location and designation.
 - 2. Joint width and movement capability.
 - 3. Joint seal manufacturer and product name.
 - 4. Joint seal color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each preformed joint seal for tests performed by a qualified testing agency.
- B. Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Mockups: Install mockups of assemblies specified in other Sections that are indicated to receive preformed joint seals specified in this Section. Use materials and installation methods specified in this Section.

1.6 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace preformed joint seals 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 agrees to furnish preformed joint seals 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: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PREFORMED, FOAM JOINT SEALS

- A. Preformed, Foam Joint Seals: Manufacturer's standard joint seal manufactured from urethane or EVA (ethylene vinyl acetate) foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corp. - Watson Bowman Acme Corp.
 - b. EMSEAL Joint Systems, Ltd.
 - c. LymTal International Inc.
 - d. MM Systems Corporation.
 - e. Nystrom, Inc.
 - f. Pecora Corporation.
 - g. Schul International Company, Inc.
 - h. Willseal LLC.
 - 2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Minimum Joint Width: As indicated on Drawings.
 - c. Maximum Joint Width: As indicated on Drawings.
 - d. Movement Capability: -25 percent/+25 percent.
 - 3. Joint Seal Color: As selected by Architect from full range of industry colors.

2.2 EXTRUDED-SILICONE JOINT SEALS

- A. Extruded-Silicone Joint Seals: Manufacturer's standard seal consisting of precured low-modulus silicone extrusion, with a neutral-curing silicone sealant for bonding extrusions to substrates.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Nystrom, Inc.
 - e. Pecora Corporation.
 - f. Sealex, Inc.
 - g. Sika Corporation; Joint Sealants.
 - h. Tremco Incorporated.
 - 2. Joint Seal Width: Joint size indicated on Drawings plus 0.75 inch (19 mm).
 - 3. Joint Seal Color: As selected by Architect from full range of industry colors.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to preformed joint seal manufacturer, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces and formulated to promote best adhesion to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with preformed joint seals and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive preformed joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed-joint seal 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 preformed joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. 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.
 - d. Exterior insulation and finish systems.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint seals. 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 by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

- A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Installation of Preformed, Foam Joint Seals:
1. Install each length of seal immediately after removing protective wrapping.
 2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
 3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
 4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.
- C. Installation of Precured, Extruded-Silicone Joint Seals:
1. Apply masking tape to each side of joint, outside of area to be covered by seal system.
 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone seal system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.

3. Press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact with substrate.
4. Complete installation of seal system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

3.4 PROTECTION

- A. Protect preformed joint seals from damage resulting from construction operations or other causes so seals are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated seals immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 91 00

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Silicone joint sealants.
- 2. Nonstaining silicone joint sealants.
- 3. Urethane joint sealants.
- 4. Mildew-resistant joint sealants.
- 5. Butyl joint sealants.
- 6. Latex joint sealants.

- B. Related Requirements:

- 1. Section 04 20 00 "Unit Masonry".
- 2. Section 07 91 00 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- 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 kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.

4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Preconstruction Laboratory 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 are needed for adhesion.
- D. Field-Adhesion-Test Reports: For each sealant application tested.
- E. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- A. Masonry Joint Preparation: The General Contractor is to obtain the services of an independent masonry consultant to provide onsite masonry training for each mason performing work on site specifically on the existing coping stones. The independent masonry consultant shall have at least ten (10) years' experience in masonry work. Individual to provide training shall have experience in providing training on five projects of similar scope and scale. Training will cover raking of Masonry Joints at coping stones.
 1. Training must be provided by a third-party masonry training expert, with a broad background in all these subjects, and complying with ASTM E2659 - 09 Standard Practice for Certificate Programs. A manufacturer's representative is not an acceptable training source.
 2. All masons who will perform work on the masonry of the building must have training detailed above, and obtain a pass on the course, which includes mock-up work. All masonry mock-ups for the project will be completed during this training.
 - a. Training will include joint preparation, removal of sealant techniques, and tooling to ensure a consistent appearance of the final work. These masons should receive a training identification badge (adhered to the mason's hardhat) indicating that such training was received.
 - b. The Architect's representative will attend the training.
 - c. Any masons who are later hired will be required to take the same job training. Masons without training shall not work on the scope of work in this section.

- d. Masons who have received training from a third party instructor approved by the Architect within the last 7 years, and regularly engage in similar work since the training, may be exempt from the class. Such mason shall provide a mockup of work prior to the start of the class to show continued understanding of working with historic masonry. The Architect shall judge the work and determine allowance of class exemption.
3. Prior to installation or placement of any new sealant, Masonry Restoration Contractor shall remove sealant in an area designated by the Architect. Mock-ups of new sealant shall be placed and allowed to cure and cleaned for Architect's review. Rejected mock-ups shall be removed entirely and replaced with new until a match satisfactory to the Architect has been placed.
4. Pre-installation Conference: General Contractor shall arrange conference at project site. General Contractor, Masonry Restoration Contractor's project manager and site foreman, and Architect shall be in attendance. If the work impacts other trades, a representative from those contractors shall also be in attendance.
 - a. Review methods and procedures related to stone or precast stone coping re-sealant, and cleaning including the following:
 - b. Construction Schedule, Contractor Sequencing Plan, and Masonry Treatment Plan.
 - c. Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Materials, material application, sequencing, tolerances, and required clearances.

1.7 FIELD 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. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace 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 agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from 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 JOINT SEALANTS, 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 joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
- C. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.
- B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adfast.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.

- d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Pecora Corporation.
 - f. Sika Corporation; Joint Sealants.
- C. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation. DOWSIL 795
 - b. GE Construction Sealants; GE SCS 9000
 - c. Pecora Corporation.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pecora Corporation.
 - b. Sika Corporation; Joint Sealants.
 - c. Tremco Incorporated.
- C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. Pecora Corporation.
 - d. Sika Corporation; Joint Sealants.
 - e. Tremco Incorporated.
- D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Dow Corning Corporation.
- E. Glazing Weather Seal: High Performance, neutral, one part, natural-curing, silicon sealant, joint movement +/- 50, complying with ASTM C1184 and ASTM C 920, Type S, Grades NS, Class 50, Use NT, G,A and O.
 - 1. Manufacturers:
 - a. DOW Silicones Corporation, DOWSIL 795 Silicone Building Sealant
 - b. GE Silicones, SCS 9000 SilPruf

- c. Coordinate with Section 08 80 00 Glazing and 08 44 13 Glazed Aluminum Curtainwalls.
- F. Gazing 4 sided structural seal (SSG): High Performance, neutral, one part, natural-curing, silicon sealant, joint movement +/- 50, complying with ASTM C1184 and ASTM C 920, Type S, Grades NS, Class 50, Use NT, G,A and O
- 1. Manufacturers:
 - a. DOW Silicones Corporation, DOWSIL 795 Silicone Building Sealant
 - b. GE Silicones, SCS 9000 SilPruf
 - c. Coordinate with Section 08 80 00 Glazing and 08 44 13 Glazed Aluminum Curtainwalls.

2.4 URETHANE JOINT SEALANTS

- A. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T and NT.
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Tremco Incorporated.
- B. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T and NT.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. Bostik, Inc.
 - c. LymTal International Inc.
 - d. Pecora Corporation.
 - e. Sika Corporation; Joint Sealants.
- C. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. LymTal International Inc.
- D. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. Bostik, Inc.
 - c. LymTal International Inc.
 - d. Pecora Corporation.
 - e. Sherwin-Williams Company (The).
 - f. Sika Corporation; Joint Sealants.
 - g. Tremco Incorporated.

2.5 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adfast.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Pecora Corporation.
 - f. Soudal USA.
 - g. Tremco Incorporated.
- C. STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. BASF Corporation.

2.6 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Pecora Corporation.

2.7 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Everkem Diversified Products, Inc.
 - b. Franklin International.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sherwin-Williams Company (The).
 - f. Tremco Incorporated.

2.8 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adfast.
 - b. Alcot Plastics Ltd.
 - c. BASF Corporation.
 - d. Construction Foam Products; a division of Nomaco, Inc.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type O (open-cell material), Type 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. 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. Provide self-adhesive tape where applicable.

2.9 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 performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Preparation of masonry skyward facing joints. Rake out joints as follows, according to procedures demonstrated in approved mockup:
 1. Remove sealant from joint completely and clean sealant from face of masonry.
 2. Remove mortar and/or sealant from joints to depth of 2.5 times joint width but not less than 1 inch or back to sound mortar, whichever is greater for typical/standard repointing.
 3. Remove all sealant from masonry surfaces within raked-out joint depth to provide joints with square backs and side joints, and to expose masonry for contact with pointing mortar. Feathered edges or existing mortar remaining on masonry are not allowed and are cause for rejection of work.

4. Brush, vacuum, or flush joints with low pressure water to remove dirt and loose debris.
 5. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 6. Cut out sealant by hand with chisel and resilient mallet. Use of power-operated grinders is not permitted.
 7. Cause no damage to the existing masonry.
 8. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- B. 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, 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 joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Metal panels.
 - d. Glazed surfaces of ceramic tile.
- C. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 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. Rake and clean existing joints.
- D. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- 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 in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C 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, and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet (300 m) of joint length thereafter per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. 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.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. 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 kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. 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 material, sealant configuration, and sealant dimensions.
 5. 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-Adhesion-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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1:
1. Joint Locations:
 - a. Control and expansion joints in pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Joints between plant-precast architectural concrete paving units.
 - d. Joints in stone paving units.
 - e. Joints between different materials listed above.
 - f. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, M, P, 50, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion JS-2.
1. Joint Locations:
 - a. Joints in pedestrian plazas.
 - b. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, immersible, S, P, 25, T, NT, I.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-3.
1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between metal panels.
 - d. Joints between different materials listed above.
 - e. Perimeter joints between materials listed above and frames of doors, windows.
 - f. Control and expansion joints in ceilings and other overhead surfaces.
 - g. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-4.
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-5.
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of unit masonry, walls and partitions.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement JS-6.
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-7.
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color As selected by Architect from manufacturer's full range of colors.
- H. Joint-Sealant Application: Concealed mastics JS-8.
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Butyl-rubber based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- I. Joint-Sealant Application: Exterior skyward facing joints in masonry units.
1. Joint Locations:
 - a. Joints in dimension stone – horizontal and skyward facing
 - b. Joints in between roofing materials and adjacent materials
 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 07 95 00 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior expansion control systems.
 - 2. Exterior wall expansion control systems.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for liquid-applied joint sealants and for elastomeric sealants without metal frames.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches long in size.
- C. Samples for Initial Selection: For each type of expansion control system indicated.
 - 1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.
- D. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches long in size.
- E. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - 1. Manufacturer and model number for each expansion control system.
 - 2. Expansion control system location cross-referenced to Drawings.
 - 3. Nominal joint width.
 - 4. Movement capability.
 - 5. Classification as thermal or seismic.
 - 6. Materials, colors, and finishes.

7. Product options.
8. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.
- B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

2.3 INTERIOR EXPANSION CONTROL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 2. Balco, Inc.
 3. BASF Corp. - Watson Bowman Acme Corp.
 4. Construction Specialties, Inc.
 5. Inpro Corporation.
 6. Michael Rizza Company.
 7. MM Systems Corporation.
 8. Nystrom, Inc.
- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

C. Floor-to-Floor:

1. Basis-of-Design Product: Indicated on Drawings
2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings
 - b. Minimum Joint Width: As indicated on Drawings
 - c. Maximum Joint Width: As indicated on Drawings
 - d. Movement Capability: -25 percent/+75 percent.
 - e. Type of Movement: Thermal.
 - f. Load Capacity:
 - 1) Uniform Load: 150 lb/sq. ft.
 - 2) Concentrated Load: 2000 lb .
 - 3) Maximum Deflection: 0.5 inch
3. Type: Elastomeric seal, recessed.
 - a. Seal Material: Manufacturer's standard.
 - 1) Color: As selected by Architect from manufacturer's full range.

D. Wall-to-Wall :

1. Basis-of-Design Product: Indicated on Drawings.
2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings
 - b. Minimum Joint Width: As indicated on Drawings
 - c. Maximum Joint Width: As indicated on Drawings
 - d. Movement Capability: -25 percent/+75 percent.
 - e. Type of Movement: Thermal.
3. Type: Elastomeric seal.
 - a. Metal: Aluminum.
 - 1) Finish: Manufacturer's standard.
 - b. Metal: Stainless steel.
 - 1) Finish: Manufacturer's standard.
 - c. Seal Material: Manufacturer's standard.
 - 1) Color: As selected by Architect from manufacturer's full range.

E. Ceiling-to-Ceiling:

1. Basis-of-Design Product: Indicated on Drawings.
2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings
 - b. Minimum Joint Width: As indicated on Drawings
 - c. Maximum Joint Width: As indicated on Drawings
 - d. Movement Capability: -25 percent/+75 percent.
 - e. Type of Movement: Thermal.
3. Type: Elastomeric seal.
 - a. Seal Material: Manufacturer's standard.
 - 1) Color: As selected by Architect from manufacturer's full range.

2.4 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
2. Balco, Inc.
3. BASF Corp. - Watson Bowman Acme Corp.
4. Chase Construction Products.
5. Construction Specialties, Inc.
6. D. S. Brown Company (The).
7. EMSEAL Joint Systems, Ltd.
8. Erie Metal Specialties, Inc.
9. Inpro Corporation.
10. LymTal International Inc.
11. Michael Rizza Company.
12. MM Systems Corporation.
13. Nystrom, Inc.
14. RJ Watson, Inc.
15. Schul International Company, Inc.
16. Tremco Incorporated.
17. Williams Products, Inc.

B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

C. Wall-to-Wall:

1. Basis-of-Design Product: Indicated on Drawings.
2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings
 - b. Minimum Joint Width: As indicated on Drawings
 - c. Maximum Joint Width: As indicated on Drawings
 - d. Movement Capability: -25 percent/+75 percent.
 - e. Type of Movement: Thermal.
3. Type: Cover plate.
 - a. Metal: Aluminum.
 - 1) Finish: Clear anodic, Class I.
4. Type: Flat seal.
 - a. Metal: Aluminum.
 - b. Seal Material: Manufacturer's standard.
 - 1) Color: As selected by Architect from manufacturer's full range.
 - c. Pantograph Mechanism: Manufacturer's standard pantographic wind-load support mechanism with stainless-steel fasteners.
5. Type: Preformed cellular foam.
 - a. Foam Material: Manufacturer's standard.
 - 1) Color: As selected by Architect from manufacturer's full range.

2.5 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary cover.

1. Drain-Tube Assemblies: Equip moisture barrier with drain tubes and seals to direct collected moisture to drain.

2.6 MATERIALS

- A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304 for plates, sheet, and strips.
 - 1. Remove tool and die marks and stretch lines or blend into finish.
- C. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.
- D. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.
- E. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
- F. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.
- G. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.
- H. Moisture Barrier: Flexible elastomeric material, PVC, minimum 30 mils thick.
- I. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- J. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical 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.

2.8 ALUMINUM FINISHES

- A. Mill finish.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.9 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.
- C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion control system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.
- C. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
 - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.

2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 5. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
1. Provide in continuous lengths for straight sections.
 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both frame interfaces before installing compression seals.
- E. Foam Seals: Install with adhesive recommended by manufacturer.
- F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not overpressurize.
- G. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.
- H. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.
1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- I. Moisture Barrier: Provide at all exterior joints and where indicated on Drawings. Provide drainage fittings at a maximum of 50 feet or where indicated on Drawings.
- 3.4 PROTECTION
- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
 - B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 07 95 00

SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Hollow-metal work.
 - 2. Fire rated hollow metal doors and frames
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants"
 - 2. Section 08 71 00 "Door Hardware for door hardware for hollow-metal doors.
 - 3. Section 08 80 00 "Glazing" for glass view panels in flush wood and hollow metal doors.
 - 4. Section 09 91 23 "Interior Painting" for finishing of doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Malcolm X West Side Learning Center, 4624 W. Madison Avenue, Chicago, IL 60644.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
 - 10. Doors to be factory finished and finish requirements.
 - 11. Fire-protection ratings for fire-rated doors.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish.
 - 2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Hollow Metal Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
 - 3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.
- E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- C. Sample Warranty: For special warranty.
- D. Quality Standard Compliance Certificates.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody.
- B. Vendor Qualifications: A vendor that is certified for chain of custody.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
- D. Comply with requirements of referenced standard and manufacturer's written instructions.
- E. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- F. Mark each door on bottom rail with opening number used on Shop Drawings.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.11 LABEL DOOR REQUIREMENTS

- A. Fire Ratings Compliance: Comply with the label requirements of NFPA and applicable local codes. Fabricate doors and frames in accordance with requirements of NFPA Standard No. 80 and U.L. Standards as follows:
 - 1. Positive Pressure Testing UL 10C
- B. Ratings Certifications
 - 1. Provide U.L. labels permanently fastened on each door that is within the size limitations established by NFPA and U.L. for labeling.
 - 2. Provide anchors for U.L. labeled frames required by the authority having jurisdiction.

1.12 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hollow Metal Doors and Frames:
 - a. Ceco Door Products; Assa Abloy Group company
 - b. Curries Company; Assa Abloy Group company
 - c. Pioneer Industries; Assa Abloy Group company
 - d. Steelcraft; Allegion company

- B. Source Limitations: Obtain hollow-metal doors and frames from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.3 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations indicated in the Door and Frame Schedule.
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 (ZF120) coating.
 - d. Edge Construction: Model 2, seamless
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 (ZF120) coating.
 - b. Construction: Face welded unless otherwise indicated.
 4. Exposed Finish: Factory.

2.4 INTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Cold rolled steel; stretcher-leveled standard flatness; minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 2, seamless
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 3. Frames:
 - a. Materials: Fabricated from either commercial grade cold-rolled steel conforming to ASTM A1008 or commercial grade hot-rolled and pickled steel conforming to ASTM A1011, minimum 0.053" thick.
 - b. Construction: All miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
 - 4. Exposed Finish: Factory.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

- D. Metallic-Coated Steel: Commercial quality, hot dipped, A-60 galvanized steel in accordance with ASTM A653, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process".
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. 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 hollow-metal frames of type indicated.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Comply with requirements in Section 088000 "Glazing."
- K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches
 - 4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges of doors with flush end closures of same material as face sheets.
 - 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on

which astragal is mounted or as required to comply with published listing of qualified testing agency.

- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - c. Compression Type: Not less than two anchors in each frame.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 - 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 - 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
 - 8. Terminated Stops: Terminate stops 6 inches above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.9 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
 - 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
 - 3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.
- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 - 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

- a. Squareness: Plus or minus 1/16 inch measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Fire rated doors.
- B. Related Requirements:
 - 1. Section 08 11 13 "Hollow Metal Doors & Frames"
 - 2. Section 08 71 00 "Door Hardware"
 - 3. Section 09 91 23 "Interior Painting."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Malcolm X West Side Learning Center, 4624 W. Madison Avenue, Chicago, IL 60644.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of door.
 - 1. Include details of core and edge construction and trim for openings.
 - 2. 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; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
 - 7. Fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (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 finished Work.
2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification and WI Certified Compliance Program certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.9 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Solid Core Wood Doors:
 - a. Masonite Architectural
 - b. Oshkosh Door Company
 - c. VT Industries Inc.
 - d. Lambton Doors
- B. Source Limitations: Obtain flush wood doors from single source from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards WDMA I.S.1-A, "Architectural Wood Flush Doors."
 - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. Regional Materials: Flush wood doors shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Certified Wood: Flush wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

- E. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
- G. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
 - 3. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
- H. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- I. Stave Lumber Core (SLC-5) may be a combination of solid, low- density hardwood lumber blocks or strips not more than 2-1/2" wide of one species of wood between 6% to 9% moisture content. Joints to be tight and staggered in adjacent rows. Lumber density is 25 to 27 lbs. per cubic foot. Formaldehyde free.
- J. Structural Composite Lumber Core (SCLC-5) is an engineered hardwood composite sometimes referred to as LSL (Laminated Strand Lumber). The material complies with WDMA minimum performance levels for interior applications with screw holding power of 540 lbs., modulus of rupture of 6,500 psi, modulus of elasticity of 1,300,000 psi and density of 38 lbs per cubic foot. Formaldehyde free.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors
 - 1. Grade: Premium, with Grade A faces.
 - 2. Species: Maple
 - 3. Cut: Straight grain, to match Acoustical Wood Ceiling and Wall Panel, see specification section 06 42 16 Flush Wood Paneling.
 - 4. Stain: To match color Flush Wood Paneling.
 - 5. Match between Veneer Leaves: Book match.
 - 6. Assembly of Veneer Leaves on Door Faces: Center-balance match.
 - 7. Room Match: Match door faces within each separate room or area of building.
 - 8. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling.
 - 9. Exposed Vertical and Top Edges: Same species as faces - edge Type A.

10. Core: Either glued wood stave or structural composite lumber.
11. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
12. WDMA I.S.1-A Performance Grade: Heavy Duty

2.4 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors

1. Grade: Premium.
2. Faces: Any closed-grain hardwood of mill option.
 - a. Hardboard Faces: ANSI A135.4, Class 1.
 - b. MDF Faces: ANSI A208.2, Grade 160.
3. Exposed Vertical and Top Edges: Any closed-grain hardwood.
4. Core: Either glued wood stave or structural composite lumber.
5. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
6. WDMA I.S.1-A Performance Grade: Heavy Duty.

B. Fire Rated Doors: Conform to "Solid Core Door" requirements specified above. Provide doors of U.L. classification indicated.

1. Reinforcement: Reinforce doors to receive hardware specified.
 - a. Surface applied hardware that is located where screws cannot penetrate the above-mentioned stiles or wood rails shall be through bolted.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements 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, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. 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 meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099123 "Interior Painting."

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors that are indicated to receive transparent finish.
- C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Transparent Finish:
 1. Grade: Premium
 2. Finish: WDMA TR-4 conversion varnish
 3. Staining: Match Architect's sample.
 4. Effect: Filled finish
 5. Sheen: Satin
- E. Opaque Finish:
 1. Grade: Premium.
 2. Finish: System 10, UV curable, water based
 3. Color: Match Architect's sample
 4. Sheen: Satin

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 1. Verify that installed 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 Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
 - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - b. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 2. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 17 13 - INTEGRATED METAL DOOR OPENING ASSEMBLIES

PART 1 GENERAL

1.01 GENERAL NOTE

- A. The General Conditions, Supplementary General Conditions, and Division 1 - General Requirements are hereby made a part of this Section as fully as if repeated herein.

1.02 SUMMARY

- A. Section Includes
 - 1. Integrated metal door opening assemblies with doors, operating hardware, accessories, and installation for a complete assembly.

1.03 RELATED SECTIONS

- A. Section 01 33 00, Submittal Procedures.
- B. Section 01 25 00, Substitution Procedures.

1.04 REFERENCES

- A. ANSI/BHMA A156.32 – Integrated Door Opening Assemblies, 2015.
- B. ANSI/UL 10C -- Positive Pressure Fire Tests of Door Assemblies, American National Standards Institute/Underwriters Laboratories, 2001.
- C. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, American Society of Testing and Materials; 2004a.
- D. NFPA 101 – Life Safety Code, National Fire Protection Association, 2003.
- E. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies, National Fire Protection Association, 2003.
- F. SDI 111 A - Recommended Steel Door Frame Details, Steel Door Institute; 2002.
- G. SDI 112 - Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames, Steel Door Institute, 1997.
- H. UL 1784 – Air Leakage Tests for Door Assemblies without an artificial bottom seal, Underwriters Laboratories Inc., 2001 (For Smoke Containment, Enclosed Elevator Lobbies, Fire Service Access Elevator Lobby Doors, Hoistway Opening Protection)

1.05 SYSTEM DESCRIPTION

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- A. Performance Requirements
 - 1. Certified to BHMA – A156.32, Integrated Door Opening Assemblies, 2015.

1.06 SUBMITTALS

- A. Shop Drawings
 - 1. In accordance with Section 01 33 00.
 - 2. Indicate each door and frame condition; frame type, profile and installation detail; items of finish hardware, finishes and electrical rough-in requirements.
- B. Samples
 - 1. In accordance with Section 01 33 00.
- C. Environmental
 - 1. Submit UL certification for Environmental Product Declaration (EPD).
- D. Performance
 - 1. Submit certification for ANSI/BHMA 156.32
- E. Fire Certificate of Compliance

1.07 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer: Firm with not less than 5 years successful experience in fabrication of integrated metal door opening assemblies with full-height latch/lock and full-height hinge.
 - 2. Supplier: Authorized distributor of manufacturer.
 - 3. Installer: Manufacturer certified.
- B. Regulatory Requirements
 - 1. Rated door assemblies shall have been tested to meet conditions of NFPA 252 as required by NFPA 101 section 6-2.3.3.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Packaging: Polyvinyl wrapped, palette by floor, and clearly marked for each opening.
- B. Delivery: Deliver to site in original unopened containers and pallets bearing system manufacturers name, and brand.
- C. Store: Horizontally on level surface, not less than 2 inches off floor in a clean, dry well-ventilated area protected from sunlight, extreme heat, dryness and moisture.
- D. Receiving, off-loading, and site distribution should be handled by an authorized Total Door Distributor unless otherwise stipulated by contract. If the G.C. or other entity handles all or any portion of the receiving, off-loading, and site distribution, they are held responsible for any and all damages that may result from potential miss handling of the product.

1.09 PROJECT CONDITIONS

- A. Do not bring door systems to site until building temperature and humidity ranges are compatible with recommended values for preservation of wood moisture content as listed by AWI AWQS. Building shall be stabilized at 30 to 60 percent humidity.

1.10 WARRANTY

- A. Integrated metal door opening assembly: Manufacturer's standard 5 year warranty against defects in material and workmanship. Refer to Manufacturer's published warranty.
- B. Store doors in a clear, dry ventilated space having controlled temperature and a relative humidity range between 30 and 60 percent. Stack doors flat and off the floor to prevent warpage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Integrated metal door systems
 - 1. Basis of Design Total Door: www.totaldoor.com.
- B. Hardware
 - 1. Total Door: www.totaldoor.com.
 - 2. Minimum requirement hardware must be provided by manufacturer and meet door hardware specification requirements.

2.02 MATERIALS

- A. Frames
 - 1. To be supplied by others.
 - 2. In accordance with ANSI/SDI A250.8, SDI 111A, and SDI 112.
 - 3. Construction: KD or All-welded units.
 - 4. Material: Steel, cold rolled, ASTM A1008, 16 gauge.
 - 5. Fire Resistance Rating: Where indicated in Contract Documents for doors.
 - 6. Spreader Bar: Removable, at sill (For all welded type).
- B. Frame Anchorage Devices
 - 1. To securely fasten to wall construction without distortion or stress.
 - 2. In accordance with fire resistance rating indicated in Contract Documents.
- C. Integrated Door Assembly
 - 1. Integrated Door Assembly
 - a. Stiles: Steel, galvanized, 16-gauge, spot welded.
 - b. Top and Bottom Rails: 5-1/2 inch 18 gauge steel rails.
 - c. Cores:
 - 1) Solid polystyrene continuously bonded to faces.
 - 2) Temperature Rise.
 - d. Thickness: 1-3/4 inches.
 - e. Faces: Steel, stretcher leveled, without seams or spot welds, galvanized 20 gauge.
 - f. Weld pattern: In accordance with manufacturer's standard details.
 - 2. Gasketing
 - a. Door System: Factory applied to locking channel

- b. Frame: Factory supplied, field apply to head of frame.
- c. Floor: Factory supplied Surface Smoke Seal to be field applied. (must be ordered with elevator shaft & lobby applications)

2.03 FINISHES

- A. Hinge and Locking Channel
 - 1. Finish: Factory Pre-Finished.
 - a. Color to be selected by Architect.
- B. Door Faces, Interior
 - 1. Finish: To be selected by Architect, refer to door schedule.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Field Conditions
 - 1. Prior to commencing installation, examine parts of building structure, which are to receive door systems and component parts.
 - 2. Report, in writing, conditions which would prevent proper execution or endanger permanency of the work to the Architect.
- B. Field Dimensions
 - 1. Where possible, verify frame tolerances before fabrication of door systems.
 - 2. Notify Architect of variances with reviewed shop drawings.
- C. Corrective measures, when necessary, shall be determined and approved prior to commencing fabrication.
- D. Coordinate door opening assembly details with adjacent work to assure proper attachments, clean junctions, etc.

3.02 INSTALLATION

- A. Install work in accordance with Contract Documents and reviewed shop drawings.
 - 1. Install door systems and hardware in accordance with manufacturer's recommendations.
 - 2. Installer: Manufacturer certified.
- B. Frames: Installed by others
 - 1. Set plumb and square in accordance with DHI standards.
 - a. Out-of-square at frame head: Not to exceed 1/16 inch.
 - b. Out-of-plumb for each frame jamb: Not to exceed 1/16 inch.
 - c. Out-of-alignment for each side in plan: Not to exceed 1/16 inch.
 - d. Twist dimension: Not to exceed 1/16 inch.
 - 2. Brace until adjacent wall is constructed.
 - 3. Securely anchor to adjacent wall.
 - 4. Furnish and install clips, fastenings, and anchorages and conceal unless otherwise noted.
- C. Integrated Door Assembly
 - 1. Hang to maintain manufacturer's installation tolerances.

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2. Adjust to freely swing without binding, sticking, or sagging, and to eliminate excessive clearances.
- D. Hardware: When installation is otherwise complete, confirm proper operation and function.

PART 4 SYSTEM SCHEDULE

Door 143

Set 90° Hold Open

2 ea	Full Height Hinges	H-13 Rigidized	Color TBD	Total Door
2 ea	Full Height Latch Channel	L-11	Color TBD	Total Door
2 ea	Operating Pulls	M32	628	Total Door
2 ea	Exit Device/insert to match skin	PF200 (Flush Panic)	628	Total Door
2 ea	Closer	TDC96P-2	Alum	Total Door
2 ea	Mag Holder	TDH100		Total Door
2 ea	Positive Pressure label (confirm rating with door schedule)			Total Door
(Stairwells may require a temperature rise rating)				
(Elevator lobby doors will require a smoke seal (W60) certified to UL1784 w/out an artificial bottom seal)				

END OF SECTION 08 17 13

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior and interior manual-swing entrance doors.
- B. Related Requirements:
 - 1. Section 08 44 13 Glazed Aluminum Curtain Walls for systems without aluminum support framing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- 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 assemblies, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Preconstruction Laboratory Mockup Testing Submittals:
 - 1. Testing Program: Developed specifically for Project.
 - 2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
 - 3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.
- B. Qualification Data: For Installer and laboratory mockup testing agency.
- C. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency with Owner and Architect present.
- E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Laboratory Mockup Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025..
- C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. 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.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- E. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of storefront systems.

1.8 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION LABORATORY MOCKUPS

- A. Preconstruction Testing Service: Contractor will engage a qualified testing agency to perform testing on preconstruction laboratory mockups.
- B. Build preconstruction laboratory mockups at testing agency facility; use personnel, products, and methods of construction that will be used at Project site.

1. Size and Configuration: As indicated on Drawings.
 2. Notify Architect seven days in advance of the dates and times when preconstruction laboratory mockups will be constructed and tested.
- C. Preconstruction Laboratory Mockup Testing Program: Test preconstruction laboratory mockups according to requirements in "Performance Requirements" Article. Perform the following tests in the following order:
1. Structural: ASTM E 330 at 50 percent of positive test load.
 2. Air Infiltration: ASTM E 283.
 3. Water Penetration under Static Pressure: ASTM E 331.
 4. Water Penetration under Dynamic Pressure: AAMA 501.1.
 5. Structural: ASTM E 330 at 100 percent of positive and negative test loads. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
 6. Interstory Drift: AAMA 501.4 at 100 percent of design displacement. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
 7. Vertical Interstory Movement: AAMA 501.7. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
 8. Thermal Cycling: According to AAMA 501.5. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
 9. Structural: ASTM E 330 at 100 and 150 percent of positive and negative test loads. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.

1.10 WARRANTY

- A. Special Warranty: Manufacturer and Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.

2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. 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. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) or 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 (19.1 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 [amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components 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, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).
- E. Structural: Test according to ASTM E 330 as follows:
 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or 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 10seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa)
 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
 1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa)
 2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- H. Energy Performance: Certify and label energy performance according to NFRC as follows:
 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.37 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.34 as determined according to NFRC 200.
 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than [15] [25] [35] [45] <Insert value> as determined according to NFRC 500.
- I. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 34
- J. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 3.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Thermal Cycling: 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. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C)
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C)
 - c. Interior Ambient-Air Temperature: 75 deg F (24 deg C) >.
- L. Structural-Sealant Joints:
 1. Designed to carry gravity loads of glazing.
 2. Designed to produce tensile or shear stress of less than 20 psi (138 kPa).
- M. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront system without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS

- A. Basis of Design: Tubelite Standard Medium Series Entrance System.
 1. Substitutions
 - a. Manufacturer's products that meet specified design requirements may be considered as a substitution. Substitution requests / submittals must include the following, and be submitted at least ten working days prior to the bid date.
 - 1) Submittal information must include test reports as specified in performance sections.
 - 2) Copy of manufactures warranty
 - 3) Any additional information as requested
 - 4) System details / samples
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: See section 08 44 13 Glazed Aluminum Curtain Wall

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 1-3/4-inch (44.5-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 deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Vertical Stiles: 4"
 - b. Top Rail: 4"
 - c. Bottom Rail: 10"
 - d. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 - 2. Door Design: Medium stile; 4-inch (88.9-mm) nominal width.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule and entrance door hardware sets indicated in "Entrance Door Hardware Sets" Article] for each entrance door to comply with requirements in this Section.
 - 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 - 3. Opening-Force Requirements:
 - a. In conformance with ADA 2010 requirements and Chicago Building Code IBC most recent:
 - 1) The force for pushing or pulling open interior swinging egress doors, other than fire doors, shall not exceed 5 pounds (22 N).
 - 2) The force for pushing or pulling open exterior hinged doors and gates shall not exceed 8.5 pounds (38 N).
 - 3) Items 1 and 2, These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.

- 4) For other swinging doors, as well as sliding and folding doors, the door latch shall release when subjected to a 15-pound (67 N) force. The door shall be set in motion when subjected to a 30-pound (133 N) force. The door shall swing to a full-open position when subjected to a 15-pound (67 N) force.
- C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
 3. Coordinate Door Hardware with Section 08 71 00 Door Hardware
- D. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
 2. Exterior Hinges: Stainless steel, with stainless-steel pin.
 3. Quantities:
 - a. For doors up to 87 inches (2210 mm) high, provide three hinges per leaf.
 - b. For doors more than 87 and up to 120 inches (2210 and up to 3048 mm) high, provide four hinges per leaf.

2.6 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.
- E. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
1. Color: As selected by Architect from manufacturer's full range of colors

- G. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

- 1. Color: Match structural sealant.

2.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads fabricated from 300 series stainless steel.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) 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.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. 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 or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. 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. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. 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. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Three coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: gloss, to match .

2.10 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 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. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

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 in Section 088000 "Glazing."

G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 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 (12.7 to 25.4 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 (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
 4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections. Testing to be attended by Owner and Architect.
- B. Field Quality-Control Testing: Perform the following test on mockups
1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Architect.
- C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
1. Test a minimum of six areas on each building facade.
 2. Repair installation areas damaged by testing.
- D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

- A. Entrance Door Hardware:
1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

2. Initial Maintenance Service: Beginning at Substantial Completion, provide [six] <Insert number> months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

3.7 ENTRANCE DOOR HARDWARE SETS See Door Hardware specification.

END OF SECTION 08 41 13

SECTION 08 41 23 - FIRE RATED ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Fire rated glazing and framing systems for installation as [sidelights,] [borrowed lights,] [windows,] and [transoms] or [wall sections] in interior openings
- B. Related Sections:
 - 1. Section 05 12 00 - "Structural Steel Framing:" Steel attachment members
 - 2. Section 05 50 00 - "Metal Fabrications:" Steel attachment members inserts and anchors
 - 3. Section 07 62 00 - "Sheet Metal Flashing and Trim" Flashing between this work and other work
 - 4. Section 07 84 13 - "Firestopping" for perimeter fire-containment systems (safing insulation) field installed with steel fire-rated glazed curtain-wall systems.
 - 5. Section 07 92 00 - "Joint Sealants" for installation of joint sealants installed with steel fire-rated glazed curtain-wall systems and for sealants to the extent not specified in this Section.
 - 6. Section 08 11 13 - "Metal Doors and Frames" for fire-rated doors.
 - 7. Section 08 41 23 - "Fire Rated Aluminum Storefront and Entrances"
 - 8. Section 08 43 13 - "Glazed Aluminum Curtainwall" for entrance [and storefront] systems installed with steel fire-rated glazed curtain-wall systems.
 - 9. Section 08 44 18 - "Glazed Steel Curtain Wall" – Fire rated curtain walls.
 - 10. Section 08 71 00 - "Door Hardware" for door hardware not provided by this Section.

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 2. AAMA 2604 -2005 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. American Society for Testing and Materials (ASTM):
 - 1. Fire safety related:
 - a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
 - 2. Material related
 - a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.
 - b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.
 - 3. Exterior-related:

- a. ASTM E 283-04: Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen
 - b. ASTM E 330-02: Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference Procedure A
 - c. ASTM E 331-04: Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 - d. ASTM E 783-02: Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors
 - e. ASTM E 1105-00: Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
- C. American Welding Society (AWS)
- 1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007
- D. Builders Hardware Manufacturers Association, Inc.
- 1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).
- E. Canadian Standards
- 1. CAN/ULC-S101 Standard Test of Fire Endurance Tests of Building Construction and Materials
 - 2. CAN/ULC-S104 Standard Method of Fire Tests of Door Assemblies
 - 3. CAN/ULC-S106 Standard Method of Fire Tests of Window and Glass Block Assemblies
- F. National Fire Protection Association (NFPA):
- 1. NFPA 80: Fire Doors and Windows.
 - 2. NFPA 251: Fire Tests of Building Construction & Materials
 - 3. NFPA 252: Fire Tests of Door Assemblies
 - 4. NFPA 257: Fire Test of Window Assemblies
- G. Underwriters Laboratories, Inc. (UL):
- 1. UL 9: Fire Tests of Window Assemblies.
 - 1. UL 10 B: Fire Tests of Door Assemblies
 - 2. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
 - 3. UL 263: Fire tests of Building Construction and Materials
 - 4. UL-752 Ratings of Bullet-Resistant Materials
- H. American National Standards Institute (ANSI):
- 1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings
- I. Consumer Product Safety Commission (CPSC):
- 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials
- J. American Society of Civil Engineers (ASCE)
- 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; 2005

1.3 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 Submittal Procedures.
- B. Product Data:
 - 1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.
- C. Shop Drawings:
 - 1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure
- D. Sustainable Requirements:
 - 1. Living Building Challenge Compliance: Compliant
 - a. I-13 Red List Declaration
- E. Structural Calculations (optional):
 - 1. Provide structural calculations sealed by a licensed professional engineer in the State in which the project is located; prepared in compliance with referenced documents and these specifications.
- F. Samples (optional). For following products:
 - 1. Glass sample-as provided by manufacturer
 - 2. Sample of frame
 - 3. Verification of sample of selected finish
- G. 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.
- H. Warranties: Submit manufacturer's warranty.
- I. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
 - 1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualifications according to
 - 1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
 - 2. International Accreditation Service for Testing Body-Building Materials and Systems
 - a. Fire Testing
 - 1) ASTM Standards E 119
 - 2) CPSC Standards 16 CFR 1201
 - 3) NFPA Standards 251, 252, 257
 - 4) UL Standards 9, 10B, 10C, 1784, UL Subject 63
 - 5) BS 476; Part 22: 1987
 - 6) EN 1634-1
 - 7) CAN/ULC Standards S101, S104, S106

- B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.
- C. Fire-Rated Wall Assemblies: Assemblies complying with ASTM E119 that are classified and labeled by UL, for fire ratings indicated, based on testing in accordance with UL 263, ASTM E119.
- D. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle under provisions specified by manufacturer.

1.7 PROJECT CONDITIONS

- A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
 - 1. Note whether field or planned dimensions were used in the creation of the shop drawings.
- B. Coordinate the work of this section with others effected including but not limited to: other interior and/or exterior envelope components and door hardware beyond that provided by this section.

1.8 WARRANTY

- A. Provide the Pilkington Pyrostop® and Fireframes® standard five-year manufacturer warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURERS - (ACCEPTABLE MANUFACTURERS/PRODUCTS]

- A. Manufacturer Glazing Material: "Pilkington Pyrostop®" fire-rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com, web site <http://www.fireglass.com>
- B. Frame System: "Fireframes® Aluminum Series" fire-rated frame system as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300 e-mail sales@fireglass.com web site <http://www.fireglass.com>
- C. Substitutions: Substitutions for Glazing Material and Frame System not permitted.

2.2 PERFORMANCE REQUIREMENTS

- A. System Description:
 - 1. Steel fire-rated glazed wall and/or window system, dual aluminum cover cap format

- a. Face widths available:
 - 1) 2"
 - 2) Custom extruded aluminum cover caps
 - 3) Custom stainless steel cover caps
- b. Duration – Windows Capable of providing a fire rating for [45], [60], [120] minutes.
- c. Duration – Walls: Capable of providing a fire rating for [60], [120] minutes.

B. Structural Performance

1. Design and size the system to withstand structural forces placed upon it without damage or permanent set when tested in accordance with ASTM E330 using load 1.5 times the design wind loads and of 10 seconds in duration.
 2. Positive wind load: [_____] lbf/sq ft. [as indicated on the drawings]
 3. Negative wind Load: [_____] lbf/sq ft. [as indicated on the drawings]
 4. Member deflection: Limit deflection of the edge of the glass normal to the plane of the glass to [flexure limit of glass] [1/175 of the glass edge length or 3/4 inch, whichever is less] [of any framing member]
 5. Accommodate movement between storefront and adjoining systems
- C. Air Infiltration: ASTM E 283; Air infiltration rate shall not exceed 0.06 cfm/ft² at a static air pressure differential of 6.24 psf.
- D. Water Resistance, (static): ASTM E 331; No leakage at a static air pressure differential of 15 psf as defined in AAMA 501.

2.3 MATERIALS - GLASS

- A. Low-E Coated glass for use in insulated exterior units See Section 08 80 00
- B. Fire Rated Glazing: Composed of multiple sheets of Pilkington Optiwhite™ high visible light transmission glass laminated with an intumescent interlayer.
- C. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201(Cat. I and II).
- D. Properties Interior Glazing

Fire-Rating	45 minute	60 minute		120 minute
Manufacturer's designation	45-200	60-101	60-201	120-106
Glazing type	single	single	single	IGU
Nominal Thickness	3/4" (19mm)	7/8" (23mm)	1-1/16" (27mm)	2-1/4" (57mm)
Weight in lbs/sf	9.2	10.85	12.5	22.9
Daylight Transmission	86	87%	86%	75%
Sound Transmission Coefficient	40dB	41dB	44dB	46dB

E. Properties Exterior Glazing

Fire-Rating	45 minute		60 minute		120 minute
Manufacturer's designation	45-200	45-260 45-360	60-201	60-261 60-361*	120-262 120-362*
Glazing type	single	IGU	single	IGU	IGU
Nominal Thickness	3/4" (19mm)	1-5/16" (33mm)	1-1/16" (27mm)	1-5/8" (41mm)	2-3/8" (60mm) [with 14 mm spacer, or 2- 1/8" (54 mm) with 8 mm spacer]
Weight in lbs/sf	9.2	12.5	12.5	15.8	22.1
Daylight Transmission	86	77	86%	77%	74%
		59-71		59-70%	33-68%
Sound Transmission Coefficient	40dB	40dB	44dB	44dB	46dB

* Low-E product.

- F. Exterior Grade: PVB inner layer installed toward exterior.
- G. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.
- H. Glazing Accessories: Manufacturer's standard compression gaskets, standoff, spacers, setting blocks and other accessories necessary for a complete installation.

2.4 MATERIALS –ALUMINUM FRAMES

- A. Aluminum Framing System [45 min. 60 min. 120 min.]
- Steel Frame — The steel framing members are made of two halves, nom. 1.9 in. wide (48.3 mm) with a nom. minimum depth of 1.38 in. (35 mm) with lengths cut according to glazing size.
 - Aluminum Trim — Supplied with the steel framing members. Nom. 2 in. (50.8 mm) wide with a nom. depth of 1.54 in. (39 mm) with lengths cut according to glazing size.
 - Stainless Steel Standoffs — Supplied with the steel framing members. Nom 5/16 in. (8 mm) diameter with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
 - Stainless Steel Moment and Connecting Braces: — Supplied with the steel framing members. Nom 3/8 in. (10 mm) thick with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
 - Framing Member Fasteners — Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1" Pan Head Sheet Metal Screws for door installation.
 - Glazing Gasket —
 - Interior Gasketing-Supplied with the steel framing members. Nom. 3/4 in. (19 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.
 - Exterior Gasketing- Supplied with the steel framing members. Nom. 2 in. (50 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.

- B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
- C. 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 Standard Specification for Carbon Structural Steel
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - 2. Reinforce members as required to receive fastener threads.

2.5 ACCESSORIES

- A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.
- B. Glazing Gaskets:
 - 1. Glazing gaskets for interior or exterior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).
- C. Intumescent Tape: As supplied by frame manufacturer.
- D. Setting Blocks: ¼" Calcium silicate.
- E. Perimeter Anchors: Steel.
- F. Flashings: As recommended by manufacturer; same material and finish as cover caps.
- G. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
 - 1. Available Products:
 - a. Dow Corning 790, 795 - Dow Corning Corp.
 - b. Momentive
 - c. Tremco

- H. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.
 - 1. Available Products:
 - a. 3M CP-25 WP+

2.6 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

- A. Available Manufacturers:
 - 1. Fibrex Insulations Inc.
 - 2. Owens Corning
 - 3. Thermafiber.
 - 4. Rockwool
- B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:
 - 1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
 - 2. Fiber Color: Regular color, unless otherwise indicated.

2.7 FABRICATION

- A. Obtain reviewed shop drawings prior to fabrication.
- B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.
- C. Factory prepared, fire-rated steel door assemblies by TGP to be prehung, prefinished with hardware preinstalled for field mounting.
- D. Field glaze door and frame assemblies.

2.8 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish frames after assembly.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.9 POWDERCOAT FINISHES

- D. Finish after fabrication.
- E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

- F. Steel or Aluminum Finishes
 - 1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
 - 2. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range].
 - 3. Acceptable Manufacturers:
 - a. Tiger Drylac
 - b. Additional manufacturers as approved by TGP
- G. Aluminum Finishes
 - 1. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: Match existing frames where frames are installed at existing building.
 - 3. Color and Gloss: at frames proposed addition, **Match Architect's sample: Section 07 42 13.16 Aluminum Metal Plate Wall Panel, Part 2.5B. Musket Gray and SW7622**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer's acceptable tolerances.
- B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.
- C. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

- A. See Fireframes Aluminum Series Installation Manual

3.3 REPAIR AND TOUCH UP

- A. Anodized Finishes
 - 1. Protect the anodized finish from harsh chemicals such as concrete/mortar or muriatic acid/brick wash. If reasonable care is taken during handling and high and low pH chemicals can be avoided, repair and/or touch-up of an anodize finish will not be needed.
 - 2. Some rub marks on an anodized surface can be removed with a mild abrasive pad such as a Scotch-Brite pad prior to touch up painting.

3. Touch-up paint should be used even more sparingly over anodize. Only the visible raw aluminum in the scratch or gouge should be touched up with a matching paint.
- B. Powder Coated Finishes
 1. Limited to minor repair of small scratches. Use only manufacturer's recommended products.
 2. Such repairs shall match original finish for quality or material and view.
 3. Repairs and touch-up not visible from a distance of 5 feet Owner and Architect to approve.
- C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.4 PROTECTION AND CLEANING

- A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
 1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
 2. Do not use any of the following:
 - a. Steam jets
 - b. Abrasives
 - c. Strong acidic or alkaline detergents, or surface-reactive agents
 - d. Detergents not recommended in writing by the manufacturer
 - e. Do not use any detergent above 77 degrees F
 - f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
 - g. Metal or hard parts of cleaning equipment must not touch the glass surface
- 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. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08 41 23

SECTION 08 44 13 – GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes Tubelite aluminum curtainwall and all components and installation accessories supplied with the system.
 - 1. Tubelite 400 Series Curtainwall systems: 8" & 10"

1.2 RELATED PRODUCTS

- A. Single Manufacture: All products in divisions listed below shall be supplied by a single manufacturer. To ensure consistency in quality, warranty, finish, and product compatibility, products supplied by different manufacturers are not acceptable.
 - 1. Division 08 42 13 - Aluminum Framed Entrances: 400CW, Narrow Stile, Basis of Design Tubelite.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Pre-installation Meeting:
 - 1. Attendees: Owner's Representative, Architect, General Contractor, Structural Engineer, Mechanical Engineer, Consultants, Curtainwall Installer, Curtainwall Manufacturer's Representative, structural support installers, and installers whose work interfaces with curtainwall and glazing.
 - 2. Agenda:
 - a. Review and finalize construction schedule.
 - b. Review code and project performance compliance documentation and testing requirements including product certification for energy (U-value, SHGC), condensation, ADA, acoustics, etc.
 - c. Review product specific mockups and field testing requirements.
 - d. Verify availability of materials, installer's personnel, equipment, and facilities required to maintain schedule.
 - e. Review means and methods related to installation, including manufacturer's written instructions.
 - f. Examine support conditions for compliance with requirements including alignment and attachment to structural members.
 - g. Review flashings, membrane interface with curtainwall, wall penetrations, openings, and conditions of other construction affecting this Work.
 - h. Review temporary protection requirements for during and after installation of this Work.

1.4 PERFORMANCE REQUIREMENTS

- A. Design Wind Loads
 - 1. Provide aluminum curtainwall system with all structural components including but not limited to anchors and mullions based on the following wind load design pressures and the deflection and stress criteria of paragraph 1.04 B. Pressures based on Allowable Stress Design (ASD).
 - a. 16.7 psf positive and negative - typical zones
 - 19.3 psf negative - corner zones.
 - b. Basic Wind Speed of 115 mph
 - i. Exposure Category II

- ii. Importance factor 1
 - c. Design criteria based on ASCE 7-10 building code *or* wind pressure diagram.
- B. Air, Water and Structural Performance:
 - 1. Air Infiltration Performance:
 - a. Shall not exceed 0.06 cfm/ft² at 6.24 psf static air pressure differential, when tested per ASTM 283.
 - 2. Water Infiltration Performance:
 - a. Static: No uncontrolled water entry at a 15 psf static pressure differential with water applied at a minimum rate of 5 gal/ft² hr when tested per ASTM E 331.
 - b. Dynamic: No uncontrolled water entry at 15 psf dynamic pressure with water applied at a minimum rate of 5 gal/ft² hr when tested per AAMA 501.1.
 - 3. Structural Performance:
 - a. Design Loads: System to withstand +/- 60 psf when tested per ASTM E330.
 - i. Maximum allowable deflection of L/175 of the clear span for spans up to 13'-6" or L/240 of clear spans plus 1/4" for spans greater than 13'-6" or an amount that restricts edge deflection of individual glazing lites of glass to 3/4" whichever is smaller.
 - b. 1.5x Design Loads: System to withstand +/- 90 psf when tested per ASTM E330.
 - i. There shall be no permanent deformation of main frame members in excess of 0.2% of its clear span, glass breakage, or permanent damage to fasteners or anchors.
 - 4. Seismic Movement:
 - a. Elastic Interstory Horizontal Movement: Design displacement at 0.010 x the story height per AAMA 501.4.
 - i. 3 cycles: 1.09" left, back to zero, 1.09" right, back to zero (one complete cycle)
 - ii. There shall be no failure or gross permanent distortion of anchors, frame, glass, or panels. Glazing gaskets may not disengage and weather seals may not fail.
 - b. Inelastic Interstory Horizontal Movement: 1.5x design displacement per AAMA 501.4.
 - i. 3 cycles: 1.64" left, back to zero, 1.64" right, back to zero (one complete cycle).
 - ii. There shall be no glass breakage, permanent damage to frame members or anchors.
- C. Thermal Cycling:
 - 1. There shall be no air and water infiltration exceeding primary performance requirements, buckling, stress on glass, edge seal failure, excess stress on structure, anchors and fasteners, or reduction in performance when tested in accordance with AAMA 501.5 at a temperature range of -20 °F to 180 °F. Interior ambient air temperature at 70°F (+/- 5 °F) for hot and cold cycles.
- D. Acoustic Performance:
 - 1. The system shall have a sound transmission class (STC) and an outdoor-indoor transmission class (OITC) rating when tested per ASTM E90 and ASTM E1332. Coordinate performance with 08 80 00 Glazing.
 - a. 1" lami glazing: STC 37, OITC 31 1/8"- .030 PVB-1/8" lami glass, 1/2" air space, 1/8"- .030 PVB-1/8" lami glass, see Glazing specification 08 44 13 for additional information.
 - 2. Test results using glass-only values are not acceptable.
- E. Thermal Transmittance and Condensation Resistance Performance Requirements
 - 1. Thermal transmittance (U-factor) for window system shall not exceed 0.28 (winter) BTU/hr-ft² °F per NFRC 100.

- a. U-Factor performance reference data per NFRC 100 thermal simulations:

CENTER OF GLASS U-FACTOR (BTU/hr-ft ² -°F)	400 SYSTEM U-FACTOR (BTU/hr-ft ² -°F)					
	Aluminum Pressure Plates aluminum spacer	Aluminum Pressure Plates warm edge spacer	Fiberglass Pressure Plates aluminum spacer	Fiberglass Pressure Plates warm edge spacer	4 Side SSG aluminum spacer	4 Side SSG warm edge spacer
0.30	0.46	0.44	0.43	0.39	0.41	0.37
0.29	0.45	0.43	0.42	0.39	0.40	0.36
0.28	0.44	0.42	0.41	0.38	0.39	0.35
0.26	0.42	0.40	0.39	0.36	0.37	0.33
0.24	0.40	0.39	0.37	0.34	0.35	0.31
0.22	0.38	0.36	0.35	0.31	0.32	0.28
0.20	0.36	0.35	0.33	0.30	0.31	0.27
0.18	0.35	0.33	0.32	0.28	0.29	0.25

2. Solar Heat Gain Coefficient (SHGC) for the window area shall not exceed 0.27 as determined in accordance with NFRC 200.
3. Condensation Resistance Factor (CRF) shall meet or exceed 66 CRF_{frame} and 66 CRF_{glass} as determined in accordance with AAMA 1503.
 - a. CRF performance data:

SYSTEM	CONDENSATION RESISTANCE FACTOR (CRF)	
	FRAME	GLASS
aluminum pressure plates	66	66
fiberglass pressure plates	76	69
4 side structurally glazed	72	69

1.5 SUBMITTALS

- A. Product Data:
 1. Manufacturer's literature for each specified system.
 2. Components within assembly, including material descriptions, component profiles, finishes, anchorage and fasteners, glazing, and internal drainage.
- B. Shop Drawings:
 1. Shop drawings must be prepared by a qualified engineering service under the employ of the [window wall manufacturer] [installer].
 2. Include system dimensions, framed opening requirements and tolerances, affected related Work, anchorage, expansion and contraction joint location and details, and field welding required.

3. Include scaled shop drawings showing detailed relationships with glazing, flashing, internal drainage, joinery, and provisions for thermal expansion.
- C. Design Data: Submit framing member structural and physical characteristics, [engineering calculations], and dimensional limitations.
- D. Samples:
 1. System components: Submit corner samples, anchors, fasteners, trim, and other materials as requested by the architect.
 2. Finish: Submit [two] aluminum sheet stock samples [2" x 3"] for each finish type.
- E. Warranty: Submit manufacturer sample warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least twenty years of documented experience.
- B. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State that the Project is located.
- C. Installer: Company approved by manufacturer and specializing in performing work of this section with at least 10 years of documented installation experience.
- D. Source Limitations: Obtain the curtainwall and all products listed in Section 1.02 from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Materials to be packed, loaded, shipped, unloaded, stored and protected in accordance with AAMA CW-10.
- B. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of this Work to be performed according to manufacturer's installation instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before fabrication of curtainwall framing and indicate measurements on Shop Drawings.
- C. Install sealant according to sealant manufacturer guidelines.
- D. Coordinate installation with other applicable trades.

1.9 WARRANTY

- A. Aluminum Curtainwall Framing Warranty:
 - 1. Manufacturer agrees to repair or replace defective curtainwall components for a period of 10 years from the date of shipment.
- B. Finish Warranty:
 - 1. Warranty covers factory-applied organic and anodic finishes on exposed extruded aluminum surfaces without standing water accumulation, against peeling, checking, cracking, chalking and change of color, per applicable AAMA specifications.
 - a. Paint Coatings
 - i. AAMA 2605 70% PVDF: 10 years
 - ii. AAMA 2603 Baked Enamel: 1 year (adhesion only)

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Aluminum Framed Curtainwall
 - 1. Tubelite Inc. 400 Series Curtainwall: 2-1/2" x 8" & 10"
 - 2. Substitutions
 - a. Manufacturer's products that meet specified design requirements may be considered as a substitution. Substitution requests / submittals must include the following and be submitted at least ten working days prior to the bid date.
 - i. Submittal information must include test reports as specified in performance sections.
 - ii. Copy of manufactures warranty
 - iii. Any additional information as requested
 - iv. System details / samples

2.2 ALUMINUM FRAMED CURTAINWALL

- A. Aluminum Framed Curtainwall: Factory or field fabricated, field glazed, factory finished aluminum, screw spline construction with infill and related flashings, anchorage and attachment devices.
 - 1. System dimensions:
 - a. Exterior face dimension: 2-1/2"
 - b. Back mullions depth: 6" & 8"
 - c. Corner mullions
 - i. 90°: inside and outside
 - 2. Glazing:
 - a. Position: face of glass setback from exterior 7/8" with 3/4" deep cover at perimeter (see drawings).
 - b. Thickness: 1" 1/4"
 - c. Method:
 - i. captured [structurally glazed]
 - ii. outside glazed
 - 3. Thermal barrier: 1/8" EPDM stem separator (thermally improved)

2.3 FINISHES

- A. Finish all exposed areas of aluminum curtainwall components in accordance with applicable AAMA Voluntary Finish Guide Specification:

SPECIFICATION	DESCRIPTION	DESIGNATION	COLOR
AAMA 2605	70% PVDF 3 coat	Exterior Paint	Match Architect's sample: Section 07 42 13.16 Aluminum Metal Plate Wall Panel, Part 2.5B. Musket Gray and SW7622

- B. Combination anodic oxide and transparent organic coatings as defined in AAMA 612 are not equivalent substitutions for the AAMA 611 anodized finishes shown above due to surface hardness disparities.
- C. Applicator Qualifications: Certified by AAMA and listed on AAMA Verified Components List.
- D. Verify accuracy of components, quantities, and sizes prior to application of finishes.
- E. Applicator – PVDF Based Finishes:
1. Use regenerative thermal oxidizer to destroy VOC's.
 2. Utilize chrome-based five –stage pretreatment system applied in accordance with AAMA and ASTM standards. Use of a chrome-based five-stage system ensures long-term adhesion and an option for an extended warranty.
 3. Possess in-house blending capabilities, allow for only specific amount of paint needed for each project.
 4. Utilize automated rotary atomization spray bell application providing uniform coverage with manual spray reinforcement for coverage in areas unreachable by automation.
 5. Employ skilled professional field service division to repair warranty or application issues arising at Project site.
 6. Utilize documented quality control protocol in accordance with AAMA procedures.

2.4 MATERIALS

- A. Aluminum extrusions: Alloy 6063-T6 or 6063-T5 in accordance with ASTM B221, and extruded within commercial tolerances and free from defects that impair strength and/or durability.
1. Optional recycled aluminum:
 - a. Provide EcoLuminum™ by Tubelite containing 70% recycled aluminum comprised of 55% pre-consumer and 15% post-consumer material.
- B. Primary extruded framing members will be a minimum thickness of:
1. 0.125" : 6" and 8" back mullion
- C. Extruded or formed trim components will be a minimum 0.060" thick.
- D. Exposed Flashings: .0125" thick aluminum sheet; finish matching framing members.
- E. Concealed Flashings: .125" thick aluminum sheet.
- F. Structural Steel Reinforcement and anchors necessary to meet the performance requirements of 1.04.
1. ASTM A36/A36M; galvanized per ASTM A123/A123M.
 2. Where galvanizing is not compatible with alloy of component parts, apply heavy coating of epoxy paint where necessary to prevent galvanic action with dissimilar materials.

- G. Galvanizing Repair Paint: High zinc content paint for over welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight and in compliance with SSPC Paint 20.
- H. Bituminous Paint: Cold applied asphalt mastic, containing no asbestos fibers.
- I. Glazing and Sealant material:
 - 1. Setting blocks and Edge Blocking: Provide in sizes and locations recommended by GANA Glazing Manual. Setting blocks used in conjunction with soft-coat low-e glass shall be silicone.
 - 2. Glazing gaskets shall be EPDM [silicone], weather-resistant, and compatible with all materials in contact.
 - 3. All sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
 - 4. Frame joinery sealants shall be suitable for application specified and as tested and approved by the window wall manufacturer.

2.5 FABRICATION

- A. Ensure joints and corners are flush, hairline and weatherproof, accurately fitted and secured.
 - 1. Prepare framework to receive anchors and hardware.
 - 2. Conceal fasteners and attachments from view.
 - 3. Reinforce framework as required for imposed loads.
- B. Expansion and Contraction: Fabricate to allow for thermal movement of materials when subjected to project temperature differential requirements.
- C. System Internal Drainage: Drain to exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 1. Fabricate drainage system so weeps and flashings are integral to system and others are not required.
- D. Allow for movement between curtainwall and adjacent construction, without damage to components or deterioration of seals.
- E. Provide for membrane interface as indicated on architectural drawings.

2.6 COMPONENTS

- A. Glass
 - 1. Provide in accordance with Section 08 80 00.
- B. Glazing
 - 1. Glazing method shall be in accordance with manufacturer installation instruction and the GANA Glazing Manual for specified glass type, or as approved by the glass fabricator.
 - 2. Refer to Section 08 80 00 for requirements.
- C. Sun Shades: Provide sun shades to help reduce natural daylight and solar heat gain.
 - 1. Basis of design: "Maxblock™ Sun Shades" by Tubelite, Inc.
 - 2. Outrigger projection: - 25"
 - 3. Refer to Section 10 71 13 for requirements.

D. Muntins:

1. Provide muntin grids as shown on architectural drawings. Finish to match curtainwall frames.

PART 3 – EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of this Work.
- B. Notify Contractor in writing, with a copy sent to Owner and Architect, of any conditions detrimental to proper and timely completion of this Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Start of this Work shall indicate acceptance of areas and conditions as satisfactory by the Installer.

3.2 INSTALLATION

- A. Preparation: Coordinate and furnish anchors, concrete inserts, sleeves, anchor bolts, and other accessories to be embedded in concrete or masonry construction or welded to structural steel. Coordinate delivery of these items to project site.
- B. Install aluminum curtainwall framing in accordance with manufacturer's installation instructions, reviewed product data, approved shop drawings, and as indicated on Drawings (per Professional Engineer review when applicable).
- C. Do not install damaged components.
- D. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- E. Provide alignment attachments and shims to permanently fasten system to building structure.
- F. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- G. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- H. Coordinate attachment and seal of membrane materials per architectural drawings.
- I. Install accessories with positive anchorage to building, weather tight mounting, provisions for thermal expansion, and coordinate installation with flashings and other components.
- J. Install hardware using templates provided. Refer to Section 08 71 00 for hardware installation requirements.
- K. Install glass in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.

- L. Install perimeter sealant in accordance with Section 07 92 00.
- M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
- N. Adjust operating hardware for smooth operation.
- O. Tolerances:
 - 1. Maximum variation from plumb: $[1/16"]$ every 3' non-cumulative, or $[1/16"]$ per 10', whichever is least.
 - 2. Maximum Misalignment of two adjoining members abutting in plane: $[1/32"]$.

3.3 CLEANING

- A. Comply with AAMA 609 and 610 for methods, equipment, and materials to clean finished aluminum after installation and for subsequent periodic maintenance.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths.
- C. Take care to remove dirt from corners, and wipe surfaces clean.
- D. Remove excess sealant from glass and aluminum by method acceptable to sealant and finish manufacturer.

3.4 PROTECTION

- A. Protect installed products from damage during subsequent construction.
- B. Protect anodized finishes from prolonged exposure to alkaline, such as lime in masonry mortar, or acidic and other corrosive materials.

END OF SECTION 08 44 13

SECTION 08 44 18 - GLAZED STEEL CURTAIN WALL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-rated curtain wall systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.

B. Related Sections include the following:

1. Section 05 12 00 "Structural Steel Framing:" Steel attachment members
2. Section 05 50 00 "Metal Fabrications:" Steel attachment members inserts and anchors
3. Section 07 62 00 "Sheet Metal Flashing and Trim" Flashing between this work and other work
4. Section 07 84 00 – "Firestopping" for perimeter fire-containment systems (safing insulation) field installed with steel fire-rated glazed curtain-wall systems.
5. Section 07 92 00 – "Joint Sealants" for installation of joint sealants installed with steel fire-rated glazed curtain-wall systems and for sealants to the extent not specified in this Section.
6. Section 08 11 13 – "Metal Doors and Frames" for fire-rated doors.
7. Section 08 41 23 – "Fire Rated Aluminum Storefront and Entrances"
8. Section 08 43 13 – "Glazed Aluminum Curtainwall" for entrance and curtain walls.
9. Section 08 44 18 – "Glazed Steel Curtain Wall" – Fire rated entrance and curtain walls.
10. Section 08 71 00 – "Door Hardware" for door hardware not provided by this Section.

1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA)

1. AAMA 501.1-2005: Standard Test Method for Water Penetration of Windows, Curtain Walls, and Doors Using Dynamic Pressure
2. AAMA 501.2-2003: Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems
3. AAMA 501.4-2000 (Revised 2001): Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts
4. AAMA 501.5-2005: Test Method for Thermal Cycling of Exterior Walls
5. AAMA 506-2000 (Revised 2003): Voluntary Specifications for Hurricane Impact and Cycle Testing of Fenestration Products
6. AAMA 1503-1998: Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
7. AAMA 2603-2002 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
8. AAMA 2604-2005 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
9. AAMA 2605-2005 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):

1. Fire safety related:

- a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
- 2. Material related
 - a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.
 - b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.
- 3. Exterior related
 - a. ASTM E 283-04: Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen
 - b. ASTM E 330-02: Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference Procedure A
 - c. ASTM E 331-04: Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 - d. ASTM E 783-02: Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors
 - e. ASTM E 1105-00: Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
- 4. Hurricane related
 - a. ASTM E 1886-05: Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
 - b. ASTM E 1996-05: Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
- 5. Sound related:
 - a. ASTM E 90-04: Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - b. ASTM E 413-04: Standard Classification for Rating Sound Insulation
- C. American Welding Society (AWS)
 - 1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007
- D. Builders Hardware Manufacturers Association, Inc.
 - 1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).
- E. Canadian Standards
 - 1. CAN/ULC-S101 Standard Test of Fire Endurance Tests of Building Construction and Materials
 - 2. CAN/ULC-S104 Standard Method of Fire Tests of Door Assemblies
 - 3. CAN/ULC-S106 Standard Method of Fire Tests of Window and Glass Block Assemblies
- F. National Fire Protection Association (NFPA):
 - 1. NFPA 80: Fire Doors and Windows.
 - 2. NFPA 251: Fire Tests of Building Construction & Materials
 - 3. NFPA 252: Fire Tests of Door Assemblies
 - 4. NFPA 257: Fire Test of Window Assemblies
- G. Underwriters Laboratories, Inc. (UL):
 - 1. UL 9: Fire Tests of Window Assemblies

2. UL 10 B: Fire Tests of Door Assemblies
3. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
4. UL 263: Fire tests of Building Construction and Materials
5. UL-752: Ratings of Bullet-Resistant Materials

- H. American National Standards Institute (ANSI):
 1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings
- I. Consumer Product Safety Commission (CPSC):
 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials
- J. American Society of Civil Engineers (ASCE)
 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; 2005

1.3 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.4 SUBMITTALS

- A. Submit in accordance with Section **<Insert Section #>**.
- B. Product Data:
 1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.
- C. Shop Drawings:
 1. Include plans, elevations and details of product showing component dimensions; framed opening requirements, dimensions, tolerances, and attachment to structure.
- D. Sustainable Requirements:
 1. Living Building Challenge Compliance: Compliant
 - 1) I-13 Red List Declaration
- E. Structural Calculations (optional):
 1. Provide structural calculations sealed by a licensed professional engineer in the State in which the project is located; prepared in compliance with referenced documents and these specifications.
- F. Samples (optional). For following products:
 1. Glass sample-as provided by manufacturer
 2. Sample of frame
 3. Verification of sample of selected finish
- G. 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.
- H. Warranties: Submit manufacturer's warranty.

- I. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
 - 1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualifications according to
 - 1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
 - 2. International Accreditation Service for Testing Body-Building Materials and Systems
 - a. Fire Testing
 - 1) ASTM Standard E119
 - 2) CPSC Standard 16 CFR 1201
 - 3) NFPA Standards 251, 252, 257
 - 4) UL Standards 9, 10B, 10C, 1784, UL Subject 63
 - 5) BS 476; Part 22: 1987
 - 6) EN 1634-1
 - 7) CAN/ULC Standards S101, S104, S106
- B. Environmental Qualifications
 - 1. Living Building Challenge Compliant and Red List Approved
 - a. Declare label (#AGN-0010)
 - b. <https://declare.living-future.org/products/technical-glass-products-fireframes-curtainwall-series> and can be used for building projects seeking to achieve either the Living Building Challenge or LEED green building rating systems.
- C. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- D. 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.
- E. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- F. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.
- G. Fire-Rated Wall Assemblies: Assemblies complying with ASTM E119 that are classified and labeled by UL, for fire ratings indicated, based on testing in accordance with UL 263, ASTM E119.

- H. Listing and Labels – Fire-Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle under provisions specified by manufacturer.

1.7 PROJECT CONDITIONS

- A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner, coordinate planned measurements with the work of other sections.
 - 1. Note whether field or planned dimensions were used in the creation of the shop drawings
- B. Coordinate the work of this sections with others effected including but not limited to: other interior and /or exterior envelope components and door hardware beyond that provided by this section.

1.8 WARRANTY

- A. Provide the Pilkington Pyrostop® and the Fireframes® Curtainwall Series standard five-year manufacturer warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (ACCEPTABLE MANUFACTURERS/PRODUCTS)

- A. Manufacturer Glazing Material: "Pilkington Pyrostop®" fire-rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com, web site <http://www.fireglass.com>.
- B. Frame System: Fireframes® Curtainwall Series fire-rated steel frame system as supplied by Technical Glass Products 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com web site <http://www.fireglass.com>.
- C. Substitutions: Substitutions for Glazing Material and Frame System not permitted.

2.2 PERFORMANCE REQUIREMENTS

- A. System Description:
 - 1. Steel fire-rated glazed curtain wall system, outside glazed pressure plate, cover cap format.
 - 2. Face Widths Available:
 - a. 1 3/4-inch.
 - b. 2 3/8-inch wide.
 - 3. Water Drainage:
 - 4. System is vertically weeped. No joint plugs or weep holes at horizontal mullions. Horizontal gaskets are notched and received by vertical gaskets.

B. Structural Performance

1. Design and size the system to withstand structural forces placed upon it without damage or permanent set when tested in accordance with ASTM E330 using load 1.5 times the design wind loads and of 10 seconds in duration.
 2. Positive wind load: [_____] lbf/sq ft. [as indicated on the drawings]
 3. Negative wind Load: [_____] lbf/sq ft. [as indicated on the drawings]
 4. Member deflection: Limit deflection of the edge of the glass normal to the plane of the glass to [flexure limit of glass] [1/175 of the glass edge length or 3/4 inch, whichever is less] [of any framing member]
 5. Accommodate movement between storefront and adjoining systems
- C. Air Infiltration: ASTM E 283; Air infiltration rate shall not exceed 0.06 cfm/ft² at a static air pressure differential of 6.24 psf.
- D. Water Resistance, (static): ASTM E 331; No leakage at a static air pressure differential of 15 psf as defined in AAMA 501.
- E. Water Resistance, (dynamic): AAMA 501.1; No leakage at an air pressure differential of 15 psf as defined in AAMA 501.
- F. Thermal Movements: Provide steel fire-rated glazed curtain-wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 MATERIALS - GLASS

- A. Low-E Coated glass for use in insulated exterior units See Section 08 80 00. See chart below for Low-E configurations.
- B. Use the paragraph above to specify the low-e coated glass in Section 08 80 00 and use the paragraph below to select glass available from Technical Glass Products. Other manufacturer's glass will need to be shipped to Technical Glass Products for incorporation into insulated unit.
- C. Not all Low-E coated glass by all manufacturers is available for assembly by others into insulated units. Consult with low-e glass manufacturer about availability of their low-e product for shipment to Technical Glass Products for inclusion into insulated units.
- D. Fire Rated Glazing: Composed of multiple sheets of Pilkington "Optiwhite™" high visible light transmission glass laminated with an intumescent interlayer.
- E. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
- F. Adjust list of thicknesses below to suit Project -- these are listed in tabular form delete those columns not used.

G. Properties Interior Glazing

Property				
Fire Rating	45 minute	60 minute		120 minute
Manufacturer's designation	45-200	60-101	60-201	120-104
Glazing type	single	single	single	IGU
Nominal Thickness	3/4" (19mm)	7/8" (23mm)	1-1/16" (27mm)	2-1/8 (54mm) [with 8 mm spacer, or 2-3/8" (60 mm) with 14 mm spacer]
Weight in lbs/sf	9.2	10.85	12.5	21.7
Daylight Transmission	86%	87%	86%	75%
Sound Transmission Coefficient	40dB	41dB	44dB	46dB

H. Properties Exterior Glazing

Property	45 minute		60 minute		120 minute
Manufacturer's designation	45-200	45-260 45-360	60-201	60-261 60-361*	120-262 120-362*
Glazing type	single	IGU	single	IGU	IGU
Nominal Thickness	3/4" (19mm)	1-5/16" (33mm)	1-1/16" (27mm)	1-5/8" (41mm)	2-3/8" (60mm) [with 14 mm spacer, or 2-1/8" (54 mm) with 8 mm spacer]
Weight in lbs/sf	9.2	12.5	12.5	15.8	22.1
Daylight Transmission	86	77	86%	77%	74%
		59-71		59-70%	33-68%
Sound Transmission Coefficient	40dB	40dB	44dB	44dB	46dB

* Low-E product.

- I. Exterior Grade: PVB inner layer installed toward exterior.
- J. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.
- K. Glazing Accessories: Manufacturer's standard compression gaskets, spacers, setting blocks and other accessories necessary for a complete installation.

2.4 MATERIALS –STEEL FRAMING

- A. Steel Curtainwall Framing System 45 min., 60 min., 120 min
 - 1. Frame: Steel: profiled steel tubing permanently joined with steel bolts.

2. Insulation: Insulate framing system against effects of fire, smoke, and heat transfer from either side. Firmly pack perimeter of framing system to rough opening with mineral wool fire stop insulation or appropriately rated intumescent sealant
3. Fasteners: Type recommended by manufacturer
4. Glazing Gaskets, Compounds and tapes: Glaze Pilkington Pyrostop glass with approved EPDM glazing gaskets and pure silicone sealant.
5. Steel Pressure Plates: Formed stainless steel pressure plate with dimensions recommended by manufacturer to securely hold glazing material in place.
6. Cover Caps: Formed extruded aluminum.

- B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
- C. 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 Standard Specification for Carbon Structural Steel
 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
- D. Brackets and Reinforcements: Manufacturer's standard high-strength materials with nonstaining, nonferrous shims for aligning system components.
- E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 2. Reinforce members as required to receive fastener threads.
- F. 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.
- G. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

2.5 ACCESSORIES

- A. Exposed Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.
- B. Glazing Gaskets:

1. Glazing gaskets for interior or exterior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).
- C. Intumescent Tape: As supplied by frame manufacturer.
- D. Setting Blocks: 1/4" Calcium silicate.
- E. Perimeter Anchors: Steel or 316 Stainless steel when exposed.
- F. Flashings: As recommended by manufacturer; same material and finish as cover caps.
- G. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
 1. Available Products:
 - a. Dow Corning 790, 795 - Dow Corning Corp.
 - b. Mumentive
 - c. Tremco
- H. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.
 1. Available Products:
 - a. 3M CP-25 WP+.

2.6 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

- A. Available Manufacturers:
 1. Fibrex Insulations Inc.
 2. Owens Corning
 3. Thermafiber
 4. Rockwool
- B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:
 1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
 2. Fiber Color: Regular color, unless otherwise indicated.

2.7 FABRICATION

- A. General:
 1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly yet enabling installation and dynamic movement of perimeter seal.

2. Accurately fit and secure joints and corners. Make joints flush and weatherproof.
3. Prepare components to receive anchor devices.
4. Provide physical and thermal isolation of glazing from framing members.
5. Provide internal guttering to drain water from joints and condensation occurring within glazing pocket.
6. Fabricate anchors.
7. Arrange fasteners and attachments to be concealed from view.

B. Guttered System Components:

1. Fabricate components to resist water penetration as follows:
 - a. Internal guttering system or other means to drain water passing joints, occurring within framing members, and moisture migrating within glazed steel curtain walls.
 - b. Pressure-equalized system, double barrier, or two lines of air and water resistance design with primary air and water barrier at interior side of glazing pocket.

2.8 POWDER COAT FINISHES

- A. Finish after fabrication.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.
- C. Interior and Exterior Steel Finishes (Note: this finish is suitable for exterior exposed portions of the wall systems, including extruded aluminum covers).
 1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
 2. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range].
 3. Acceptable Manufacturers:
 - a. Tiger Drylac
 - b. Additional manufacturers as approved by TGP

2.9 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 1. Color and Gloss: **Match Architect's sample: Section 07 42 13.16 Aluminum Metal Plate Wall Panel, Part 2.5B. Musket Gray and SW7622.**

C. EXECUTION

2.10 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer's acceptable tolerances.
- B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.
- C. Do not proceed until such conditions are corrected.

2.11 INSTALLATION

- A. See Fireframes Curtainwall Series Installation Manual

2.12 PROTECTION AND CLEANING

- A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from the glass. Do not apply markers to the glass surface. Remove nonpermanent labels, and clean surfaces.
 - 1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
 - 2. Do not use any of the following:
 - a. Steam jets
 - b. Abrasives
 - c. Strong acidic or alkaline detergents, or surface-reactive agents
 - d. Detergents not recommended in writing by the manufacturer
 - e. Do not use any detergent above 77 degrees F
 - f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
 - g. Metal or hard parts of cleaning equipment must not touch the glass surface
- 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. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08 44 18

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for door hardware specified in other Sections.
 - 3. Electrified door hardware.
- B. Related Sections:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames" for astragals provided as part of labeled fire-rated assemblies and for door silencers provided as part of hollow-metal frames.
 - 2. Section 08 14 16 "Flush Wood Doors" for astragals and integral intumescent seals provided as part of labeled fire-rated assemblies.
 - 3. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for installation of entrance door hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Wiring Diagrams: For power, signal, and control wiring and including the following:
 - a. Details of interface of electrified door hardware and building safety and security systems.
 - b. Schematic diagram of systems that interface with electrified door hardware.
 - c. Point-to-point wiring.
 - d. Risers.
 - e. Elevations doors controlled by electrified door hardware.
 - 2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware

- schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
- b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
 - c. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - d. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - 5) Fastenings and other pertinent information.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) List of related door devices specified in other Sections for each door and frame.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For electrified door hardware, from the manufacturer.
 - 1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- B. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- C. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
 1. For door hardware, an Architectural Hardware Consultant (AHC).
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer.
 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- G. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- H. Accessibility Requirements: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and Illinois Accessibility Code (IAC) for door hardware on doors in an accessible route.
 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Closers: Adjust door and gate closer sweep periods so that, from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.
- I. Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Requirements for access control.
5. Address for delivery of keys.

- J. Preinstallation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 4. Review sequence of operation for each type of electrified door hardware.
 5. Review required testing, inspecting, and certifying procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.8 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:

- a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Period: Manufacturers standard warranty period.

1.10 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. Stanley Commercial Hardware; Div. of The Stanley Works.

2.3 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

- B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. Select Products Limited.

2.4 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
- C. Lock Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: As indicated in hardware sets.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
- F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
 - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

2.5 ELECTROMECHANICAL LOCKS

- A. Electromechanical Locks: BHMA A156.25; Grade 1; motor or solenoid driven; mortise latchbolt; with strike that suits frame.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
 - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

2.6 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

- A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Door Controls International, Inc.
 - b. Rockwood Manufacturing Company.
 - c. Trimco.

2.7 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - b. DORMA Architectural Hardware; Member of The DORMA Group North America.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

2.8 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Manufacturer: Same manufacturer as for locking devices.

2.9 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
- B. Keys: Nickel silver or Brass.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: Information to be furnished by Owner.
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.

2.10 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel, unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. Rockwood Manufacturing Company.
 - c. Trimco.

2.11 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Astragals: BHMA A156.22.

2.12 INTEGRATED WIEGAND OUTPUT EXIT DEVICES – MULTI-CLASS READER

- A. Integrated Wiegand Output Multi-Class Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated proximity card reader, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
 2. Integrated reader supports the following credentials:
 - a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
 - b. 13.56 MHz proximity credentials: HID iClass, HID iClass SE, SE for MIFARE Classic, DESFire EV1.
 3. 12VDC external power supply required for reader. 24VDC required for solenoid operated exit trim. Fail safe or fail secure options.
 4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
 5. Competitor Alternates Allowed Option>Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.
 - a. Acceptable Manufacturers:
 - 1) Sargent Manufacturing (SA) – M1 80 Series.
 - 2) Schlage (SC) – AD300 Series w/ APTIQ Readers.

2.13 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - b. Norton Door Controls; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

2.14 AUTOMAITC OPERATORS

- A. Automatic Operators: BHMA A156.19.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Besam.
 - b. Horton.
 - c. Norton Door Controls; an ASSA ABLOY Group company.

2.15 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass base metal.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. Rockwood Manufacturing Company.
 - c. Trimco.

2.16 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Rixson.
 - b. Rockwood Manufacturing Company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

2.17 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - d. Reese Enterprises, Inc.

2.18 ELECTROMAGNETIC DOOR HOLDERS

- A. Manufacturers:
 1. Architectural Builders Hardware (ABH), Inc.; 2000 Series: <https://www.abhmfg.com/>
 2. LCN, an Allegion brand; SEM7800 Series and SHE: www.allegion.com/us/#sle.
 3. Rixson; an Assa Abloy Group company; 900 Series: www.assaabloydss.com/#sle.
 4. Sargent; an Assa Abloy Group company; 1500 Series: www.assaabloydss.com/#sle.
- B. Electromagnetic Door Holders: Comply with BHMA A156.15.
 1. Type: Wall mounted, single unit, standard duty, with strike plate attached to door.
 2. Holding Force, Standard Duty: 40 lbs.-force, minimum.
 3. Door Armature: Cast aluminum furnished with through-bolted and sex nuts with the projection required for wall and door conditions. Armatures requiring rod or tube extensions are not acceptable. Where required to make contact, provide shims of the same material and shape as the armature base.
 4. Voltage: As required under Division 26 and provide power supplies by same manufacturer as holders.
 5. Electric boxes, conduit and wiring to be provided under Division 26.
 6. Provide interface with fire detectors and fire-alarm system for fire-rated door assemblies.

2.18 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - d. Reese Enterprises, Inc.

2.19 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hiawatha, Inc.
 - b. Rockwood Manufacturing Company.
 - c. Trimco.

2.20 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. Rockwood Manufacturing Company.
 - c. Stanley Commercial Hardware; Div. of The Stanley Works.

2.21 AUXILIARY ELECTRIFIED DOOR HARDWARE

- A. Auxiliary Electrified Door Hardware:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McKinney Products Company; an ASSA ABLOY Group company.
 - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - c. Securitron Magnalock Corporation; an ASSA ABLOY Group company.

2.22 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where

bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.23 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
 - 1. Configuration: Provide one power supply for each door opening with electrified door hardware.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Section 017900 "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

HARDWARE SET 1

3	EA	HINGES	TA2714 4.5 X 4.5	652	MCK
1	EA	CLASSROOM	DG1 8237 E2MI	626	SAR
1	EA	WALL STOP	400	626	ROC
1	EA	DOOR POSITION SWITCH	DPS-M	BLK	SEC
1	EA	EXIT ALARM	EA-708	626	SDC
1	EA	CYLINDER	AS REQUIRED	626	SAR
1	EA	POWER SUPPLY	AQD1	600	SEC

HARDWARE SET 2

3	EA	HINGES	TA2714 4.5 X 4.5	652	MCK
1	EA	STOREROOM	DG1 86 8204 E2MI	626	SAR
1	EA	CLOSER	CPS7500	689	NOR
1	EA	KICK PLATE	8" X 2" LDW B4E CSK	630	ROC

HARDWARE SET 3

3	EA	HINGES	T4A3786 4.5 X 4.5	652	MCK
1	EA	PUSH PLATE	70F 8" X 16"	630	ROC
1	EA	PULL	RM3020-12	630	ROC
1	EA	CLOSER	7500	689	NOR
1	EA	MOP PLATE	4" X 1" LDW B4E CSK	630	ROC
1	EA	KICK PLATE	8" X 2" LDW B4E CSK	630	ROC
1	EA	WALL STOP	400	626	ROC

HARDWARE SET 4

6	EA	HINGES	TA2714 4.5 X 4.5	652	MCK
1	EA	AUTO FLUSH BOLT	2960	626	ROC
1	EA	PASSAGE	8215 E2MI	626	SAR
1	EA	COORDINATOR	2600	628	ROC
2	EA	MOUNTING BRACKET	2601	628	ROC
2	EA	CLOSER	CPS7500T	689	NOR
2	EA	ARMOR PLATE	34" X 2" LDW B4E CSK	630	ROC

HARDWARE SET 5

3	EA	HINGES	TA2714 4.5 X 4.5	652	MCK
1	EA	PASSAGE	8215 E2MI	626	SAR
1	EA	CLOSER	CPS7500T	689	NOR
1	EA	KICK PLATE	8" X 2" LDW B4E CSK	630	ROC

HARDWARE SET 6

2	EA	HINGES	T4A3386 NRP 4.5 X 4.5	630	MCK
1	EA	ELECTRIC HINGE	T4A3386 QC12 4.5 X 4.5	630	MCK
1	EA	STOREROOM	DG3 LX RX 8204 E2MI	626	SAR
1	EA	OVERHEAD STOP	1 SERIES	630	RIX
1	EA	CLOSER	7500	689	NOR
1	EA	THRESHOLD	271A	628	PEM
1	EA	SWEEP	315CN	628	PEM
1	SET	WEATHERSTRIPPING	BY FRAME MANUFACTURER		
1	EA	DRIP CAP	346C	628	PEM
1	EA	DOOR HARNESS	QC-C0XX		MCK
1	EA	FRAME HARNESS	QC-C1500P		MCK
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

HARDWARE SET 7

7	EA	HINGES	T4A3386 NRP 4.5 X 4.5	630	MCK
1	EA	ELECTRIC HINGE	T4A3386 QC12 4.5 X 4.5	630	MCK
1	PR	AUTO FLUSH BOLTS	2842	630	ROC
1	EA	DUST PROOF STRIKE	570	630	ROC
1	EA	STOREROOM	DG3 LX RX 86 8204 E2MI	626	SAR
1	EA	COORDINATOR	2600	628	ROC
2	EA	MOUNTING BRACKET	2601	628	ROC
2	EA	CLOSER	CPS7500T	689	NOR
2	EA	ARMOR PLATE	34" X 2" LDW B4E CSK	630	ROC
1	EA	THRESHOLD	271A	628	PEM
2	EA	SWEEP	315CN	628	PEM
1	SET	WEATHERSTRIPPING	BY FRAME MANUFACTURER		
1	EA	DRIP CAP	346C	628	PEM
1	EA	DOOR HARNESS	QC-C0XX		MCK
1	EA	FRAME HARNESS	QC-C1500P		MCK
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

HARDWARE SET 8

2	EA	PULLS	RM3401-48	629	ROC
		FIRE EXIT HARDWARE BY MANUFACTURER			
2	EA	FIRE/LIFE WALL MAG	SEM7800 SERIES AS REQUIRED	689	LCN
		REMAINING HARDWARE PROVIDED BY INTEGRATED DOOR MANUFACTURER			

HARDWARE SET 9

3	EA	HINGES	T4A3786 4.5 X 4.5	652	MCK
1	EA	EXIT DEVICE	43 8815 ETMI	630	SAR
1	EA	CLOSER	7500	689	NOR
1	EA	KICK PLATE	8" X 2" LDW B4E CSK	630	ROC
1	EA	WALL STOP	400	626	ROC

HARDWARE SET 10

1	EA	CONTINUOUS HINGE	MCK-12HD QC-12	628	MCK
1	EA	EXIT DEVICE	DG3 16 43 53 55 8804	630	SAR
1	EA	PULL	RM3050-12	630	ROC
1	EA	OVERHEAD STOP	1 SERIES	630	RIX
1	EA	CLOSER	J7500	689	NOR
1	EA	THRESHOLD	271A	628	PEM
1	EA	SWEEP	315CN	628	PEM
1	SET	WEATHERSTRIPPING	BY FRAME MANUFACTURER		
1	EA	DOOR HARNESS	QC-C0XX		MCK
1	EA	FRAME HARNESS	QC-C1500P		MCK
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

HARDWARE SET 11

2	EA	CONTINUOUS HINGE	MCK-12HD QC-12	628	MCK
1	EA	EXIT DEVICE	DG3 16 43 53 55 AD8610	630	SAR
1	EA	EXIT DEVICE	DG3 16 43 53 55 AD8610 X 106	630	SAR
2	EA	PULL	RM3411-48	629	ROC
2	EA	OVERHEAD STOP	1 SERIES	630	RIX
2	EA	CLOSER	J7500	689	NOR
1	EA	THRESHOLD	271A	628	PEM
2	EA	SWEEP	315CN	628	PEM
1	SET	WEATHERSTRIPPING	BY FRAME MANUFACTURER		
2	EA	DOOR HARNESS	QC-C0XX		MCK
2	EA	FRAME HARNESS	QC-C1500P		MCK
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

HARDWARE SET 12

2	EA	CONTINUOUS HINGE	MCK-12HD QC-12	628	MCK
1	EA	EXIT DEVICE	DG3 43 53 55 56 AD8610	630	SAR
1	EA	EXIT DEVICE	DG3 43 53 55 56 AD8610 X 106	630	SAR
2	EA	PULL	RM3411-48	629	ROC
2	EA	OVERHEAD STOP	6 SERIES	630	RIX
1	EA	CLOSER	J7500	689	NOR
1	EA	AUTOMATIC OPERATOR	6060	689	NOR
1	EA	ACTUATOR	10PBS1	630	BEA
1	EA	ACTUATOR	10PBDGP1	630	BEA
2	EA	BOLLARD	10BOLLARDSLV	SLV	BEA
1	EA	MODULE	10BR3		BEA
1	EA	THRESHOLD	271A	628	PEM
2	EA	SWEEP	315CN	628	PEM
1	SET	WEATHERSTRIPPING	BY FRAME MANUFACTURER		
1	EA	POWER SUPPLY	BPS-12/24-1	600	SEC
2	EA	DOOR HARNESS	QC-C0XX		MCK
2	EA	FRAME HARNESS	QC-C1500P		MCK
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	CARD READER	BY SECURITY CONTRACTOR		

HARDWARE SET 13

2	EA	CONTINUOUS HINGE	MCK-12HD	628	MCK
2	EA	DUMMY PUSH BAR	43 8893	630	SAR
2	EA	PULL	RM3411-48	629	ROC
2	EA	OVERHEAD STOP	6 SERIES	630	RIX
1	EA	CLOSER	J7500	689	NOR
1	EA	AUTOMATIC OPERATOR	6060	689	NOR
1	EA	ACTUATOR	10PBJ1	630	BEA

HARDWARE SET 14

2	EA	CONTINUOUS HINGE	MCK-12HD	628	MCK
1	EA	ROLLER LATCH	590	626	ROC
2	EA	FLUSH PULL	1066S	626	TRI
1	EA	WALL STOP	400	626	ROC

Malcolm X College – West Side Learning Center
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HARDWARE SET 15

5	EA	HINGES	TA2714 NRP 4.5 X 4.5	652	MCK
1	EA	ELECTRIC HINGE	TA2714 QC12 4.5 X 4.5	652	MCK
1	EA	MANUAL FLUSH BOLT	555	626	ROC
1	EA	ACCESS CONTROL LOCK	DG1 M1-82281-IPS E2MI	626	SAR
1	EA	CLOSER	7500 H	689	NOR
1	EA	KICK PLATE	8" X 2" LDW B4E CSK	630	ROC
2	EA	WALL STOP	400	626	ROC
1	EA	DOOR HARNESS	QC-C0XX		MCK
1	EA	FRAME HARNESS	QC-C1500P		MCK

HARDWARE SET 16

2	EA	HINGES	TA2714 NRP 4.5 X 4.5	652	MCK
1	EA	ELECTRIC HINGE	TA2714 QC12 4.5 X 4.5	652	MCK
1	EA	ACCESS CONTROL LOCK	DG1 M1-82281-IPS E2MI	626	SAR
1	EA	OVERHEAD HOLDER	9 SERIES	630	NOR
1	EA	CLOSER	7500	689	NOR
1	EA	KICK PLATE	8" X 2" LDW B4E CSK	630	ROC
1	EA	DOOR HARNESS	QC-C0XX		MCK
1	EA	FRAME HARNESS	QC-C1500P		MCK

Hardware Set 17

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY HEIGHT AS REQ	628	IVE
2	EA	FIRE EXIT HARDWARE	9827-L-F-LBR-17-499F LENGTH AS REQ	630	VON
2	EA	CYLINDERS	AS REQUIRED	626	YAL
2	EA	SURFACE CLOSER	4040XP EDA X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	KICK PLATE	8400 15" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7800 SERIES AS REQUIRED	689	LCN
2	EA	MEETING STILE	328AA (2 PCS - 1 SET) HEIGHT AS REQUIRED	AA	ZER
1	EA	GASKETING	188S H & J	BK	ZER
1	EA	POWER SUPPLY	AQD1	600	SEC

END OF SECTION 08 71 00

08 71 00.1 – DOOR HARDWARE SET LIST

<u>DOOR NUMBER</u>	<u>HARDWARE SET</u>
101A	1
101B	2
101C	10
121A	12
121B	13
122A	12
122B	13
136A	11
136B	11
139	3
140	3
141	4
142A	5
142B	6
143	8
144	7
ST1B	9
101D	17
002LL	2
136C	No Hardware set
136D	11

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for glazed curtain walls.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 08 44 13 "Glazed Aluminum Curtain Walls" for glazing sealants used in structural-sealant-glazed curtain walls.
 - 2. Section 08 11 13 "Hollow Metal Doors and Frames"
 - 3. Section 07 92 00 Joint Sealants

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Malcolm X West Side Learning Center, 4624 W. Madison Avenue, Chicago, IL 60644.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of the following products; 12 inches square.
 - 1. Insulating glass.
- C. Glazing Accessory Samples: For sealants, in 12-inch lengths. Install sealant samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturers of insulating-glass units with low-E coatings, glass testing agency, and sealant testing agency.
- B. Product Certificates: For glass.
- C. Product Test Reports: For insulating glass and glazing sealants, for tests performed by a qualified testing agency
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in Section 084413 "Glazed Aluminum Curtain Walls" to match glazing systems required for Project, including glazing methods.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 1. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 2. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.12 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure

of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers and Fabricators: Specifications herein are based on glass and materials manufactured or fabricated by the following companies. Not all firms listed manufacture or fabricate all the items specified herein. However, to ensure consistent quality of appearance and performance, provide each type or kind of glass or material from a single source. Manufacturers for specialty products are listed within the specification to establish a particular type, color, pattern, etc.
 1. Manufacturers
 - a. AGC FLOAT GLASS NORTH AMERICA
 - b. PPG
 - c. GUARDIAN INDUSTRIES
 - d. PILKINGTON NORTH AMERICA
 2. Fabricators
 - a. VIRACON
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 2. Design Snow Loads: As indicated on Drawings.
 3. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 4. Maximum Lateral Deflection: As indicated on Drawings.
 5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with basic-protection testing requirements in ASTM E 1996 for Wind Zone 4 when tested according to ASTM E 1886. Test specimens

shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located more than 30 feet above grade.

- E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- F. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Glazing Manual."
 2. AAMA Publications: AAMA GD5G-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: As indicated on drawings.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- B. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with one of the following to comply with interlayer manufacturer's written instructions:
 - 1. Polyvinyl butyral interlayer.
 - 2. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
 - 3. Ionomeric polymer interlayer.
 - 4. Cast-in-place and cured-transparent-resin interlayer.
 - 5. Cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film.

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
 - 2. Spacer: Aluminum with black, color anodic finish.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they 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. Field-applied sealants shall have a VOC content of not more than 250 g/L.
 4. Sealants shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Colors of Exposed Glazing Sealants: Match Architect's samples
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Manufacturers:
 - a. DOW CORNING
 - b. GE
 - c. TREMCO
 2. Applications: where one or more porous bond surfaces are contacted.
- C. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Manufacturers:
 - a. BOSTIK CONSTRUCTION PRODUCTS
 - b. DOW CORNING
 - c. GE
 - d. PECORA
 - e. TREMCO
 2. Applications: where only non-porous bond surfaces are contacted.
- D. Weather Seal: High Performance, neutral, one part, natural-curing, silicon sealant, joint movement +/- 50, complying with ASTM C1184 and ASTM C 920, Type S, Grades NS, Class 50, Use NT, G,A and O
1. Manufacturers:
 - a. DOW Silicones Corporation, DOWSIL 795 Silicone Building Sealant
 - b. GE Silicones, SCS 9000 SilPruf
- E. 4 sided structural seal (SSG): High Performance, neutral, one part, natural-curing, silicon sealant, joint movement +/- 50, complying with ASTM C1184 and ASTM C 920, Type S, Grades NS, Class 50, Use NT, G,A and O
1. Manufacturers:
 - a. DOW Silicones Corporation, DOWSIL 795 Silicone Building Sealant
 - b. GE Silicones, SCS 9000 SilPruf

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: 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. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 INSULATING GLASS SCHEDULE

- A. Glass Type IG-1: Low-E-coated, clear insulating glass.
 - 1. Basis-of-Design Product: Viracon VRE1-54
 - 2. Overall Unit Thickness: 1 inch
 - 3. Minimum Thickness of Each Glass Lite: 1/4 inch
 - 4. Outdoor Lite: Fully tempered float glass.
 - 5. Interspace Content: Air.
 - 6. Indoor Lite: Fully tempered float glass.
 - 7. Low-E Coating: Pyrolytic on second surface.
 - 8. Winter Nighttime U-Factor: 0.30 maximum.
 - 9. Summer Daytime U-Factor: 0.27 maximum.
 - 10. Visible Light Transmittance: 47 percent minimum.
 - 11. Solar Heat Gain Coefficient: 0.31 maximum.
 - 12. Safety glazing required.

END OF SECTION 08 80 00

SECTION 08 83 00 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. Annealed monolithic glass mirrors.
 - 2. Tempered monolithic glass mirrors.
- B. Related Requirements:
 - 1. Section 088000 "Glazing" for glass with reflective coatings used for vision and spandrel lites.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Mirror Trim: 12 inches long.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of mirror and mirror mastic signed by product manufacturer.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For mirrors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

- 1. Warranty Period: Five years from date of final acceptance of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide mirrors by one of the following:
 - 1. ARCH ALUMINUM & GLASS CO, INC.
 - 2. GARDNER GLASS PRODUCTS
 - 3. GUARDIAN INDUSTRIES CORP.
 - 4. LENOIR MIRROR COMPANY
 - 5. VIRGINIA MIRROR COMPANY, INC.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503 manufactured using copper-free, low-lead mirror coating process.
- B. Annealed Monolithic Glass Mirrors: Mirror Glazing Quality, clear.
 - 1. Nominal Thickness: $\frac{1}{4}$ ".

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 1. Adhesive shall have a VOC content of 70 g/L or less.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Gunther Mirror Mastics
 - b. Palmer Products Corporation

2.4 MIRROR HARDWARE

- A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
 - 1. Bottom: J-channels formed with front leg and back leg not less than $\frac{3}{8}$ and $\frac{7}{8}$ inch in height, respectively, and a thickness of not less than 0.04 inch.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) EPCO Model 2010.
 - 2) C.R. LAURENCE Standard J-Channel
 - 3) SOMMER and MACA INDUSTRIES Aluminum Shallow Nose "J" Molding Lower Bar.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than $\frac{5}{8}$ and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) EPCO Model 2010.
 - 2) C.R. LAURENCE Standard J-Channel
 - 3) SOMMER and MACA INDUSTRIES Aluminum Shallow Nose "J" Moulding Lower Bar.
 - 3. Finish: Clear anodized.

2.5 FABRICATION

- A. Fabricate mirrors in the shop. To suit project conditions, and before tempering, cut mirrors to final sizes and shapes. See drawings for sizes. At wall to wall conditions, field verify dimensions prior to fabricating mirrors.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Polish all edges
 - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.

- a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
- b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
- c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 08 83 00

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Shaft wall framing.
- C. Framing accessories.

1.02 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014, with Editorial Revision (2015).
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.
- E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.
- F. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, limitations, and deflection criteria.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.04 MOCK-UP

- A. Provide mock-up of stud wall, ceiling, and soffit framing as part of plastering section mockups and finish specified in other sections. Coordinate with installation of associated work specified in other sections.

PART 2 - PRODUCTS

2.01 FRAMING MATERIALS

- A. Non-Loadbearing Framing System Components: ASTM C645 and as follows: .

1. Studs: "C" shaped with flat or formed webs with knurled face, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return); galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and the following for minimum thickness of base (uncoated) metal, with width and limiting heights. Limiting heights are based on using 16" o.c. stud spacing with 1/2" thick Gypsum board panels and 5 psf load perpendicular to partition or furring with an allowable deflection of L/360.
 - a. Minimum thickness of base metal: (0.0179") 25 gauge.
 - b. Stud Width: 2 1/2" = Limiting Height: 9'-10"
 - c. Stud Width: 3 5/8" = Limiting Height: 12'-4"
 - d. Stud Width: 4" = Limiting Height: 13'-4"
 - e. Stud Width: 6" = Limiting Height: 17'-11"
 - f. Provide 20 gauge studs where indicated. Limiting heights per ASTM C754.
 2. Runners: U shaped, sized to match studs.
 3. Channels: Cold-rolled steel, 0.0598 inch minimum thickness of base (uncoated) metal and 7/16 inch wide flanges, and as follows:
 - a. Carrying Channels: 1-1/2 inches deep, 475 lb./1000 feet, unless otherwise indicated.
 - b. Furring: Hat-shaped sections, minimum depth of 3/4 inch, 300 lb./1000 feet.
 4. Stiffeners: 3/4" cold-rolled steel channels at 0.3 lb. Per ft., rust-inhibitive paint finish
 5. Furring:
 - a. Hat-shaped sections, minimum depth of 3/4 inch, 300 lb./1000 feet.
 - b. Rolled Steel Channels: Hot or cold rolled type with a minimum weight per thousand lin. ft. of not less than the following: 300 lbs. for 3/4" size; 410 lbs. for 1" hot rolled; 475 lbs. for 1-1/2" cold rolled; 1120 lbs. for 1-1/2" hot rolled; 590 lbs. for 2" cold rolled and 1260 lbs. for 2" hot rolled size.
 - c. Pencil Rods: Hot rolled steel of circular cross section, not less than 3/8" diameter when used for support of lath, not less than 3/16" diameter when used as hangers.
- B. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
1. Products:
 - a. Same manufacturer as other framing materials.
- C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.
 3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
 4. Deflection and Firestop Track:
 - a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.
 - b. Products:
 - 1) FireTrak Corporation; Posi Klip.
 - 2) Metal-Lite, Inc; The System.
 5. Deflection and Firestop Track:

- a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.
- b. Products:
 - 1) FireTrak Corporation; Posi Klip.
 - 2) Metal-Lite, Inc; The System.
- 6. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.

E. Fasteners: ASTM C1002 self-piercing tapping screws.

F. Sheet Metal Backing: 0.036 inch thick, galvanized.

G. Anchorage Devices: Powder actuated.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.02 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.
- C. Proceed only after unsatisfactory conditions have been corrected. Commencement of work in this section will be an indication of the acceptance of substrate conditions and the Contractor will be held responsible for the satisfactory execution and results of the finished work.

3.02 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- E. Align and secure top and bottom runners at 24 inches on center.

- F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- G. Install studs vertically at spacing indicated on drawings.
- H. Align stud web openings horizontally.
- I. Secure studs to tracks using crimping method. Do not weld.
- J. Stud splicing is not permissible.
- K. Fabricate corners using a minimum of three studs.
- L. Double stud at wall openings, door, and window jambs, not more than 2 inches from each side of openings.
- M. Coordinate erection of studs with requirements of door frames; install supports and attachments.
- N. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

3.03 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.
- I. Laterally brace suspension system.

3.04 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.

END OF SECTION 09 22 16

SECTION 09 29 00 – GYPSUM BOARD

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Specified Elsewhere:
 - 1. Section 09 30 13 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.2. SUMMARY

- A. Section Includes:
 - 1. Gypsum drywall (gypsum wallboard) work shown on the drawings and in schedules, and defined to include gypsum board work with a tape-and-compound joint treatment system known as "drywall finishing" work.
 - 2. Gypsum screw-type metal support system at ceilings, soffits, partitions, and as otherwise indicated.
 - 3. Gypsum drywall applied to metal and/or wood framing and furring.
 - 4. Drywall finishing (joint tape-and-compound treatment).
 - 5. Moisture and mold-resistant gypsum board.
 - 6. Tile backing panels.

1.3. REFERENCES

- A. All references are the current editions unless noted otherwise.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A1003 - General Requirements for Steel Sheet.
 - 2. ASTM A641 - Zinc Coated (Galvanized) Carbon Steel Wire.
 - 3. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
 - 5. ASTM C645 - Non-Load (axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
 - 6. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
 - 7. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
 - 8. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
 - 9. ASTM C1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
 - 10. ASTM C1396 – Standard Specification for Gypsum Board.
 - 11. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings.
 - 12. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- C. Gypsum Association:

1. GA-201 - Gypsum Board for Walls and Ceilings.
2. GA-203 - Installation of Screw Type Steel Framing Members to Receive Gypsum Board.
3. GA-214-96 – Recommended Levels of Gypsum Board Finish.
4. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
5. GA-600 - Fire Resistance Design Manual; Gypsum Association.

D. Gypsum Construction Handbook; USG Corporation, 2000.

1.4. SUBMITTALS

A. Submit in accordance with Section 01 33 00:

1. Manufacturer's Data: Submit manufacturer's product specifications, samples, and installation instructions for each gypsum drywall component, including other data to show compliance with these specifications.

1.5. QUALITY ASSURANCE

A. Applicator: Company specializing in gypsum board systems work with five years documented experience.

B. Fire-Protection Ratings: At locations indicated on drawings, provide fire-rated assemblies tested per ASTM E119 and acceptable to authorities for ratings required. Provide assemblies as listed in the following:

1. GA-600, "Fire Resistance Design Manual."
2. Underwriters Laboratories Inc.'s (UL) "Fire Resistance Directory".

C. Industry Standard: Comply with requirements of GA-216 "Application and Finishing of Gypsum Board" by the Gypsum Association, except where more detailed or more stringent requirements are indicated including the recommendations of the manufacturer.

D. Source Limitations: Obtain gypsum boards, trim accessories, adhesives and joint treatment products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

E. Perform work in accordance with GA203 and ASTM C754.

1.6. PRODUCT HANDLING

A. Deliver gypsum drywall materials in sealed containers and bundles, fully identified with manufacturer's name, brand, type and grade; store in a dry, well ventilated space, protected from the weather, under cover and off the ground.

1.7. PROJECT CONDITIONS

A. Temperature: Maintain temperature in areas of installation at not less than 55° F. for at least 24 hours before installation begins and for not less than 48 hours after joint finishing has been completed.

B. Ventilation: Provide controlled ventilation during joint finishing operations, to eliminate excessive moisture. Avoid drafts during hot, dry weather to prevent excessively fast drying of joint compound.

PART 2 - PRODUCTS

2.1. METAL SUPPORT MATERIALS

- A. See Section 09 22 16 – Non-Structural Metal Framing for steel framing system.

2.2. GYPSUM BOARD PRODUCTS

A. General:

1. Sheet Size: 48" wide, maximum length available which will minimize end joints.
2. Acceptable manufacturers:
 - a. Georgia Pacific
 - b. National Gypsum Co.
 - c. U. S. Gypsum Co. (USG)

- B. Gypsum Board; Abuse Resistant Typical: Complying with ASTM C1396 and with a rating of 10 per ASTM D3273.

1. Thickness: 5/8".
2. Type X.
3. Long Edges: Tapered.
4. Acceptable Products, General Locations: The following products, provided they comply with all requirements of the Contract Documents, will be considered acceptable:
 - a. Fiberock VHI (Very High Impact) Abuse Resistant / USG
 - b. DensArmor Plus Abuse Resistant / Georgia Pacific
 - c. Gold Bond Brand eXP / National Gypsum Co.

- C. Cementitious Backer Board (Tile backing panels): ANSI A118.9 and ASTM C1288 or 1325, with manufacturer's standard edges.

1. Thickness: 5/8".
2. Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D3274
5. Acceptable Products, General Locations: The following products, provided they comply with all requirements of the Contract Documents, will be considered acceptable:
 - a. USG Corporation, DUROCK Cement Board, Next Generation
 - b. National Gypsum Company, Permabase Plus Cement Board

- D. Glass-Mat Gypsum Sheathing Board: ASTM C1177 / C1177M, with fiberglass mat laminated to both sides and with manufacture's standard edges.

1. Thickness: 5/8".
2. Type X.
3. Acceptable Products, General Locations: The following products, provided they comply with all requirements of the Contract Documents, will be considered acceptable:
 - a. CertainTeed Corporation, GlasRoc Sheathing
 - b. Georgia Pacific, DensGlass Sheathing

c. USG Corporation, Securock

E. Shaft Construction:

1. Gypsum Core Liner Board: 1" thick, maximum permissible length; square edges; ends square out; to fit in fire rated shaft wall system.
2. Gypsum Firecode 'C' Core: ½" thick, tapered long edges, maximum length available which will minimize end joints.

F. Trim Accessories: Manufacturer's standard galvanized steel beaded units with flanges for concealment in joint compound, including corner beads, edge trim and control joints; except provide semi-finishing type (flange not concealed) where indicated.

1. Control joint: No. 093 made from roll-formed zinc.
2. Vinyl trim will not be acceptable unless noted otherwise.
3. Pre-taped metal trim is acceptable.

G. Joint Treatment Materials:

1. ASTM C475, GA201, and GA216; type recommended by the manufacturer for the application indicated.
2. Joint Tape:
 - a. Interior, typical: Glass mesh.
 - b. Interior, mold and moisture-resistant board: Glass mesh.
3. Joint Compound:
 - a. Interior:
 1. On typical interior work provide:
 - a) Embedding and First Coat: Setting-type (chemical-hardening-type).
 - b) Additional and Final Coats: Ready-mixed vinyl-type or non-casein-type (all-purpose type).
 2. On moisture and mold-resistant gypsum board provide:
 - a) All coats: Setting-type (chemical-hardening-type) with a rating of 10 per ASTM D3273.

H. Miscellaneous Materials:

1. Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.
2. Gypsum Board Fasteners: Comply with GA201 and GA216, Phillips head screws.
3. Acoustical Sealants: Refer to Section 07 9200 – Joint Sealants.
4. Sound Attenuation Blankets: See Specification Section 07 2100 - Building Insulation.

PART 3 - EXECUTION

3.1. INSPECTION

- A. Examine the areas and the spaces to receive gypsum drywall, and the conditions under which gypsum drywall is to be installed. Notify the Architect, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected.

3.2. INSTALLATION OF METAL SUPPORT SYSTEMS

- A. Comply with ASTM C754, ASTM C840, GA-203, and manufacturer's instructions.
- B. Install runner tracks at ceiling and structural system where gypsum drywall stud system abuts other work.
 - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
 - 2. Isolate partition framing and wall framing where it abuts structure. Install Vertical Deflection System as specified herein at head of assemblies that avoid axial loading of assembly and laterally support assembly.
 - a. Use of Single Runner and Horizontal Bridging System requires the removal of all screws anchoring studs to the top track after bridging installation.
- C. Screw furring members to structural support where possible, otherwise wire tie.
- D. Install supplementary framing, runners, furring, wood grounds, blocking and bracing at opening and terminations in the work, and at locations to support fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported directly on gypsum board alone. Wood grounds shall consist of not less than 2 x 6 blocking bolted or screwed to wall framing.
- E. Coordinate installation of bricks, anchors, blocking, electrical, and mechanical work placed in or behind partition framing.

3.3. GYPSUM BOARD INSTALLATION REQUIREMENTS

- A. Standards: In addition to compliance with ASTM C840, GA201 and GA216, comply with manufacturer's instructions and requirements for fire-resistance ratings.
- B. Insure that sound attenuation blankets and wall insulation, as indicated, are installed prior to gypsum board installation.
- C. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories. Install control or expansion joints as indicated on the drawings. When not shown, provide control joints at 30'-0" maximum intervals in both directions. Coordinate locations with other work and with Architect.
- D. Install wall/partition board vertically and avoid end-butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.
- E. Space fasteners in gypsum board accordance with GA-216 and manufacturer's recommendations.
- F. At partitions designed to allow vertical deflection of the building structure, no wallboard anchoring screws may be driven into the top runners.
- G. Unless otherwise noted, install boards on one side of studs completely to metal floor and roof deck above at each room. Provide one coat tape and compound treatment in non-exposed area above ceiling. Seal boards tight to underside of roof or floor deck and seal all penetrations. Where insulation occurs in stud walls, install boards on both sides of studs to deck above. Boards not extending to deck above shall be a minimum of 4" above ceiling.

3.4. GYPSUM BOARD APPLICATION

- A. Single-Layer Soffits and Partitions:
 - 1. Install in accordance with manufacturer's installation instructions.
 - 2. Fasten with screws at metal support.
 - 3. Provide drywall finishing as specified herein.

3.5. INSTALLATION OF SHAFT WALL

- A. Install in accordance with manufacturer's installation instructions and indicated UL Design classification.

3.6. INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. Use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
- B. Install metal corner beads at external corners of drywall work.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, such as ceiling to wall intersections, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
- D. Install J-type semi-finishing trim where indicated, and where exterior gypsum board edges are not covered by applied moldings.
- E. Install metal control joint (beaded type) where indicated or as directed by Architect.

3.7. INSTALLATION OF DRYWALL FINISHING

- A. Provide GA-214 Level 4 finish.
- B. Drywall finish for exposed drywall shall not begin until temperatures can be maintained above 55° F.
- C. Apply treatment at gypsum board joints both directions, flanges of trim accessories, penetrations, fasteners heads, surface defects and elsewhere to prepare work for decoration. Prefill open joints and rounded or beveled edges, using type of compound recommended by manufacturer.
 - 1. Apply joint tape at joints between gypsum boards.
 - 2. Apply joint compound in three coats (not including prefill of repaired openings in base), and sand between last two coats and after last coat.
 - 3. Feather coats onto adjoining surfaces so that camber is maximum 1/16".
- D. Partial Finishing (Level 2 finish): Omit third coat and sanding on concealed drywall work which is indicated for drywall finishing, including sound, fire, air, smoke-rated work and partitions above suspended ceilings.

3.8. TOLERANCES

- A. Maximum Variation From True Position: 1/4".
- B. Maximum Variation of any Member from Plane: 1/4".
- C. Maximum Variation from True Flatness: 1/8" in 10' in any direction.
- D. Maximum joint camber (concave or convex): 1/16".

3.9. PROTECTION OF WORK

- A. Protect gypsum drywall work from damage and deterioration during the remainder of the construction period.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Base Bid:
 - a. Porcelain tile.
 - b. Glazed ceramic tile.
 - c. Crack isolation membrane.
 - d. Metal edge strips.
- 2. Deduct Alternate Bid #10:
 - a. Porcelain tile.
 - b. Reduced quantity of glazed ceramic tile.
 - c. Crack isolation membrane.
 - d. Metal edge strips.

B. Related Requirements:

- 1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
- 2. Section 09 29 00 "Gypsum Board" for tile backing panels.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 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:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.
 - 3. Metal edge strips in 6-inch (150-mm) lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.
- C. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as 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 indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
 - 2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
 - 3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

1.8 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 requirements in ANSI A137.1 for labeling 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 can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type from single source or producer.
 - 1. Obtain tile of each type and color or finish 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 single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Crack isolation membrane.
 - 2. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

- A. Tile Type PCT-1: Unglazed porcelain tile.
 - 1. Acceptable Manufacturers / Products:
 - a. Atlas Concorde / Cove
 - b. Architect approved equal.
 - 2. Face Size: 12" X 24".
 - 3. Face Size Variation: Variation not to exceed 1 mm.
 - 4. Thickness: 9 mm.
 - 5. Face: Plain with square edges.
 - 6. Dynamic Coefficient of Friction: Not less than 0.42.
 - 7. Tile Color: Breeze.
 - 8. Grout Color: As selected by Architect from manufacturer's full range.
- B. Tile Type PCT-2: Unglazed porcelain tile.
 - 1. Acceptable Manufacturers / Products:
 - a. Atlas Concorde / Cove
 - b. Architect approved equal.
 - 2. Face Size: 12" X 24"
 - 3. Face Size Variation: Variation not to exceed 1 mm.
 - 4. Thickness: 9 mm.
 - 5. Face: Plain with square edges.
 - 6. Dynamic Coefficient of Friction: Not less than 0.42.
 - 7. Tile Color: Coast.
 - 8. Grout Color: As selected by Architect from manufacturer's full range.
- C. Tile Type CT-1: Glazed ceramic wall tile.
 - 1. Acceptable Manufacturers / Products:
 - a. Daltile / Color Wheel Classic
 - b. Architect approved equal.
 - 2. Module Size: 3 by 6 inches.
 - 3. Thickness: 5/16 inch (8 mm).
 - 4. Face: Plain with manufacturer's standard edges.
 - 5. Finish: Bright, opaque glaze.
 - 6. Tile Color: Currant SH17
 - 7. Grout Color: As selected by Architect from manufacturer's full range.

8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
 - b. External Corners for Thinset Mortar Installations: Surface bullnose, same size as adjoining flat tile.
 - c. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.4 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch (1-mm) nominal thickness.

2.5 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 2. For floor applications, where tile size exceeds 14 inches in any direction, provide mortar that is recommended by manufacturer for large format tiles.
 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.6 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
 1. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.7 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. Self-leveling Underlayments: High-performance, easy preparation, quick-setting cement-based formulation provided or approved by manufacturer of tile-setting materials for installations where tile size exceeds 14 inches in any direction and where floor flatness is critical.
- C. Metal Edge Strips:

1. TR-1: Sloped-shaped, height to match tile and setting-bed thickness, metallic, ADA compliant, designed specifically for flooring transition applications; stainless steel or anodized aluminum material.
 2. TR-2: Cove-shaped, height to match floor tile and setting-bed thickness, depth to match wall tile and setting-bed thickness, metallic, designed specifically for flooring to wall transition applications; stainless steel or anodized aluminum material.
 3. TR-3: Profile with square visible surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
 4. TR-4: Profile with a 90° vertical wall section, trapezoid-perforated anchoring leg, and integrated grout joint spacer.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. 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.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
 5. Verify that floor flatness levels comply with TCNA requirements for large format tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors with trowelable patching compound specifically recommended by tile-setting material manufacturer.
- B. Apply self-leveling underlayment to entire area of concrete substrates for tile floors in which tile size exceeds 14 inches in any direction. Maximum allowable variation in floor flatness, except where sloping to floor drains is required, is 1/8 inch in 10 feet from the required plane, with no more than 1/16 inch variation in 2 feet when measured from the high points in the surface.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Install crack isolation membrane over existing cracks and over slab control joints.
- C. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.4 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - b. Tile floors consisting of rib-backed tiles.
- 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. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in brick pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. Where tile size exceeds 14 inches in any direction, the running bond offset shall be no greater than 33%.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Porcelain Tile: 3/16 inch.
 - 2. Glazed Ceramic Wall Tile: 1/16 inch.
- G. Metal Edge Strips: Install where exposed edge of tile flooring meets other flooring and at floor to wall transitions.
- H. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. 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.

3.6 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation: TCNA F113; thinset mortar.
 - a. Thinset Mortar: Latex-portland cement mortar.
 - b. Grout: High-performance unsanded grout.
- B. Interior Wall Installations, Wood or Metal Studs or Furring:
 - 1. Tile Installation: TCNA W243; thinset mortar on gypsum board.
 - a. Thinset Mortar: Latex-portland cement mortar.
 - b. Grout: High-performance unsanded grout.
 - 2. Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.
 - a. Thinset Mortar: Latex-portland cement mortar.
 - b. Grout: High-performance unsanded grout.
 - 3. Tile Installation: TCNA W245 or TCNA W248; thinset mortar on glass-mat, water-resistant gypsum backer board.
 - a. Thinset Mortar: Latex-portland cement mortar.
 - b. Grout: High-performance unsanded grout.

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Base Bid:
 - a. Acoustical panels and exposed suspension systems for ceilings.
 - 2. Deduct Alternate Bid #1:
 - a. Acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical panels.
 - 4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - 5. Perimeter moldings.

- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- C. 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.
- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 ACOUSTICAL PANELS

- A. Provided they comply with the project requirements, the following Manufacturers / Products will be considered acceptable:
 - 1. Armstrong / Ultima
 - 2. USG / Mars
 - 3. CertainTeed / Symphony M
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with acoustically transparent membrane on face.
 - 2. Pattern: E (lightly textured).
- C. Color: White.
- D. LR: Not less than 0.90.
- E. NRC: Not less than 0.75.
- F. CAC: Not less than 35.
- G. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.
- H. Thickness: 3/4 inch (19 mm).

- I. Modular Size: 24 by 24 inches (610 by 610 mm).
- J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. 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/C 635M.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - 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 according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

2.5 METAL SUSPENSION SYSTEM

- A. Provided they comply with the project requirements, the following Manufacturers / Products will be considered acceptable:
 - 1. Armstrong / Prelude
 - 2. USG / DX/DXL
 - 3. CertainTeed / Classic

- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Steel or aluminum cold-rolled sheet.
 - 5. Cap Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
 - 1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: Manufacturer's standard 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.
 - 1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
 - 2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.

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. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and Cisca's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.

8. 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.
 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- 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 3.6 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. As indicated on reflected ceiling plans.
 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
- 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 23 - LINEAR METAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes strip, linear metal pans and suspension systems for ceilings.
- B. Related Requirements:
 - 1. Section 09 51 13 "Acoustical Panel Ceilings" for ceilings with exposed suspension systems.

1.3 DEFINITIONS

- A. LR: Light Reflectance coefficient.
- B. NRC: Noise Reduction Coefficient.

1.4 COORDINATION

- A. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:
 - 1. Linear Metal Baffle: Set of 12-inch- (300-mm-) long Samples of each type and color and a 12-inch- (300-mm-) long spliced section.
 - 2. Suspension System Members: 12-inch- (300-mm-) long Sample of each type.
 - 3. End Cap: Full size.

1.7 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Metal ceiling layout.
 - 2. Linear pattern.
 - 3. Joint pattern.
 - 4. Ceiling suspension members, including carrier and component layouts.
 - 5. Method of attaching hangers to building structure.
 - 6. Details of system assembly and connection to building components.
 - 7. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - 8. Ceiling perimeter and penetrations through ceiling; trim and moldings.
 - 9. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).
- B. Qualification Data: For testing agency, Manufacturer, and Installer.
- C. Product Test Reports: For each linear metal ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For linear metal ceiling and components and anchor and fastener type.
- E. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by National Voluntary Laboratory Accreditation Program for testing indicated.
- B. Manufacturer/Installer Qualifications:
 - 1. Provide metal ceiling system components produced by a single manufacturer with a minimum 5 years' experience in actual production of specified products and with resources to provide consistent quality in appearance and physical properties, without delaying the work.
 - 2. Provide suspension system components produced by a single manufacturer to provide compatible components for a complete metal ceiling system installation.
 - 3. Perform installations using a firm with installers having no less than 3 years of successful experience on projects of similar size and requirements.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver system components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Carefully place on skids, to prevent damage from moisture and other construction activities.
- C. Handle linear system components and accessories carefully to avoid damaging units and finishes in any way.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install linear metal ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Carefully place on skids, to prevent damage from moisture and other construction activities.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.
- B. Structural Criteria: Install and certify system to comply with structural and wind load requirements of governing codes.
- C. Installation Standard for Suspension System: Comply with ASTM C 636.

2.2 LINEAR METAL CEILING BAFFLES, GENERAL

- A. Source Limitations: Obtain each type of ceiling baffle and its supporting suspension system from single source from single manufacturer.
- B. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.
 - 1. Aluminum Sheet: Roll-formed aluminum sheet, complying with ASTM B 209 (ASTM B 209M); alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

- a. Painted Finishes: Electrolytic zinc-coated steel complying with ASTM A 879/A 879M, G12 ((Z40)) coating; surface treatment as recommended by finish manufacturer for type of use and finish indicated.
- C. Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated to be securely retained on carriers, and finished to comply with requirements indicated.
- D. End Caps: Manufacturer's standard material; fabricated to fit and conceal exposed ends of baffles.

2.3 LINEAR METAL CEILING BAFFLES

A. Decorated Wood-Look Metal Baffles at Assembly Hall room #136:

- 1. Provided they comply with the project requirements, the following Manufacturers / Products will be considered acceptable:
 - a. Hunter Douglas / Tavola Levels
 - b. Armstrong / Metalworks Blades
 - c. USG / Paraline Baffles
- 2. Provide baffles for interior installations providing single beam access with use of scissor clips. Material thickness per manufacturer's recommendations.
- 3. Baffle Configuration Pattern: Custom. Refer to layout indicated on Drawings.
- 4. Baffle Spacing: Standard 12 inches, unless indicated otherwise on Drawings.
- 5. Modular Profile Sizes:
 - a. 2 by 10 inches.
 - b. 2 by 12 inches.
- 6. Length: As indicated on Drawings.
- 7. Colors and Finishes:
 - a. Powder-coat paint finish (interior and exterior). Formaldehyde-free, Class A composite panel
 - b. Finish: Terrace Maple 8466 (Hunter Douglas or approved equal).
 - c. Finish: As selected by Architect from Manufacturer's full range of options.
- 8. Acoustic Infill: Manufacturer's standard fiberglass infill capable of achieving and NRC rating of 1.00.

B. Metal Sheet Baffles at Lobby #101:

- 1. Provided they comply with the project requirements, the following Manufacturers / Products will be considered acceptable:
 - a. Hunter Douglas / V-Baffle Fins
 - b. Architect approved equal.
- 2. Panels with formed edges to snap into carriers with a positive action. Overlap continuous runs of panels 1" for fixed carrier or pivot carrier applications.

3. Material: Aluminum.
4. Fire Rating: Class A.
5. Recycled Content: 92%.
6. Baffle Spacing: Standard 6 inches, unless indicated otherwise on Drawings.
7. Modular Profile Sizes:
 - a. 0.025 by 6 inches.
8. Length: As indicated on Drawings.
9. Finish: Factory applied polyester enamel finish on all surfaces including top and bottom edges.
10. Color: To match Hunter Douglas Natural #7163.

2.4 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/C 635M.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - a. 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.
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 according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

2.5 METAL SUSPENSION SYSTEM

- A. Decorated Wood-Look Metal Baffles at Assembly Hall room #136:
 1. Manufacturers / Products: Provide suspension system by same manufacturer as baffles.
 2. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60 (Z180), Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized according to ASTM A 653/A 653M, G60 (Z180) coating designation; with prefinished, cold-rolled, 15/16-inch- (24-mm-) wide aluminum caps on flanges.
 - a. Structural Classification: Intermediate-duty system.
 - b. End Condition of Cross Runners: Override (stepped) or butt-edge type.

- c. Face Design: Flat, flush.
- d. Face Finish: Custom color to match Architect's sample. All visible suspension items to be black.

B. Metal Sheet Baffles at Lobby #101:

- 1. Suspension System: Fixed screen carrier, formed into a one directional pattern with fixed V-shaped carriers spaced at maximum 60 inch on center, and suspended from the building structure. Two directional framing pattern with pivot T-shaped carriers spaced 48 inch on center and cross tee runners at 48 inch on center suspended from the building structure.
- 2. Colors and Finishes: Black.
- 3. Fixing Clips: Use fixing clips at all moveable carrier and pivot carrier applications.

2.6 ACCESSORIES

- A. Hanger Brackets: Scissor-clip beam attachment for splicing and connection baffles to suspension system. Black finish.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color-Coated Finish: Manufacturer's standard baked paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear metal ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of linear metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders and comply with layout shown on reflected ceiling plans and on Coordination Drawings.

3.3 INSTALLATION

- A. General: Install acoustical metal ceilings per manufacturer's written instructions and comply with ASTM C 636/C 636M, ASTM E 580 and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. 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.
 - 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal baffles.
 - 1. Screw attach moldings to substrate at intervals not more than 18 inches on-center and not more than 6" from ends, leveling with ceiling suspension system to a tolerance of 1/8" in 10'. Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system carriers so they are aligned and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

- E. Cut linear metal ceilings for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.
- F. Install linear metal baffles in coordination with suspension system and exposed moldings and trim.
 - 1. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
 - 2. Install baffles in directions indicated on Drawings.
 - 3. Panel-joints shall flow smoothly and in a straight line within 1/8" in 10'. Intersections shall be continuous.
 - 4. Where metal pan ends are visible, install end caps.
- G. Adjust components to provide uniform tolerances.
- H. Replace all ceiling panels that are scratched, dented or otherwise damaged.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Suspended ceiling system.
 - 2. Hangers, anchors, and fasteners.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections: Testing and inspecting of completed installations of linear metal ceiling hangers and anchors and fasteners shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of linear metal ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Linear metal ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 CLEANING

- A. Remove protective film from panels only when space is completely clean and free of airborne particles. Use white cotton gloves for final installation of panels into grid system.
- B. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing strippable, temporary protective covering. Comply with manufacturer's written instructions for stripping of

temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 09 54 23

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Base Bid:
 - a. Resilient base.
 - b. Resilient stair accessories.
 - c. Resilient molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 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.

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).

1.6 FIELD CONDITIONS

- A. Maintain ambient 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 resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient 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. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. Source Limitations: Obtain each type of resilient accessory from single source from single manufacturer.

2.2 THERMOSET-RUBBER BASE

- A. Provided they comply with the project requirements, the following Manufacturers / Products will be considered acceptable:
 - 1. Johnsonite / Baseworks Thermoset Rubber Base
 - 2. Roppe / Pinnacle Rubber Base
- B. Product Standard: ASTM F 1861, Type TS (rubber).
 - 1. Group: I (solid, homogeneous).
 - 2. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors:

1. RB-1: To match Johnsonite Pebble #32

2.3 RUBBER STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Provided they comply with the project requirements, the following Manufacturers will be considered acceptable:
 1. Johnsonite
 2. Roppe
- C. Stair Treads:
 1. Length: Match existing stair width
 2. Rubber tread
 3. Texture: Raised Round
 4. Color: To be selected by Architect from full range of colors.
 5. Grit Tape Insert: To be selected by Architect from full range of colors.
- D. Risers: Smooth, flat; in height that fully covers substrate.
 1. Style: Coved toe, by length matching treads.
 2. Thickness: Manufacturer's standard.
- E. Stringers: Height and length after cutting to fit risers and treads and to cover stair stringers.
 1. Thickness: Manufacturer's standard.
- F. Colors and Patterns: As selected by Architect from Manufacturer's full range of options.

2.4 RUBBER MOULDING ACCESSORIES

- A. Acceptable Manufacturers:
 1. Johnsonite
 2. Roppe
- B. Description: Rubber reducer and transition strips.
- C. Profile and Dimensions: Cove, dimension as indicated on the drawings.
- D. Locations: Where resilient sheet products or tile carpet products abut to dissimilar materials.
- E. Colors and Patterns: As selected by Architect from full range of industry colors, to match adjacent flooring.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 36 – STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Base Bid: Static-control, rubber floor tile.
 - 2. Moisture barrier.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:
 - a. Examination and preparation of substrates to receive static-control resilient flooring.
 - b. Installation techniques required for specified products.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Environmental Product Declaration (EPD): Published disclosure of product's environmental impacts based on a full Life Cycle Assessment (LCA).
 - 4. Health Product Declaration (HPD): Published declaration with full disclosure of known hazards.
- C. Samples: For each type of static-control resilient flooring and in each color, pattern, and texture required, in manufacturer's standard size, but not less than 6 by 9 inches (150 by 230 mm).

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes, or fraction thereof, of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required. I

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended in writing by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).
 - 1. Floor Tile: Store on flat surfaces.

1.10 PROJECT CONDITIONS

- A. Maintain ambient temperatures in spaces to receive static-control resilient flooring within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), during the following time periods:
 - 1. Period recommended in writing by manufacturer before installation.
 - 2. During installation.
 - 3. Period recommended in writing by manufacturer after installation.
- B. Until Substantial Completion, maintain ambient temperatures in installation areas 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 static-control resilient flooring installation.

- D. Close spaces to traffic for period recommended in writing by manufacturer after static-control resilient flooring installation.
- E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Flooring products to comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 STATIC-CONTROL, RUBBER FLOOR TILE, SDT-1

- A. Manufacturers / Products:
 - 1. Flexco / ESD Rubber Tile
 - 2. Architect approved equal.
- B. Thickness: See Finish Schedule.
- C. Size: See Finish Schedule.
- D. Colors and Patterns: See Finish Schedule
- E. Source Limitations: Obtain floor tile from single source from single manufacturer.
- F. Static-Control Properties: As determined by testing identical products in accordance with test method indicated by an independent testing and inspecting agency.
- G. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested in accordance with ASTM E648 or NFPA 253.
- H. Composition: ASTM F1344, Class I-B homogenous rubber, through-mottled pattern).
- I. Surface: See Finish Schedule.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.
 - 1. Adhesives to have a VOC content of 50 g/L or less.

2. Adhesives to comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.
- D. Floor Polish: Provide protective, static-control liquid floor polish products recommended in writing by floor-covering manufacturer.
- E. Moisture Barrier:
 1. Moisture Reduction Barrier for Concrete Substrates: Suitable moisture reduction barrier to treat substrate moisture levels that exceed the manufacturers of subsequent flooring recommendations.
 2. A two component, 100 percent solids epoxy, one-coat moisture barrier for concrete slabs that exhibit moisture vapor emissions rates (MVER) up to 20 lbs per 1000 square feet (9.07 kg per 92.9 m²) per 24 hours, reduces transmission rates to less than 3 lbs (1.36 kg).
 3. Manufacturers; Products:
 - a. MAPEI : Planiseal LVB
 - b. Ardex: MC Ultra
 - c. Laticrete: Supervap

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with installation or static-control characteristics of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates in accordance with manufacturer's written instructions and with oversight by manufacturer's representative to ensure successful installation of static-control resilient flooring and electrical continuity of floor-covering systems.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with floor-covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer.

4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
 1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

- A. Install static-control resilient flooring in accordance with manufacturer's written instructions.
- B. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.
 1. For adhesively installed flooring, embed grounding strips in static-control adhesive.
- C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
 1. Extend static-control resilient flooring below built-in items and permanent, but movable, items that allow for a flexible layout as indicated on Drawings.
- D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings.
- E. Extend static-control resilient flooring to center of door openings where flooring or color transitions occur.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other non-permanent, non-staining marking device.
- G. Free-Lay Installation: Install static-control resilient flooring in accordance with manufacturer's written instructions for a completed installation without open cracks, raising and puckering at joints, and surface imperfections.
- H. Adhesive Installation: Adhere static-control resilient flooring to substrates using a full spread of static-control 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 INSTALLATION OF FLOOR TILE

- A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
 - 1. Lay floor tiles square with room axis.
- B. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to test electrical resistance of static-control resilient flooring in accordance with ASTM F150 for compliance with requirements.
 - 1. Arrange for testing after the following:
 - a. Static-control adhesives have fully cured.
 - b. Static-control resilient flooring has stabilized to ambient conditions.
 - c. Ground connections are completed.
 - 2. Arrange for testing of static-control resilient flooring **[before]** **[and]** **[after]** performing floor polish procedures.
- B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.
- B. Perform the following operations immediately after completing static-control resilient flooring:
 - 1. Remove static-control adhesive from exposed surfaces.
 - 2. Remove dirt and blemishes from exposed surfaces.
 - 3. Sweep and vacuum surfaces thoroughly.
 - 4. Damp-mop surfaces to remove marks and soil.
- C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - 1. Do not wax static-control resilient flooring.
- D. Cover static-control resilient flooring and protect from rolling loads until Substantial Completion.

END OF SECTION 09 65 36

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Base Bid: Modular carpet tile.
 - 2. Deduct Alternate Bid: None.
- B. Related Requirements:
 - 1. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet tile installation, plans showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Type, color, and location of edge, transition, and other accessory strips.
 - 8. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, 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 tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type, but not less than 10 sq. yd. (8.3 sq. m).

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: **10** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE PRODUCTS

- A. CPT-1:
 - 1. Manufacturer: Tarkett, or Architect approved equal.
 - 2. Pattern: Element #04468.
 - 3. Color: Bay Sands #76005.
 - 4. Fiber Content: Nylon.
 - 5. Dye Method: 60 percent solution dyed, 40 percent yarn dyed.
 - 6. Pile Characteristic: Patterned Loop.
 - 7. Pile Thickness: 0.101 inch (2.6 mm).
 - 8. Stitches: 9.9 per inch (39 per 10 cm).
 - 9. Gauge: 5/64.
 - 10. Surface Pile Weight: 16 oz./sq. yd. (542.4 g/sq. m).
 - 11. Primary Backing: Non-woven synthetic fiber.
 - 12. Backing System: Ethos Modular with Omniccoat Technology.
 - 13. Size: 18 by 36 inches (457 by 914 mm).
 - 14. Applied Treatments:
 - a. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - b. Antimicrobial Treatment: Manufacturer's standard treatment.
 - 15. Performance Characteristics:
 - a. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - b. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
 - c. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
 - d. Electrostatic Propensity: Less than 2 kV according to AATCC 134.

B. CPT-2:

1. Manufacturer: Tarkett, or Architect approved equal.
2. Pattern: Avant #04840.
3. Color: Glazed Teak #11714.
4. Fiber Content: Nylon.
5. Dye Method: 100 percent solution dyed.
6. Pile Characteristic: Cut and loop.
7. Pile Thickness: 0.187 inch (4.7 mm).
8. Stitches: 10.4 per inch (40.9 per 10 cm).
9. Gauge: 5/64.
10. Surface Pile Weight: 25 oz./sq. yd. (848 g/sq. m).
11. Primary Backing: Non-woven synthetic fiber.
12. Backing System: Ethos Modular with Omnicoat Technology.
13. Size: 18 by 36 inches (457 by 914 mm).
14. Applied Treatments:
 - a. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - b. Antimicrobial Treatment: Manufacturer's standard treatment.
15. Performance Characteristics:
 - a. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - b. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
 - c. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
 - d. Electrostatic Propensity: Less than 2 kV according to AATCC 134.

C. CPT-3:

1. Manufacturer: Tarkett, or Architect approved equal.
2. Pattern: Cartography #04843.
3. Color: Tanned Taupe #15608.
4. Fiber Content: Nylon.
5. Dye Method: 100 percent solution dyed.
6. Pile Characteristic: Level-loop.
7. Pile Thickness: 0.187 inch (4.7 mm).
8. Stitches: 9.7 per inch (38.2 per 10 cm).
9. Gauge: 5/64.
10. Surface Pile Weight: 20 oz./sq. yd. (678 g/sq. m).
11. Primary Backing: Non-woven synthetic fiber.
12. Backing System: Ethos Modular with Omnicoat Technology.
13. Size: 18 by 36 inches (457 by 914 mm).
14. Applied Treatments:
 - a. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - b. Antimicrobial Treatment: Manufacturer's standard treatment.
15. Performance Characteristics:
 - a. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - b. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
 - c. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
 - d. Electrostatic Propensity: Less than 2 kV according to AATCC 134.

D. CPT-4:

1. Manufacturer: Tarkett, or Architect approved equal.
2. Pattern: Cartography #04843.
3. Color: Guidelines #15602.
4. Fiber Content: Nylon.
5. Dye Method: 100 percent solution dyed.
6. Pile Characteristic: Level-loop.
7. Pile Thickness: 0.187 inch (4.7 mm).
8. Stitches: 9.7 per inch (38.2 per 10 cm).
9. Gauge: 5/64.
10. Surface Pile Weight: 20 oz./sq. yd. (678 g/sq. m).
11. Primary Backing: Non-woven synthetic fiber.
12. Backing System: Ethos Modular with Omnicoat Technology.
13. Size: 18 by 36 inches (457 by 914 mm).
14. Applied Treatments:
 - a. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - b. Antimicrobial Treatment: Manufacturer's standard treatment.
15. Performance Characteristics:
 - a. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - b. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
 - c. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
 - d. Electrostatic Propensity: Less than 2 kV according to AATCC 134.

E. CPT-5: Not used.

F. CPT-6: Not used.

G. CPT-7:

1. Manufacturer: Tarkett, or Architect approved equal.
2. Pattern: Abrasive Action II #02578.
3. Color: Cork #19107.
4. Fiber Content: Nylon.
5. Dye Method: 100 percent solution dyed.
6. Pile Characteristic: Patterned-loop.
7. Pile Thickness: 0.187 inch (4.7 mm).
8. Stitches: 8 per inch (31.5 per 10 cm).
9. Gauge: 1/12.
10. Surface Pile Weight: 24 oz./sq. yd. (813.6 g/sq. m).
11. Primary Backing: Non-woven synthetic fiber.
12. Backing System: Ethos Modular with Omnicoat Technology.
13. Size: 24 by 24 inches.
14. Applied Treatments:
 - a. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - b. Antimicrobial Treatment: Manufacturer's standard treatment.
15. Performance Characteristics:
 - a. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.

- b. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
- c. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
- d. Electrostatic Propensity: Less than 2 kV according to AATCC 134.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - b. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

- C. Concrete Substrates: 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 adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile 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 tile manufacturer.
- E. Extend carpet tile 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 carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "CRI Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile 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 tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 72 00 - WALL COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Base Bid:
 - a. Full-scale, custom-from-scratch, digital vinyl wallcovering.
 - b. Design of digital imaging for wallcovering.
 - 2. Deduct Alternate Bid: None.
- B. Owner-Furnished Materials:
 - 1. Image files for use in final design.

1.3 PREFABRICATION MEETINGS

- A. Prefabrication Conference: Conduct conference to discuss design and deliverables at Project site.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Shop Drawings:
 - 1. Show location and extent of each wallcovering type. Indicate pattern placement, seams and termination points.
 - 2. Provide digital file of art for review.
 - 3. Provide a printed, low-resolution hard copy of art for review.

- C. Samples: For each type of wallcovering and for each color, pattern, texture, and finish specified, full width by 36-inch- (914-mm-) long in size.
 - 1. Wallcovering Sample: From same production run to be used for the Work, with specified treatments applied.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each wallcovering, for tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wallcoverings to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
 - 1. Build mockups for each type of wallcovering on each substrate required. Comply with requirements in ASTM F 1141 for appearance shading characteristics.
 - 2. Mockups are to be full-scale prints which include at least one seam.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wallcoverings 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 levels intended for occupants after Project completion during the remainder of the construction period.
- B. Lighting: Do not install wallcovering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wallcovering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wallcovering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wallcoverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. ASTM-E84 Tunnel Test: Class A
 - 2. NFPA 286 Corner Burn Test: Class A
 - 3. NFPA 265 Corner Burn Test: Class A
 - 4. BS476 Part 6 and 7: Pass all requirements
 - 5. CAN / ULC S102.2: Pass all requirements
 - 6. NFPA Life Safety Code: Meets or Exceeds.
- B. Breaking Strength Characteristics:
 - 1. Machine Direction – Warp: Exceeds Type II minimum of 50 lbs.
 - 2. Cross Machine Direction – Fill: Exceeds Type II minimum of 55 lbs.
- C. Tearing Strength Characteristics:
 - 1. Machine Direction – Warp: Exceeds Type II minimum of 25 lbs.
 - 2. Cross Machine Direction – Fill: Exceeds Type II minimum of 25 lbs.
- D. Thermal Characteristics:
 - 1. Cold Crack Resistance: No change at 20 degrees Fahrenheit
 - 2. Heat Aging: Does not become stiff, brittle, discolored, or show loss of grain after seven days at 158 degrees Fahrenheit.
- E. Mold, Mildew, and Bacterial Resistance:
 - 1. ASTM-G21: Pass all requirements of CCCW-408-D.
- F. Environmental Characteristics:
 - 1. NYC MEA: Register cadmium and lead free formulation.
 - 2. Prop 65 compliant.
 - 3. WA-101, NSF/ANSI 342 Sustainability Standard.

2.2 DIGITAL VINYL WALLCOVERING

- A. Description: Provide mildew-resistant products in rolls from same production run and complying with the following:
 - 1. FS CCC-W-408D and CFFA-W-101-D for Type II, Medium-Duty products.
 - 2. ASTM F 793 for strippable wallcoverings.
 - a. Category: II, Decorative with Medium Serviceability

- B. Width: 54 inches (1372 mm).
- C. Thickness: Not less than 0.017, nor greater than 0.027.
- D. Total Weight: 20 oz. per lineal yard, excluding coatings.
- E. Vinyl Weight: 17 oz. per lineal yard.
- F. Fabric Weight: 3 oz. per lineal yard.
- G. Class A
- H. Low VOC, recyclable, PVC & POA (Olefin) free, no plasticizers, no phthalates, no formaldehyde, no chlorine, no halogen, no heavy metals, including: cadmium, mercury, lead, or zinc, and no ozone-depleting chemicals. Minimum 31% post-consumer content.
- I. Backing: Woven Osnaburg fabric.
 - 1. Fiber Content: Polycotton.
- J. Repeat: As determined, if applicable, by custom design.
- K. Stain-Resistant Coating: Manufacturer's standard coating.
- L. Colors and Patterns: Full-scale, custom-from-scratch, digital imaging designed by manufacturer's in-house studio in conjunction with Owner and Architect.
- M. Textures: Smooth Matte, Suede, or Artist Canvas, as selected by Architect.

2.3 ACCESSORIES

- A. Adhesive: Pre-mixed, heavy-duty, mildew-resistant, nonstaining, strippable adhesive, for use with specific wallcovering and substrate application indicated and as recommended in writing by wallcovering manufacturer.
 - 1. Adhesive shall have a VOC content of 50 g/L or less.
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 099123 "Interior Painting" and recommended in writing by primer/sealer and wallcovering manufacturers for intended substrate.
- C. Seam Tape: As recommended in writing by wallcovering manufacturer.

PART 3 - EXECUTION

3.1 DESIGN

- A. Engage a manufacturer with an in-house design studio to assist Owner and Architect with creation of custom-from-scratch, digital vinyl wallcovering. Manufacturer is to have a minimum of five (5) years experience designing custom graphics for use on vinyl wallcovering.

B. File Submission:

1. Submit files in a folder as follows:
 - a. The main art file shall be in the main folder. Acceptable file formats for this file include .psd, .tif, .ai, .eps, .pdf, or .indd.
 - 1) Fonts within this file are to be converted to outlines.
 - 2) All non-essential layers and unused elements are to be deleted to reduce file size.
 - 3) A minimum of 1 inch bleed is to be included on all sides of art.
 - 4) Image resolution should be between 50 and 100 ppi/dpi at the final output size. All images in the file should be the same resolution.
 - 5) All images used are to be kept in their original color space. For example, do not convert RGB images to CMYK.
 - 6) All spot colors other than black are to be specified as Pantone Solid Coated. Process black is to be specified using CMYK values of 30-30-30-100. Black should not be built as RGB.
 - 7) Provide layers in the file to allow for adjustments if needed.
 - 8) If color matching is required, provide a physical match print. If a color cannot be reproduced exactly, the closest match possible will be considered.
 - 9) Artwork shall not include metallic colors, as standard CMYK inks cannot produce this effect.
 - 10) If gradients are used, specify both the beginning and ending PMS color of the gradient. Gradients in vector format shall be avoided to prevent banding. Gradients that cover a short tonal range over a long dimension shall be avoided to prevent banding.
 - b. A subfolder named "Fonts" shall contain all font and typeface files for all fonts used in the art.
 - c. A subfolder named "Links" shall contain all imported and linked content use in the art. All imported art elements are to be linked rather than embedded.

- C. Final artwork must be approved, in writing, by Architect prior to the start of any production.

3.2 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wallcovering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, undamaged, structurally sound surface free of flaking, unsound coatings, cracks, and defects. Surfaces are to be free of mold, mildew, grease, and stains.

- D. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 1. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer recommended in writing by primer/sealer manufacturer and wallcovering manufacturer.
 - 2. Metals: If not factory primed, clean and apply primer recommended in writing by primer/sealer manufacturer and wallcovering manufacturer.
 - 3. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wallcovering manufacturer.
 - 4. Painted Surfaces: Treat areas susceptible to pigment bleeding.
 - 5. If moisture is present, immediately identify and eliminate the source(s) of the moisture and verify that all wall surfaces are completely dry before proceeding.
 - 6. Remove any mold or mildew from walls and hanging surface prior to installation.
- E. Check painted surfaces for pigment bleeding. Sand gloss, semi-gloss, and eggshell finishes with fine sandpaper.
- F. Remove all loose paint, prior adhesives, and other wallcoverings prior to commencing work.
- G. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- H. Clean, then prime all surfaces with a universal, white-pigmented, mold inhibiting wallcovering primer, approved by the manufacturer.
- I. Use only lead pencils for marking walls and/or back of wallcovering. Do not use ballpoint or marking pens.
- J. Do not install wallcovering until a temperature of 65 degrees Fahrenheit is maintained in the area of installation for at least 48 hours before installation.
- K. Acclimatize wallcovering materials by removing them from packaging in the installation areas not less than 48 hours before installation.

3.4 WALLCOVERING INSTALLATION

- A. Comply with wallcovering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Manufacturer is to provide a panel map which clearly shows the finished artwork and sequentially numbered panels. Install rolls as numbered, in accordance with the panel map.
- C. Before cutting, lay out panels in numeric order and examine goods to ensure no damage has occurred.
- D. Each panel should be inspected for color consistency, accuracy, and proper mural dimension. Inspection and installation are to be done under adequate, permanent lighting that represents the final lighting conditions.
- E. Trim sides of each panel to the edge of the printed image, being careful not to cut into the image.
- F. Install wallcovering without lifted or curling edges and without visible shrinkage.

- G. Use a sufficient amount of adhesive and do not overwork the material.
- H. If dry hanging, apply adhesive to substrates using a 1/4" to 3/8" nap roller. Smooth panels into adhesive after allowing adhesive to tack up.
- I. If wet hanging, apply adhesive to back of panels using a 3/8" to 1/2" nap roller. Carefully book pasted panels without creasing.
- J. Hang the first panel to a vertical plumb line. Overlap subsequent panels, being certain to match all design elements along the entire seam.
- K. Double cut matched seams on the wall. Do not cut substrate underneath wallcovering. Remove selvage from both side of the cut and close the seam within one hour.
- L. Seams are to be straight, tight-fit, and free from air and paste bubbles.
- M. Smoothing tools are to be free of sharp edges and wrapped with a soft cloth.
- N. Fully bond wallcovering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.5 CLEANING

- A. Sponge each panel with clean water to remove excess adhesive at seams, perimeter edges, and adjacent surfaces. Blot surfaces dry with a clean towel.
- B. Use cleaning methods recommended in writing by wallcovering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Base Bid: Surface preparation and the application of paint systems on interior substrates.
- 2. Deduct Alternate Bid #3: Increased quantity of surface preparation and the application of paint systems on interior substrates.
- 3. Deduct Alternate Bid #10: Increased quantity of surface preparation and the application of paint systems on interior substrates.
- 4. Deduct Alternate Bid #11: Increased quantity of surface preparation and the application of paint systems on interior substrates.

B. Related Requirements:

- 1. Section 09 93 00 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
- D. Colors: As indicated in a color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Fiber-Cement Board: 12 percent.
 3. Masonry (Clay and CMUs): 12 percent.

4. Wood: 15 percent.
 5. Gypsum Board: 12 percent.
 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 2. Sand surfaces that will be exposed to view, and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- J. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.

- g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
- 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
- 1. Latex System MPI INT 3.1A:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - 1) Benjamin Moore / Ultra Spec Interior/Exterior Acrylic High-Build Masonry Primer
 - 2) PPG Architectural / Dulux Gripper Interior/Exterior Universal Acrylic Primer/Sealer
 - 3) Sherwin Williams / PrepRite ProBlock Interior/Exterior Latex Primer/Sealer
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Gloss
 - 2) PPG Architectural / Dulux Lifemaster Interior 100% Acrylic Semi-Gloss
 - 3) Sherwin Williams / Pro Tech Interior Latex Semi-Gloss Enamel

B. Cement Board Substrates:

1. Latex System MPI INT 3.3A:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - 1) Benjamin Moore / Ultra Spec Interior/Exterior Acrylic High-Build Masonry Primer
 - 2) PPG Architectural / Dulux Gripper Interior/Exterior Universal Acrylic Primer/Sealer
 - 3) Sherwin Williams / PrepRite ProBlock Interior/Exterior Latex Primer/Sealer
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Gloss
 - 2) PPG Architectural / Dulux Lifemaster Interior 100% Acrylic Semi-Gloss
 - 3) Sherwin Williams / Pro Tech Interior Latex Semi-Gloss Enamel

C. CMU Substrates:

1. Latex System MPI INT 4.2A:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - 1) Benjamin Moore / Ultra Spec Hi-Build Masonry Block Filler
 - 2) PPG Architectural / Dulux X-Pert Interior/Exterior Latex Blockfiller
 - 3) Sherwin Williams / PrepRite Interior/Exterior Block Filler
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Gloss
 - 2) PPG Architectural / Dulux Lifemaster Interior 100% Acrylic Semi-Gloss
 - 3) Sherwin Williams / Pro Tech Interior Latex Semi-Gloss Enamel

D. Steel Substrates:

1. Latex System, Alkyd Primer MPI INT 5.1Q:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Gloss
 - 2) PPG Architectural / Dulux Lifemaster Interior 100% Acrylic Semi-Gloss
 - 3) Sherwin Williams / Pro Tech Interior Latex Semi-Gloss Enamel
2. Water-Based Dry-Fall System MPI INT 5.1C:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Topcoat: Dry fall, latex, flat, MPI #118.
 - 1) Benjamin Moore / Dry Fall Latex Dry Fall Flat
 - 2) PPG Architectural / Glidden Professional Waterborne Flat Dryfall
 - 3) Sherwin Williams / Pro Industrial Waterborne Acrylic Dryfall

E. Galvanized-Metal Substrates:

1. Latex System MPI INT 5.3J:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - 1) Benjamin Moore / Ultra Spec HP Acrylic Metal Primer
 - 2) Sherwin Williams / Pro Industrial Pro-Cryl Universal Primer
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Gloss

- 2) PPG Architectural / Dulux Lifemaster Interior 100% Acrylic Semi-Gloss
 - 3) Sherwin Williams / Pro Tech Interior Latex Semi-Gloss Enamel
2. Water-Based Dry-Fall System MPI INT 5.3H:
 - a. Prime Coat: Dry fall, water based, for galvanized steel, matching topcoat.
 - b. Topcoat: Dry fall, water based, for galvanized steel, flat (MPI Gloss Level 1), MPI #133.
 - 1) Behr Paint / Pro Dryfall
 - 2) Diamond Vogel / Luminance 300 Latex Dri-Mist Flat
 - 3) PPG Architectural / Glidden Spraymaster Interior DTM Latex Dryfall Flat

F. Wood Substrates: Doors.

1. Latex over Latex Primer System MPI INT 6.3T:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - 1) Benjamin Moore / Fresh Start Multi-Purpose Latex Primer
 - 2) PPG Architectural / Dulux Gripper Interior/Exterior Universal Acrylic Primer/Sealer
 - 3) Sherwin Williams / PrepRite ProBlock Primer Sealer
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 4), MPI #43.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Semi Gloss
 - 2) PPG Architectural / Pittsburgh Paints Wonder-Tones Interior Satin Latex Enamel
 - 3) Sherwin Williams / Pro Tech Interior Latex Stain Enamel

G. Gypsum Board and Plaster Substrates:

1. Latex over Latex Sealer System MPI INT 9.2A:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Primer Sealer
 - 2) PPG Architectural / Glidden Professional PVA Drywall Interior Primer and Sealer
 - 3) Sherwin Williams / Pro Tech Interior Drywall Surfacer Primer
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat (Ceilings): Latex, interior, flat (MPI Gloss Level 1), MPI #53.
 - 1) Benjamin Moore / Ultra Spec 500 Interior Flat Finish
 - 2) PPG Architectural / Glidden Professional Ultra-Hide 250 Interior Acrylic Flat
 - 3) Sherwin Williams / Super Paint Interior Latex Flat
 - d. Topcoat (Walls): Latex, interior (MPI Gloss Level 3), MPI #52.
 - 1) Benjamin Moore / Ultra Spec 500 Interior Eggshell
 - 2) PPG Architectural / PPG Paints Speedhide Interior Satin Acrylic Latex
 - 3) Sherwin Williams / Pro Tech Interior Eggshell Paint
2. High-Performance Architectural Latex System MPI INT 9.2B:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Primer Sealer
 - 2) PPG Architectural / Glidden Professional PVA Drywall Interior Primer and Sealer
 - 3) Sherwin Williams / Pro Tech Interior Drywall Surfacer Primer
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Eggshell
 - 2) PPG Architectural / Glidden Diamond Interior Paint + Primer Eggshell
 - 3) Sherwin Williams / ProMar 200 HP Zero VOC Interior Acrylic Eg-Shel

H. Acoustic Panels and Tiles:

1. Latex, Flat System MPI INT 9.3A:
 - a. Prime Coat: Latex, interior, matching topcoat.
 - b. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.
 - 1) Benjamin Moore / Ultra Spec 500 Interior Flat Finish
 - 2) PPG Architectural / Glidden Professional Ultra-Hide 250 Interior Acrylic Flat
 - 3) Sherwin Williams / Super Paint Interior Latex Flat
- I. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings.
 1. Latex System MPI INT 10.1A:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - 1) Benjamin Moore / Ultra Spec 500 Waterborne Interior Primer Sealer
 - 2) PPG Architectural / Glidden Professional PVA Drywall Interior Primer and Sealer
 - 3) Sherwin Williams / Pro Tech Interior Drywall Surfacer Primer
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.
 - 1) Benjamin Moore / Ultra Spec 500 Interior Flat Finish
 - 2) PPG Architectural / Glidden Professional Ultra-Hide 250 Interior Acrylic Flat
 - 3) Sherwin Williams / Super Paint Interior Latex Flat

END OF SECTION 09 91 23

SECTION 09 93 00 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and application of wood stains and transparent finishes on the following interior substrates:
 - 1. Base Bid:
 - a. Interior trim.
 - b. Interior wood veneer paneling.
 - c. Architectural wood cabinets.
 - d. Panel edging for prefabricated, acoustical, wood veneer wall and ceiling paneling as specified in Section 06 42 16 "Flush Wood Paneling."
 - 2. Deduct Alternate Bid #3:
 - a. Interior trim.
 - b. Interior wood veneer paneling.
 - c. Architectural wood cabinets.
 - d. Panel edging for prefabricated, acoustical, wood veneer ceiling paneling as specified in Section 06 42 16 "Flush Wood Paneling."
 - e. Reduced quantity of panel edging for prefabricated, acoustical, wood veneer wall paneling as specified in Section 06 42 16 "Flush Wood Paneling."
 - 3. Deduct Alternate Bid #11:
 - a. Reduced quantity of interior wood veneer paneling.
 - b. Architectural wood cabinets.
 - c. Reduced quantity of panel edging for prefabricated, acoustical, wood veneer wall paneling as specified in Section 06 42 16 "Flush Wood Paneling."
- B. Related Requirements:
 - 1. Section 06 20 23 "Interior Finish Carpentry."
 - 2. Section 06 41 13 "Wood-Veneer-Face Architectural Cabinets."
 - 3. Section 06 42 16 "Flush Wood Paneling."

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- D. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples: For each type of finish system and in each color and gloss of finish required.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches (200 mm) square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product listed in wood finish systems schedules for the product category indicated.

2.2 MATERIALS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base.
 - 1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
 - 2. Shellacs, Clear: VOC not more than 730 g/L.
 - 3. Stains: VOC not more than 250 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
- D. Stain Colors: Match Architect's samples.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with finish application only after unsatisfactory conditions have been corrected.
 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Interior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
3. Sand surfaces exposed to view and dust off.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 1. Use applicators and techniques suited for finish and substrate indicated.
 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD -FINISH-SYSTEM SCHEDULE

- A. Wood Substrates: Wood trim, paneling, and cabinets.
 1. Water-Based Varnish over Stain System MPI INT 6.4U:
 - a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90.
 - 1) Columbia Paint Wood Classics Interior Oil Stain-250
 - 2) PPG Architectural Deft Interior Alkyd ft 400
 - 3) Sherwin Williams Minwax Interior Oil Stain-250
 - b. Intermediate Coat: Water-based varnish matching topcoat.
 - c. Topcoat: Varnish, water based, clear, in sheen as selected by Architect.

- 1) Semi-gloss: (MPI Gloss Level 5), MPI #129.
 - a) Benjamin Moore Lenmar Aqua Plastic Waterborne Urethane Clear Semi-Gloss
 - b) Old Masters Water-Based Polyurethane Semi-Gloss
 - c) PPG Architectural Deft Interior/Exterior Polyurethane Water-Based Semi-Gloss
 - d) Sherwin Williams Minwax Polycrylic Protective Finish Semi-Gloss
- 2) Gloss: (MPI Gloss Level 6), MPI #130.
 - a) Benjamin Moore Lenmar Aqua Plastic Waterborne Clear Gloss
 - b) Old Masters Water-Based Polyurethane Gloss
 - c) PPG Architectural Deft Interior Polyurethane Water-Based Acrylic Gloss
 - d) Sherwin Williams Minwax Polycrylic Protective Finish Gloss

END OF SECTION 09 93 00

SECTION 10 14 19 – DIMENSIONAL LETTER SIGNAGE

PART 1- GENERAL

1.01 DESCRIPTION

- A. Provide wall mounted building identification letters.

1.02 RELATED SECTIONS

- A. Wood Blocking: Section 06 10 50.

1.03 SUBMITTALS

- A. Layout Drawings: Provide full size layout drawing indicating letter style, size and spacing.
- B. Submit manufacturer's product data and installation instructions.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver in manufacturer's original unopened protective covering.
- B. Store in original packing.
- C. Handle so as to prevent damage.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Material: Brushed aluminum fabricated halo illuminated channel letters. Aluminum surface to be 45 degree brushed.
- B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- C. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Furnish inserts, as required, to be set into masonry work.

2.02 DIMENSIONAL LETTERS

- A. Halo Aluminum Channel Letters: Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects.

Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements specified for finish, style and size.

- B. Text: As indicated.
- C. Letter Style: As indicated on the drawings.
- D. Size: As indicated on the drawings.

2.03 FINISH

- A. General: Comply with NAAMA "Metal Finishes Manual" for finish designations and applications recommendations.
- B. All exposed aluminum surfaces: Architectural Class II, clear anodized fine satin finish.

2.04 MANUFACTURERS

- A. Manufacturer: A.R.K. RAMOS; ASI SIGN SYSTEMS; VOMAR PRODUCTS, INC. ; GEMINI.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Securely install in location indicated on the drawings in accordance with manufacturer's written instructions and recommendations.
 - 1. Install letters level, plumb and at heights indicated, with surfaces free from distortion or other defects in appearance.
 - 2. Mount letters with 1" projection from wall surface.
- B. Clean all surfaces after installation.

END OF SECTION 10 14 19

SECTION 10 21 13.17 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Base Bid: Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.
- 2. Deduct Alternate Bid: None.

B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry" for blocking.
- 2. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

- 1. Include plans, elevations, sections, details, and attachment details.
- 2. Show locations of cutouts for compartment-mounted toilet accessories.
- 3. Show locations of centerlines of toilet fixtures.
- 4. Show locations of floor drains.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: One hinge(s) with associated fasteners.
 - 2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: One door bumper(s) with associated fasteners.
 - 4. Door Pull: One door pull(s) with associated fasteners.
 - 5. Fasteners: Ten fasteners of each size and type.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: [25] [75] [200] or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Recycled Content of Plastic Panel: Minimum 20 percent postconsumer recycled content.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 PLASTIC TOILET COMPARTMENTS

- A. Manufacturers:
 - 1. Scranton Products
 - 2. Architect approved equal.

2.3 MATERIALS

- A. Doors, Panels and Pilasters:

1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
 2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
 3. Thickness: 1 inch (25 mm) with 1/4 inch (6 mm) radiused edges. One edge of pilaster and transom panels to be ship lapped.
 4. Recycled Content (Post Industrial): 25 percent.
 5. Recycled Content (Post Industrial): 100 percent.
 6. Recycled Content (Post Consumer): 100 percent.
 7. Fire Rating: Tested in accordance too NFPA 286: Pass.
 8. Fire Rating: Tested to meet ASTM E 84: Class B flame spread/smoke developed rating.
 9. Standard Collection, Does not meet NFPA 286 or ASTM E84.
- B. Aluminum and Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.
- C. Stainless Steel: ASTM A167, Type 304.

2.4 TOILET COMPARTMENT SYSTEM

- A. Basis of Design: ARIA Toilet Partitions as manufactured by and supplied by Scranton Products.
1. Style: Full height floor mounted overhead braced toilet compartments.
- B. System Construction:
1. System Specified Height: 8'-10".
 2. Doors: 8'-6" high. Mounted 4" above finished floor.
 3. Dividing Panels: Two panels stacked and secured with 3 dowels ensuring proper alignment totaling the system specified height.
 4. Trim: Application to hide seam gap between dividing panels.
 5. Pilasters: System specified height, shoeless system secured with 3/4 inch (19 mm) long stainless steel tamper resistant Torx head screws and angled wall brackets.
 6. Transom Panel: Height required to accommodate specified system height with ship lap on one edge. Mounted with four mending plates using 3/4 inch (19 mm) long stainless steel tamper resistant Torx head screws.
 7. Wall Brackets: 54 inches (1372 mm) long, heavy-duty aluminum with bright dip anodized finish. Mounts to pilasters, panels and walls with 3/4 inch (19 mm) long stainless steel tamper resistant Torx head screws.
- C. System Design:
1. Door Design: As determined by the Architect from Manufacturer's selection.
 2. Side Panel Design: As determined by the Architect from Manufacturer's selection.
 3. Color: As determined by the Architect from Manufacturer's selection.
 4. Trim: As determined by the Architect from Manufacturer's selection.
 5. Trim Color: As determined by the Architect from Manufacturer's selection.

2.5 HARDWARE

- A. Hinges: Helix style 78 inches (1981 mm) edge mounted continuous hinge.
1. Stainless steel: 0.074 inch (1.88 mm) thick 304-2B stainless steel using a stainless-steel pin in 0.234 inch (5.94 mm) diameter.

2. Closing degree is minus 5 degrees. Hinge is designed to come to a full close on its own weight.
- B. Occupancy Indicator Latch and Housing: Satin stainless-steel showing green and red occupancy indicators.
 1. Latch housing: Satin stainless steel.
 2. Slide bolt and button: Satin stainless steel.
 3. Door Pulls: Satin stainless steel.
- C. Coat Hook and Bumper:
 1. Combination type, chrome plated Zamak.
 2. Equip outswing handicapped doors with second door pull and door stop.

2.6 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Door Size and Swings: 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 designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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).
 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer 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. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware 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 13.17

SECTION 10 22 26 – OPERABLE 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. Manually operated, individual panel operable partitions.
- B. Related Sections include the following:
 - 1. Division 3 Sections for concrete tolerances required.
 - 2. Division 5 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
 - 3. Division 6 Sections for wood framing and supports, and all blocking at head and jambs as required.
 - 4. Division 9 Sections for wall and ceiling framing at head and jambs.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable 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. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.
- C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 "Standard Practice for Architectural Application and Installation of Operable Partitions."

1.4 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.
- B. Shop Drawings: Show location and extent of operable partitions. Include plans, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
- D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
- B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.6 WARRANTY

- A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
- B. Partition Warranty period: Two (2) years from date of shipment.
- C. Suspension System Warranty: Five (5) years from date of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, PRODUCTS, AND OPERATIONS

- A. Basis of Design: Acousti-Seal Premier manually operated individual panel operable partition. by Modernfold, Inc.
- B. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Modernfold, Inc
- C. Products: Subject to compliance with the requirements, provide the following product:
 - 1. Acousti-Seal Premier manually operated individual panel operable partition.

2.2 OPERATION

- A. Acousti-Seal Premier: Series of individual flat panels, manually operated, top supported with operable floor seals.
- B. Final Closure:
 - 1. Horizontally expanding panel edge with removable crank.
 - 2. Final closure to be made remote to the face of acoustically rated type IV-A pocket door.

2.3 PANEL CONSTRUCTION

- A. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 18-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
- B. Panel skin shall be:
 - 1. Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction minimum:
 - a. 50 STC

- C. Hinges for Closure Panels, Pass Doors, and Pocket Doors shall be:
 - 1. Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
- D. Panel Trim: No vertical or horizontal trim required or allowed on edges of panels; minimal groove appearance at all panel joints.
- E. Panel Weights:
 - 1. 50 STC - 8 lbs./square foot

2.4 PANEL FINISH

- A. Panel finish shall be:
 - 1. Premium Fabric Wallcovering (Carnegie Xorel.) Color to be selected from manufacturer's full range of color options.
- B. Panel Trim: Exposed panel trim of one consistent color:
 - 1. To be selected from manufacturer's full range of finish options.
- C. Panel Finish at Closure Door shall be:
 - 1. Match wood veneer acoustical wall panels specified in 06 42 16 Flush Wood Paneling. High Density MDF or Wood Veneer finish, which ever matches finish as outlined in above noted specification. Samples to be provided for final approval by Architect.

2.5 SOUND SEALS

- A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.
- B. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
- C. Horizontal bottom floor seals shall be:
 - 1. Modernfold IC2 Bottom Seal. Manually activated operable bottom seals with removable handle providing nominal 2-inch (51mm) operating clearance with an operating range of +0.50-inch (13mm) to -1.50-inch (38mm). Seal shall be operable from panel edge or face.

2.6 SUSPENSION SYSTEM

- A. Basis of Design: #17 Suspension System - "Smart Track™"
 - 1. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
 - a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
 - 2. Carriers: Two all-steel trolleys with steel tired ball bearing wheels. Non-steel tires are not acceptable. Suspension system shall provide automatic indexing of panels into stack area using preprogrammed switches and trolleys without electrical, pneumatic, or mechanical activation.

3. Multiple stack bundles and multiprogramming required.

2.7 OPTIONS

- A. Single Pass Doors:
 1. Matching pass door same thickness and appearance as the panels. ADA compliant pass door to be trimless and equipped with friction latch and flush pulls for panic operation. No threshold will be permitted.
 - a. Self-Illuminated recessed exit signs.
- B. Pocket Doors:
 1. Acousti-Seal Pocket Doors by Modernfold, Inc., with same construction, acoustic rating, finish, and appearance as the adjacent panels.
 - a. Pocket Door configuration shall be manually operated: Type IV bi-fold door hinged to a jamb on one side as required.

PART 3: EXECUTION

3.1 INSTALLATION

- A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- B. Install operable partitions and accessories after other finishing operations, including painting have been completed.
- C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

- A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that insure operable partitions are without damage or deterioration at time of Substantial Completion.

3.3 ADJUSTING

- A. Adjust operable 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 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 partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 DEMONSTRATION

- A. Demonstrate proper operation and maintenance procedures to Owner's representative.
- B. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION 10 22 26

SECTION 10 26 00 – WALL AND DOOR PROTECTION

PART 1- GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. End-wall guards.
 - 2. Abuse-resistant wall coverings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
 - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.
- B. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.
 - 1. Include Samples of accent strips and accessories to verify color selection.
- C. Samples for Verification: For each type of exposed finish on the following products, prepared on samples of size indicated below:
 - 1. End-Wall Guards: 12 inches (300 mm) long. Include example top caps.
 - 2. Abuse-Resistant Wall Covering: 6 by 6 inches (150 by 150 mm) square.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from the same product run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 96-inch- (2400-mm-) long units.
 - 2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
 - 2. Keep plastic materials out of direct sunlight.
 - 3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).
 - a. Store wall-guard covers in a horizontal position.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing 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.

2.3 END-WALL GUARDS

- A. Flush-Mounted, Plastic-Cover, End-Wall Guard (EG-1): Manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover that is flush with adjacent wall surface and that covers entire end of wall, installed over continuous retainer including mounting hardware.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Finish Legend or a comparable product by ones of the following:
 - a. InPro Corporation / G2-140D Flush Mount End Wall Protector Profile, 2" (51mm) wings.
 - b. Architect-approved equal.
 - 2. Cover: Reformulated PETG with Biopolymer Blend, minimum 0.080-inch (2 mm) wall thickness; in dimensions and profiles indicated on Drawings.
 - a. Height: 8 feet (2.4 m).
 - b. Color and Texture: Match Architect's sample.
 - 3. Retainer: 0.070-inch- (1.8 mm) thick, continuous, extruded aluminum.

2.4 ABUSE-RESISTANT WALL COVERINGS

- A. Impact-Resistant Wall Panels (WP-1): Fiberglass reinforced thermosetting polyester resin panel sheets.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Finish Legend or a comparable product by ones of the following:
 - a. Marlite
 - b. Architect-approved equal.
 - 2. Dimensions:
 - a. Thickness – 0.090 " (2.29mm) nominal
 - b. Width - 4'-0" (1.22m) nominal.
 - c. Length – 10'-0" (3.0m) maximum, as indicated on the drawings.

3. Tolerance:
 - a. Length and Width: $\pm 1/8$ " (3.175mm)
 - b. Square - Not to exceed $1/8$ " for 8 foot (2.4m) panels or $5/32$ " (3.96mm) for 10 foot (2.4m) panels
 4. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
 - a. Flexural Strength - 1.7×10^4 psi per ASTM D 790.
 - b. Flexural Modulus – 6.0×10^5 psi per ASTM D 790.
 - c. Tensile Strength – 8.0×10^3 psi per ASTM D 638.
 - d. Tensile Modulus – 9.43×10^5 psi per ASTM D 638.
 - e. Water Absorption - 0.17% per ASTM D 570.
 - f. Barcol Hardness (scratch resistance) of 30 as per ASTM D 2583.
 - g. Izod Impact Strength of 7.0 ft. lbs./in ASTM D 256
 5. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
 6. Front Finish:
 - a. Color: To match architect's sample.
 - b. Surface: Pebbled.
 7. Fire Rating: Class A (I).
 8. Aluminum Anodized Trim: Heavy weight extruded aluminum 6063-T5 alloy prefinished at the factory.
 - a. Profiles:
 - 1) F 550 Inside Corner, 8' length
 - 2) F 561 Outside Corner, 8' length
 - 3) F 565 Division, 8' length
 - 4) F 570 Edge, 8' length
 - 5) Color: Brite Satin Anodized
 9. Outside Corner Guard:
 - a. F 560SS Stainless Corner Guard
 - b. Finish: #4 brushed satin
- B. Impact-Resistant Wall Panels (WP-2): PVC-Free Rigid Sheet Wall Panels.
1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Finish Legend or a comparable product by ones of the following:
 - a. Acrovyn / PVC-Free Textured Sheet
 - b. Architect-approved equal.
 2. Sheet Thickness: 0.040 inch (1.0 mm).
 3. Color and Texture: See finish schedule.
 4. Height: Full wall.
 5. Trim and Joint Moldings: Extruded rigid plastic that matches wall-covering color.
 6. Mounting: Adhesive.

2.5 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Polycarbonate Plastic Sheet: ASTM D6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. (800 J/m) of notch when tested according to ASTM D256, Test Method A.

- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- D. Adhesive: As recommended by protection product manufacturer.

2.6 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.7 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm) apart.
 - 3. Adjust end and top caps as required to ensure tight seams.
- D. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Warm-air dryers.
- B. Related Requirements:
 - 1. Section 08 83 00 "Mirrors" for frameless mirrors.
 - 2. Section 09 30 13 "Ceramic Tiling" for ceramic toilet and bath accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Where a manufacturer's product is specified, equal products as manufactured by BOBRICK, BRADLEY, AMERICAN SPECIALTIES, may be used, provided the product meets the requirements of the specifications. Where an item is listed as "No Substitution", the specified item must be submitted.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Paper Holder: Owner furnished; Contractor Installed.
- B. Soap Dispenser: Owner furnished; Contractor Installed.
- C. Accessible Grab Bars: Bobrick Series 5806.99
 - 1. Diameter: 1-1/4 inch
 - 2. Material: Stainless steel, standard satin finish; peened.
 - 3. Fasteners: Concealed.
 - 4. Style and Length:
 - a. As indicated, where not indicated provide 36 and 42" long horizontal and 18" vertical bars.
 - b. Provide both horizontal and vertical bars in conformance with ANSI A117.1, 604.5.
- D. Paper Towel Dispenser: Owner furnished; Contractor Installed.
- E. Robe/Towel Hook: PETER PEPPER PRODUCTS Model 2015; brass; satin chrome finish.
- F. Sanitary Napkin Disposal: BOBRICK Model B-270.
 - 1. Type: Surface Mount.
 - 2. Material: Stainless steel, satin finish.
- G. Electric Hand Dryer: Model Xlerator by EXCEL DRYER INC.

1. Type: Surface Mount
2. Electrical: 115V, 20 amp, 1/10 hp, UL approved
3. Drying Time: 10 – 15 seconds.
4. Finish: Baked enamel. Color as selected by Architect.
5. Warranty: 5 years from date of final acceptance of the work.
6. Other Acceptable Manufacturers: WORLD DRYER CORPORATION or AMERICAN DRYER.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Edges: All throat openings and similar type exposed edges of waste receptacles and similar type accessories to be hemmed or sufficiently rounded to preclude accidental cuts to users.
- C. Miters: Provide one-piece seamless beveled or return flange; open miters. If not welded, must be worked to eliminate sharp edges; which may cut or snag are not acceptable.

2.5 SCHEDULE OF ACCESSORIES

- A. Location, quantity and mounting height of accessories as indicated on drawings Accessible Mounting Height sheet.
- B. Keyed Units: Key all similar types of units alike. Provide two keys per unit.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer: Examine substrates, previously installed inserts anchorages necessary for mounting of accessories and other conditions under which installation is to occur.
 1. Notify Contractor in writing of conditions detrimental to proper and time completion of the work.
 2. Do not proceed with work until satisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.
- C. Provide concealed fasteners whenever possible of types required for substrate conditions encountered.
 1. Metal Stud and Gypsum Board: Screws or bolts anchored to 16 gauge (minimum) metal plate blocking.
 2. Concrete Masonry Units: Integral fasteners (i.e. expansion anchors, etc.)

- D. Lead, plastic or fiber plugs are not acceptable.
- E. Grab Bars: Coordinate grab bar locations as to right hand or left hand installations with field conditions.
 - 1. Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F446.
- F. Upon completion of installation, adjust each accessory unit for proper operation and clean exposed surfaces. Turn over keys to designated Owner's personnel.

3.3 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 44 00 – FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers, mounting brackets and cabinets for fire extinguishers.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with the codes listed in the *Codes, Standards, and Regulations* document within these *Standards*.
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data

- 1. Product data for each type of product specified.
- 2. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

B. Samples

- 1. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for those units with factory-applied color finishes.
- 2. Samples for verification purposes of each type of metal finish required, prepared on metal samples of same thickness and alloy indicated for final unit of Work.
- 3. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 FIRE EXTINGUISHERS

- A. Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by AE from manufacturer's standard, that comply with authorities having jurisdiction.
- B. Provide fire extinguisher listed below:
 - 1. Multi-Purpose Dry Chemical Type (Designation FE): UL Rated 4A-60BC, 10 lb. nominal capacity, in enameled steel container, for Class A, B, and C fires.
 - a. Amerex Model B500/B500T
 - b. Ansul Sentry Model A05
 - c. Buckeye Model 5 ABC

2.3 MOUNTING BRACKETS

- A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated.
 - 1. Provide manufacturer's standard metal brackets for extinguishers not located in cabinets.

2.4 FIRE EXTINGUISHER CABINETS

- A. Provide fire extinguisher cabinets where indicated and from the same manufacturer as the extinguishers. Provide sizes required for housing specified fire extinguishers, and as follows:
- B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
- C. Fire Rated Cabinets: UL listed with UL Listing Mark with rating of wall where it is installed.
- D. Cabinet Type: Suitable for mounting conditions indicated of the following types:
 - 1. Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth.
 - a. Larsen's Architectural Series 2720-RL (2-1/2" Trim Style) and FS 2720-RL
 - b. Larsen's Architectural Series 2720-RM (4-1/2" Trim Style) and FS 2720-RM
 - c. J.L. Industries 4017 and 4017FX
- E. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
 - 1. Exposed Trim: One piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Square edge trim with 1/4 to 5/16 inch backbend depth.
 - b. Trim Metal: Of same metal and finish as door.

- c. Trim Metal: Enameled steel.
- F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
 - 1. Cold-Rolled Steel: Solid, white baked acrylic enamel, which can be used either as a finish or prime coat. Door shall include lettering.
- G. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door vertically. Provide lettering to comply with authorities having jurisdiction for letter style, red in color, size, spacing, and location.
- H. Identify bracket mounted extinguishers with FIRE EXTINGUISHER in red letter decals applied to wall surface. Use letter size, style, and location as selected by AE.
- I. Door Style: Manufacturer's standard design.
 - 1. Solid Panel: Full flush opaque panel of material indicated.
- J. Door Hardware:
 - 1. Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide concealed or continuous type hinge permitting door to open 180 deg.
 - 2. Special Requirement: Provide recessed concealed handle with cam action latch.

2.5 FINISHES FOR FIRE EXTINGUISHER CABINETS, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering prior to shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.
 - 1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb.

END OF SECTION 10 44 00

SECTION 11 01 90 – ROOF FALL PROTECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The design, installation and use of horizontal lifeline systems used exclusively for fall arrest and fall restraint.
- B. The design, installation and use of the horizontal lifeline systems shall conform to all requirements of the current Occupational Safety and Health Administration (OSHA) Standards 29 CFR parts 1910, OSHA proposed rule-making Personal Protective Equipment (fall protection systems); Federal register #68:23527- 23568; publication dated May 2, 2003 and ANSI Z359.1 latest edition.

1.02 SUBMITTALS

- A. Professional engineer's OSHA qualified person certification.
- B. Shop drawings
 - 1. Provide shop drawings prepared under the supervision of and reviewed by a qualified professional engineer.
 - 2. Show complete layout and configuration of the horizontal lifeline systems, including all components and accessories.
 - 3. Clearly indicate design and fabrication, hardware and installation details.
 - 4. Include structural analysis data for the components signed and sealed by the qualified professional engineer responsible for their preparation.
 - 5. Include all roof level connection details (to ensure anchor bolts do not penetrate ceiling below)
- C. Mill certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- D. Welding certificates.
- E. Test reports: Submit upon request.
- F. Equipment manual and inspection log book: Submit at closeout, documentation to include:
 - 1. As-built drawings of the installed systems.
 - 2. Manufacturer's initial inspection and certification for use logs.
 - 3. System use procedures.
 - 4. Pre-use inspection procedural requirements.
 - 5. Manufacturer's periodic inspection and maintenance requirements.
- G. As-built drawings: Update shop drawings to include:
 - 1. Manufacturer, part name, part number and serial number of all fall protection equipment installed. Clearly indicated on the drawings for location where each part has been installed.

1.03 QUALITY ASSURANCE

- A. Professional engineer: A professional engineer who is legally qualified to practice in jurisdiction where the 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 systems that are similar to those indicated for this Project in material, design and extent.
- B. Qualified person: OSHA defines a qualified person as one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project or product.
- C. Manufacturer: Work shall be performed by a manufacturer and installer specializing in the design, fabrication and installation of horizontal lifeline systems.
- D. Installers: Minimum 5 years' experience installing fall protection similar to that required for this project. Installers must be approved by the fall protection system manufacturer.
- E. Source limitations: Obtain each component of the horizontal lifeline system through one source from a single manufacturer.
- F. Welding: Perform welding using AWS certified welders.
 - 1. AWS D1.1, "Structural Welding Code -Steel."
 - 2. AWS D1.6, "Structural Welding Code -Stainless Steel."
- G. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC, "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
 - 2. AISC, "Manual of Steel Construction, Allowable Stress Design."
 - 3. AISC, "Manual of Steel Construction, Load and Resistance Factor Design."
 - 4. AISC, "Specification for the Design of Steel Hollow Structural Sections."
 - 5. AISC, "Specification for Allowable Stress Design of Single-Angle Members."
 - 6. AISC, "Specification for Load and Resistance Factor Design of Single- Angle Members."
 - 7. RCSC, "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
 - 8. ACI 318, "Building Code Requirements for Structural Concrete."

PART 2 - PRODUCTS

2.01 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. GUARDIAN FALL PROTECTION – XS Platform BV
 - 2. MSA FP -Latchways ManSafe
 - 3. DBI/SALA, Evolution
 - 4. BACOU-DALLOZ, MILLER Fall Protection, Söll – Xenon

5. UNILINE SAFETY SYSTEMS LTD -Uniline

- B. Basis of Design for Horizontal Fall Protection Roof Anchor:
1. Guardian CB-12 or 18: Coordinate height of roof anchor with thickness of insulation/ roofing system. Anchors to be welded to the roof deck.

2.02 MATERIALS

- A. Unless stated otherwise, all components shall be manufactured from type 316L stainless steel and shall conform to ANSI/ASSE Z359.1: (2007), "Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components."
- B. Castings: ASTM A743, Grade CF 8M or CF 3M.
- C. Steel Plates, Bars: ASTM A240 (Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications).

2.03 COMPONENTS

- A. Pass-Through Devices: The pass-through device shall enable the user's sub- lanyard system to connect to the horizontal lifeline cable. The device shall be designed to enable the user to move safely and easily along the length of the lifeline. The device shall enable the passage of the pass-through device over intermediate support points without being released from the lifeline. A locking mechanism shall secure the device onto the cable and prevent it from releasing accidentally. Where specified on the engineering drawings, the device must be able to be connected or disconnected anywhere along the length of the line.
- B. Intermediate Supports: Shall be designed to ensure passage of the pass- through over intermediate anchorage points without being released from the lifeline.
- C. Tension Indicators and Turn-Buckles: Each horizontal lifeline shall be equipped with a pretension indicator. The indicator shall provide a means to verify and adjust correct tension of the lifeline cable. Cable tensions shall be calculated in accordance with the horizontal lifeline system manufacturer's requirements. Minimum breaking strength shall exceed 11,000 lbs.
- D. D-Rings: D-rings shall be fastened to the supporting structure in accordance with the drawing requirements. A lock washer shall be provided under the turned element. Minimum breaking strength shall exceed 10,000 lbs.
- E. In-Line Shock-Absorbers: In-line shock absorbers may be utilized to dissipate the energy generated in a fall and to reduce the end anchorage forces. Minimum breaking strength shall exceed 11,000 lbs. Allowable normal preset tension shall exceed 180 lbs. Activation threshold shall not exceed 440 lbs.
- F. Cable: ASTM A492. The cable shall be of wire rope construction, 8 mm (5/16") in diameter, with a minimum breaking strength of 8,800 lbs. Cable net weight shall not to exceed 0.18 lbs./ft. Cable ends shall be terminated with swaged fittings.
- G. Vertical Lifeline: Vertical lifelines shall be of 3 strand polyester construction, 16 mm (5/8") in diameter, with a minimum breaking strength of 6,000 lbs. Vertical lifelines shall have an integral

double locking snap hook on one end and be 40 ft. in length.

- H. Rope Grab Fall Arrestor: Rope grab fall arrestor shall be designed for use with the specified vertical lifeline and shall have a minimum breaking strength of 5000 lbs.
- I. Termination Plate: Termination plate shall be designed for use with and field termination of specified vertical lifeline.
- J. Shock-absorbing Sub-assembly: Shock-absorbing sub-assembly shall have a double locking snap hook at one end, a D-ring at the other end, with each end connected to an integral shock absorber. The connecting material shall be nylon webbing and the total length shall be 2 ft.
- K. Restraint Lanyard: Restraint lanyard shall be of 1-inch polyester or 1 ¾ inch nylon webbing construction, 6 ft. fixed length with double locking snap hooks on each end.
- L. Full Body Harness: Full body harness shall be of polyester web construction with one back D-ring, one chest D-ring, and two hip D-rings. Provide two large and two extra large size harnesses.
- M. Self-Retracting Lifeline: Lightweight, expands and retracts with the user so there is no slack in the line. Provide with self-locking swivel snap hook with impact indicator and swiveling anchorage loop to prevent twisting of the line. Size as required for all roof areas provided with fall arrest. Provide two.
- N. Signage: Signage shall be cast acrylic sheet, ¼ inch thick of size shown on the drawings. Lettering shall be 1-inch high block style. Colors shall be black for the letters and safety yellow for the background.
- O. Storage Lockers: Lockers shall be 72 inches high, 15 inches wide and 15 inches deep. Construction shall be of 16-gauge sheet, welded to 12-gauge framing angles. Doors shall be vented with 3 heavy duty hinges per door. A strike and eye shall be provided for a padlock. Finish shall be baked enamel and color shall be safety yellow.

2.04 PERFORMANCE REQUIREMENTS

- A. The horizontal lifelines shall be designed under the supervision of a professional engineer qualified in the design of horizontal lifelines. The professional engineer shall be designated as an OSHA qualified person in fall protection.
- B. Design horizontal lifelines and size lanyards in accordance with ANSI Z 359.1 and all applicable OSHA regulations, proposed rules and compliance directives, including necessary clearances and allowable heights of fall allowed by the installed equipment. The supplier's engineer/OSHA qualified person will review the stanchion layout provided on the Drawings and notify the Architect prior to preparation of shop drawings of any deviations required to allow for full compliance with the above standards, regulations, rules and directives.
- C. Verify all existing site dimensions prior to commencing design. Report unsatisfactory site conditions to the Architect in writing. Indicate measurements on shop drawings
- D. Design the horizontal lifelines used exclusively for fall arrest to comply with the following criteria:

1. A minimum of two users to be attached to each system simultaneously.
 2. Users to attach to the system using a full body harness and lanyard, incorporating a shock-absorber that limits the maximum arresting force on the user to 900 lbs.
 3. The fall of both users that generates the greatest component forces and/or the greatest fall clearance requirements.
 4. Components and anchorages shall be designed with a two to one factor of safety against permanent deformation or fracture.
 5. End anchorage and intermediate support forces to be resisted by the supporting structure shall not exceed the capacities stated on the engineering drawings. Where necessary, in-line shock absorbers should be utilized to reduce the end anchorage forces.
- E. Design the horizontal lifelines used exclusively for fall restraint to comply with the following criteria:
1. A minimum of two users to be attached to each system simultaneously.
 2. Users to attach to the system using a full body harness and carabiner. The arrestor shall incorporate a shock-absorber that limits the maximum arresting force on the user to 900 lbs.
 3. The system shall be designed for component forces resulting from both users generating the maximum restraining force simultaneously.
 4. Components and anchorages shall be designed with a two to one factor of safety against permanent deformation or fracture.
 5. End anchorage and intermediate support forces to be resisted by the supporting structure shall not exceed the capacities stated on the engineering drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify all existing site dimensions prior to commencing installation.
- B. Report unsatisfactory site conditions that would cause defective installation of products or cause latent defects in workmanship and function to the contract administrator in writing.
- C. Installation shall not commence until shop drawings have been received, reviewed and returned by the contract administrator.
- D. Install the horizontal lifeline systems and components in accordance with reviewed shop drawings and manufacturer's requirements.
- E. Coordinate installation with work of other trades.
- F. Verify installed height of all lifelines will be 12" above roof membrane and notify Architect of any deviations prior to installation.
- G. Install signs where indicated using stainless steel screws or masonry anchors, and two-sided double stick industrial adhesive foam tape per manufacturer's recommendations.
- H. Install a laminated map of the stanchion locations and a laminated sheet of procedures for proper usage onto the front of the storage locker. The map of stanchion locations and the procedures for usage will be provided to the Contractor by the A/E, in 11" x 17" format, for lamination and

installation by the Contractor.

3.02 FIELD QUALITY CONTROL

- A. Install all work true, level, tightly fitted and flush with adjacent surfaces as required and in accordance with the manufacturer's requirements.
- B. Correct deficiencies in work that test reports and inspections indicate do not comply with the contract documents.

3.03 ADJUSTING

- A. Adjust equipment in accordance with the manufacturer's requirements, ensuring correct cable tension. Leave all systems in proper working order.

3.04 EQUIPMENT MANUAL AND INSPECTION LOG

- A. Complete the initial inspection of the equipment for certification for initial use.
- B. Complete and submit the manufacturer's equipment manual and inspection log book.

3.05 DEMONSTRATION

- A. Instruct Owner's personnel in the proper and safe use of all provided equipment.

END OF SECTION 11 01 90

SECTION 12 11 12 - MANUAL AND ELECTRONIC INTELLIGENT ROLLER SHADE SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Provide manually operated, sunscreen and blackout roller shades as applicable.
- B. Provide electrically operated, sunscreen and blackout roller shades as applicable. Work includes local, group and master control systems for shade operation with addressable, encoded, electronic drive units (EDU).
- C. Related Sections:
 - 1. Division 09 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for blocking, installation of shade pockets, closures and related accessories.
 - 2. Division 09 - Acoustical Ceilings: Coordination with acoustical ceiling systems for blocking, installation of shade pockets, closures and related accessories.
 - 3. Division 26 - Electrical: Electric service for EDU's, and EDU controls, internal communication, low voltage wiring and data transfer, and connection to the Internet and required.

1.2 SUBMITTALS

- A. Bid Submittal, Information Required with Submittal of Bid: In order to evaluate proposals for integrated lighting or AV control and window shade systems, the Architect requires the following information be submitted prior to the award of the system.
 - 1. Bid proposal shall be accompanied with a document that notes all deviations from these specifications on a line-by-line basis.
 - 2. Bid shall confirm that roller shade EDU's and all related controls shall be integrated into a compatible control system as specified herein.
 - 3. Bid shall include separate line items listing the control/interface components required for audiovisual. Roller shade controls manufacturer shall list all components included in their bid and shall include a letter stating that they shall be financially responsible for any change orders and/or back charges required to interface with the motorized roller shade system.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 - 3. Storage and handling requirements and recommendations.
 - 4. Mounting details and installation methods.
 - 5. Typical wiring diagrams including integration of EDU controllers with building management system, audiovisual and lighting control systems as applicable.
- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, power and control wiring diagrams, and relationship to adjacent work.
 - 1. Prepare shop drawings on AutoCAD or Microstation format using base sheets provided electronically by the Architect.
 - 2. Prepare control, wiring diagrams based on, switching and operational requirements provided by the Architect in electronic format.
 - 3. Include one-line diagrams, wire counts, coverage patterns, and physical dimensions of each item.

- D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
- E. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shade cloth samples and aluminum finish sample as selected. Mark face of material to indicate interior faces.
- F. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- G. Warranty: Provide manufacturer's warranty documents as specified in this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten years experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this section. This includes but is not limited to all required extrusions, accessories, controls and fabricated roller shades or else all stated and published warranties may be void.
- B. Installer Qualifications: Engage an installer, which shall assume responsibility for installation of all system components, with the following qualifications.
 - 1. Installer for roller shade system shall be trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.
- C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing. Where applicable, system components shall be FCC compliant.
- E. Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, and ATCC9645.
- F. Requirements for Electronic Hardware, Controls, and Switches:
 - 1. Roller shade hardware, shade fabric, EDU, and all related controls shall be furnished and installed as a complete two-way communicating system and assembly.
- G. Mock-Up: Provide a mock-up, if Architect requires, of one roller shade assembly for evaluation of mounting, appearance and accessories.
 - 1. Locate mock-up in window designated by Architect.
 - 2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Power and control wiring shall be complete and certified, fully operational with uninterrupted communication on the lines and minimal noise certified by a commissioning agent (engaged by others).
 - 1. 485, and Dry Contract Network: Noise on the line not to exceed shade manufacturer's limits.

1.6 WARRANTY

- A. Warranty: Provide manufacturer's standard warranties, including the following:
 - 1. Roller Shade Hardware, and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
 - 2. Electronic Roller Shade EDU's and EDU Control Systems: Manufacturer's standard non-depreciating five-year warranty.
 - 3. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to access to the work above 12' Feet AFF, which are the responsibility of others.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer for Window Shade System: Products by MechoSystems; 42-03 35th Street, Long Island City, NY 11101. Tel: (718) 729-2020. Contact Elisa Taccogna @ Elisa.taccogna@springswindowfashions.com or 773.720.1351.
- B. The following alternate manufacturers may be considered provided they meet the design and project criteria required for the scope of the roller shades herein:
 - 1. Lutron Manufacturing
 - 2. Silent Gliss USA

2.2 INTELLIGENT ENCODED ELECTRONIC DRIVE SYSTEM

- A. Electronic Drive Unit (EDU):
 - 1. Intelligent Encoded EDU, and Control System: Tubular, asynchronous (non-synchronous) EDU's, with built-in reversible capacitor operating at 120VAC/60Hz, (230VAC/50Hz) single phase, temperature Class B, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each EDU.
 - 2. Quiet [42 – 46 db] (within 3 feet open air).
 - 3. Conceal EDU's inside shade roller tube.
 - 4. Maximum current draw for each shade EDU of 0.9Amps at 120VAC.

5. Use EDU's rated at the same nominal speed for all shades in the same room.
 6. Use EDU's with minimum of 34RPM, that shall not vary due to load / lift capacity.
 7. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade EDU and tube assembly.
- B. EDU System: (software, two-way communication): Specifications and design are based on the Intelligent EDU Control System, WhisperShade®IQ® System) as manufactured by MechoSystems. Other systems may be acceptable providing all of the following performance capabilities are provided. EDU and control systems not in complete compliance with these performance criteria shall not be accepted as equal systems.
1. EDU shall support two methods of control.
 - a. Local Dry Contact Control Inputs:
 - 1) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to the upper and lower limits.
 - 2) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to local switch preset positions.
 - 3) Shall support configuring the EDU under protected sequences so that a typical user would not change the EDU's setup. At a minimum the configuration should include setting limits, setting custom presets and configuring key modes of operation.
 - b. Network Control:
 - 1) EDU shall be equipped with a bi-directional network communication capability in order to support commanding the operation of large groups of shades over a common backbone. The network communication card shall be embedded into the tubular EDU assembly.
 2. Upper and lower stopping points (operating limits) of shade bands shall be programmed into EDU's using either a hand held removable program module / configurator or a local switch.
 3. Alignment Positions: Each EDU shall support a minimum of 133 repeatable and precisely aligned shade positions (including limits and presets).
 - a. All shades on the same switch circuit or with the same network group address with the same opening height shall align at each limit or preset (intermediate stopping position) when traveling from any position, up or down.
 - b. Shades of differing heights shall have capability for custom, aligned intermediate stop positions when traveling from any position, up or down.
 - c. Alignment of shades mechanically aligned on the same EDU shall not exceed +/- 0.125 inches (3.175mm) when commanded to the same alignment position.
 - d. Alignment of shades on adjacent EDU's shall not exceed +/- 0.25" inches (6.35mm) when commanded to the same alignment position.
 - e. Local Switch Presets: A minimum of 3 customizable preset positions shall be accessible over the local dry contact control inputs and over the network connection.
 - 1) Upon setting the limits for the shade EDU these preset positions shall automatically default to 25%, 50% and 57% of the shade travel.
 - 2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator or local switch shall be capable of customizing the position of these presets.
 - f. Network Presets: A minimum of 29 customizable preset positions (including the 3 local switch presets) shall be accessible via network commands.
 - 1) Upon setting the limits for the shade EDU these preset positions shall automatically default to the lower limit unless customized elsewhere.

- 2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator shall be capable of customizing the position of these presets.
4. Network Control:
 - a. The system shall have the capability of two-way digital communication with the EDU's over a common backbone.
 - b. Each EDU shall possess 8 addresses capable of being employed for various levels of group control. These addresses shall be configurable via a handheld configurator and/or a PC controller. A 9th unique address shall enable the EDU(s) to be independently controlled and configured over the network via a handheld configurator and/or a PC controller.
 - c. Low Voltage Communication Network Implementation.
 - 1) The low voltage network shall employ a bus topology with daisy chained network connections between nodes over a CAT5 cable (4 UTP) or over a 2 UTP cable employing at least 1 pair at 16 AWG for power and 1 pair at 22 AWG for data.
 - 2) The low voltage network (+/- 13VDC) shall be powered by the nodes attached to it. These nodes could be line voltage powered EDU's attached to 120 VAC or 230 VAC. Alternatively, low voltage nodes shall be powered typically by a centralized low voltage power supply. If a CAT5 network cable is employed and the node draws less than 1W then the node may be powered by DC power supplied by an associated line voltage EDU.
 - 3) Network Capacity: 4000 ft max, 250 nodes max
 - (a) The number and size of a centralized DC supply shall vary depending upon the network requirements.
5. Operating Modes:
 - a. Uniform or Normal Modes of Operation:
 - 1) Uniform mode shall allow for shades to only move to defined intermediate stop positions to maintain maximum uniformity and organization.
 - 2) Normal Mode shall allow for shades to move to both intermediate stop positions, plus any position desired between the upper and lower limits as set by the installer.
6. Wall Switches:
 - a. Shades shall be operated by, 5, or 10-button low voltage standard switches. Standard switch shall be wired to a network splitter and communicate across MechoNet.
 - 1) Location: Provide (2) switches in Assembly Hall: one Podium-switch and one wall switch.
 - b. An address that is transmitted by either a switch or central controller shall be responded to by those EDU's with the same address in their control table.
 - c. Standard switch may control an individual, sub-group or group of EDU's in accordance with the address in each EDU.

2.3 SHADE BANDS

- A. Shade Bands: Construction of shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 1. Concealed Hembar: Shall be continuous extruded aluminum for entire width of shade band and with the following characteristics:
 - a. Hembar shall be heat sealed on all sides.
 - b. Open ends shall not be accepted.

2. Shade Band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.
 - b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a “snap-on” snap-off” spline mounting, without having to remove shade roller from shade brackets.
 - c. Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this specification and shall not be accepted.

2.4 ROLLER SHADE FABRICATION

- A. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design.
- B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
 1. All batten / seam locations to be approved by Architect.
- C. For railroad shade bands, provide seams in railroad multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroad multi-width shade bands.
 1. All batten / seam locations to be approved by Architect.
- D. Provide battens for railroad shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.
 1. All batten / seam locations to be approved by Architect.
- E. Blackout shade bands, when used in side channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet (115 mm) on center extending fully into the side channels. Battens shall be concealed in an integrally colored fabric to match the inside and outside colors of the shade band, in accordance with manufacturer's published standards for spacing and requirements.
 1. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.
 2. All batten / seam locations to be approved by Architect.

2.5 ROLLER SHADE COMPONENTS

- A. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
 3. Use only Delran engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester shall not be accepted.
- B. Motorized Shade Hardware and Shade Brackets:
1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade. Plastic components without use of steel angle construction do not meet the intent of this specification and shall not be accepted.
 2. Provide shade hardware system that allows for field adjustment of EDU or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
 3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the EDU axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade EDU (multi-banded shade, subject to manufacturer's design criteria).
 4. All bands within a single EDU group shall be aligned within 1/4 inch (6 mm).
- C. Manual Operated Chain Drive Hardware and Brackets:
1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
 2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
 3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
 4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
 5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
 6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
 7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
 8. Drive Bracket / Brake Assembly:
 - a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
 - b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
 - c. The brake shall be an over running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
 - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake

- assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
- e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
9. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.6 ROLLER SHADE SCHEDULE

- A. Roller Shade Schedule: Refer to the Drawings for locations.
- 1. Shade Type MS-1: Motorized interior, independently operated, solar and blackout double shades in all exterior windows of rooms and spaces shown on Drawings, and related EDU control systems. MS-1 type shades shall have capability of being controlled by AV and, or lighting control system.
 - a. Bracket #13 with 5" closure and tile support
 - b. #5113 shade pocket
 - 2. Shade Type MS-2: Motorized interior sunscreen roller shades in all exterior / interior windows of rooms and spaces as shown on referenced Drawings, and related EDU control requirements systems. Include the following as scheduled and as indicated on the Drawings:
 - a. Electro 1 bracket
 - b. #4124 shade pocket and 3" closure
 - 3. Shade Type MS-3: Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings.
 - a. Mecho5 bracket
 - b. Shade pocket #4124 with 2" closure and tile support.

2.7 SHADECLOTH

- A. Visually Transparent Single-Fabric Shadecloth: Basis of Design: MechoSystems, EcoVeil® group, single thickness, opaque non-raveling 0.034-inch thick TPO fabric, comprised of 100% Thermoplastic Olefin (TPO), in colors selected from manufacturer's available range.
- 1. Basket Weave: "1550 series", 3 percent open, 2 by 2 basket-weave pattern.
- B. Vinyl Room Darkening Shadecloth (Single-Fabric): Basis of Design: MechoSystems, Chelsea Blackout "0250 series", blackout material, washable and colorfast laminated and embossed acrylic coated polyester fabric, 0.018 inches thick blackout material and weighing 11.50 oz. per square yard, with a minimum of 62 threads per square inch in colors selected from manufacturer's available range.
- 1. Color: Selected from manufacturer's standard colors.

2.8 ROLLER SHADE ACCESSORIES

- A. Shade Pocket: For recessed mounting in acoustical tile or drywall ceilings as indicated on the drawings.
- 1. Either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Window Covering Subcontractor (WC) Responsibilities:
 - 1. Shade Control Subcontractor shall furnish shade controllers, interfaces, splitters, coupler, sensors, and switches for installation by project electrical contractor. Locations for all visible devices to be coordinated with Architect. The shade control subcontractor shall inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.
- C. Integration with Third Party Systems:
 - 1. Main Contractor shall coordinate and provide for others to furnish, install or program any interfaces or wiring to integrate 3rd party systems to the roller shade control system as specified herein. Integration to shade control network can be accomplished locally through dry contact closures, or RS-232.
 - a. MechoNet Interface as required for all rs-232 integration.

3.3 INSTALLATION OF ROLLER SHADES

- A. Contractor Furnish and Install Responsibilities:
 - 1. Window Covering Contractor (WC) shall provide an on site Project Manager, and shall be present for all related jobsite scheduling meetings.
 - 2. WC shall supervise the roller shade installation and setting of intermediate stops of all shades to assure the alignment of the shade bands within a single EDU group, which shall not exceed +/- 0.125 inches (3.175mm), and to assure the alignment between EDU groups, which shall not exceed +/- 0.25 inches (6.35mm).
 - 3. WC shall be responsible for field inspection on an area-by- area and floor-by-floor basis during construction to confirm proper mounting conditions per approved shop drawings.
 - 4. Verification of Conditions: examine the areas to receive the work and the conditions under which the work would be performed and notify General Contractor and Owner of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation shall constitute acceptance of substrate conditions by the installer.
 - 5. WC Installer shall install roller shades level, plumb, square, and true according to manufacturer's written instructions, and as specified here in. Blocking for roller shades installed under the contract of the interior General Contractor shall be installed plumb, level, and fitted to window mullion as per interior architect's design documents and in accordance with industry standard tolerances. The horizontal surface of the shade pocket shall not be out-of-level more than 0.625 inch (15.875mm) over 20 linear feet (6.096 meters)
 - 6. Shades shall be located so the shade band is not closer than 2 inches (50 mm) to the interior face of the glass. Allow proper clearances for window operation hardware.
 - 7. Adjust, align and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
 - 8. Installer shall set Upper, Lower and up to 3 intermediate stop positions of all motorized shade bands, and assure alignment in accordance with the above requirements.

9. WC shall certify the operation of all motorized shades and turn over each floor for preliminary acceptance.
10. The WC shall participate and cooperate with the electrical contractor, the window shade manufacturer and the Commissioning agent to verify and certify the installation is in full conformance with the specifications and is fully operational. This work to occur during the commissioning stage and is in addition to preliminary acceptance required for each floor.
11. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
12. WC shall train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12 11 12

SECTION 12 36 61.19 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Base Bid:
 - a. Quartz agglomerate countertops.
 - b. Quartz agglomerate backsplashes.
 - c. Quartz agglomerate end splashes.
 - d. Quartz agglomerate apron fronts.
2. Deduct Alternate Bid: None.

B. Related Requirements:

1. Section 06 20 23 "Interior Finish Carpentry."
2. Section 06 41 16 "Plastic-Laminate-Faced Architectural Cabinets."
3. Section 06 42 16 "Flush Wood Paneling."
4. Section 07 92 00 "Joint Sealants."

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
 1. Colors and Patterns:
 - a. QZ-1: Corian Quartz Cloud White
 - b. QZ-2: Corian Quartz Coarse Pepper
 - c. Substitutions: Provided they comply with the project requirements, products from Cambria, Vicostone, Samsung Chemical, or Wilsonart may be considered acceptable.
- B. Particleboard: ANSI A208.1, Grade M-2 at dry locations and Grade M-2-Exterior Glue at wet locations.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:
 - 1. Front:
 - a. Typical: Straight, slightly eased at top.
 - b. Where indicated on Drawings: Straight, slightly eased at top with apron, 6 inches (150 mm) high.
 - 2. Backsplash, where indicated on Drawings: Straight, slightly eased at corner.
 - 3. End Splash, where indicated on Drawings: Matching backsplash.
- C. Countertops: 3/4-inch- (19-mm-) thick, quartz agglomerate with front edge built up with same material.
- D. Backsplashes: 3/4-inch- (19-mm-) thick, quartz agglomerate.
- E. Joints: Fabricate countertops without joints.
- F. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- B. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions.
- C. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.
- D. Install aprons to backing and countertops with adhesive.

- E. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- F. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.19