WILLIAMS PARK FIELDHOUSE
2820 SOUTH STATE STREET
CHICAGO, ILLINOIS 60616

NEW CONSTRUCTION
PBC PROJECT NO. 11320

PUBLIC BUILDING COMMISSION OF CHICAGO

Mayor Rahm Emanuel
Chairman

Carina E. Sánchez
Executive Director

Room 200
Richard J. Daley Center
50 West Washington Street
Chicago, Illinois 60602
312-744-3090
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ISSUED FOR BID ON DECEMBER 6, 2017

By
STL ARCHITECTS, INC
808 NORTH DEARBORN STREET
CHICAGO ILLINOI 60610
312 644 9850
SECTION 00 01 10

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**INFORMATION AVAILABLE TO BIDDERS - REPORTS**

**PART 1 - GENERAL**

1.1 **SUMMARY**

A. This document summarizes information available to Bidders, in addition to contract documents, including:

1. Geotechnical Soils report.  
2. Environmental Reports  
3. FF&E Manual

B. Above information is available for information only. The Owner and the Architect do not guarantee the accuracy or validity of the data, nor do they assume any responsibility for the Contractor's interpretation of the data.

C. Verify data and existing conditions. At Contractor's option, perform additional investigations at own expense.

1.2 **GEOTECHNICAL REPORT**

A. The following is the geotechnical report prepared for the project site and is as follows:

1. By Flood Testing Laboratories, Inc; dated July 12, 2016; titled “Geotechnical Soils Report”.  

The report is included in Book #4: Existing Conditions Reports.

1.3 **ENVIRONMENTAL REPORTS**

A. The following are the environmental reports prepared for the project and are as follows:

1. By Environmental Consulting Group, Inc; dated June 13, 2016; titled “Lead-Based Paint Inspection Report”.
4. By Environmental Consulting Group, Inc; dated August 5, 2016; titled “Ground Penetrating Radar Survey”.
5. By Environmental Consulting Group, Inc; dated October 24, 2016; titled “Asbestos Materials and Lead Based Paint Testing Report”.

The reports are included in Book #4: Existing Conditions Reports.

1.4 **FF&E MANUAL**

A. The following is the FF&E Manual prepared for the project and is as follows:

1. By STL Architects, Inc; dated December 6, 2017; titled “Furniture, Fixtures, and Equipment Manual”.

Williams Park Fieldhouse  
PBC PROJECT NO. 11320  
00 01 11 - 1  
INFORMATION AVAILABLE TO BIDDERS
1.5 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Concealed Conditions: General and Supplementary Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01 14 10
PRE-CONSTRUCTION PROJECT MOCK-UPS

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 SUMMARY
   A. Section includes: Construction of project Mock-Ups independent of the building
      construction as indicated on the drawings, to be used to demonstrate aesthetic effects
      and set quality standards for materials and execution of the building assemblies
      indicated.
      1. Mockups in this section comprise work from multiple trades and across multiple
         specification sections.
      2. Refer to individual specification sections for mockups of work specific to those
         sections.
   B. Construction of mockup components shall be independent and in advance of building
      construction schedule.
   C. Construct mockups in locations approved by Architect where mockups can remain
      undisturbed for project duration.
      1. Locate exterior wall mockup with solar orientation as directed by the Architect.

1.3 SUBMITTALS
   A. Installer Qualifications:
      1. The construction team for the mockup shall be the same team who perform the
         work.
   B. Component Submittal:
      1. Provide submittals required by the technical specification for each component to
         be incorporated into the Project Mock-Up before the component is to be
         incorporated into the Project Mock-Up.
      a. Shop Drawings specific to the Project Mock-Up are required prior to
         construction of the mockup.
C. General Contractors schedule:
   1. At time of baseline schedule submit a schedule for the construction of the Project Mock-Up sequencing the participation of all the Sub-Contractors/ installers allowing time for submittals, fabrication (if required) and delivery of each component of the Project Mock-Up and allowing two (2) weeks for testing of each component before approval for installation of the component. The General contractor is sole responsible for delays caused by failure of any component requiring re-testing.

1.4 QUALITY ASSURANCE

   A. Installers: the supervisor and all workmen that will install each component of the building enclosure shall be experienced in the installation of the component, trained for the work, and accepted in writing by the component provider.

   B. Project Mock-Up testing: The Owner will employ qualified testing services to conduct field testing of the Project Mock-Up and connection to abutting components as required to demonstrate compliance with the Contract Documents. Initial testing will be paid for by the Owner. Additional testing required by failure to comply with the requirements of the Contract Documents including cost of re-execution of the Project Mock-Up will be born by the General Contractor until the Contract Document requirements are met.

PART 2 - PRODUCTS

2.1 MOCKUPS, GENERAL

   A. Methods: Utilize methods for the mock-up that are the same as methods that will be used for the project work.

   B. Location: Locate mockups on site and outside of building construction zone, in protected areas away from activity that is likely to damage the mockup.

   C. Retain and protect mockups until associated project work is finished and accepted.
      1. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      2. Obtain Architect’s approval prior to removing mockups

2.2 MATERIALS/FABRICATION

   A. Refer to the Drawings and Specification Section for each material and component of the Project Mock-Ups

2.3 INCIDENTAL MATERIALS, CONSTRUCTION AND FACILITIES
A. Provide materials, construction and equipment required for maintenance and protection of the Project Mock-Up and the Owners testing program.

2.4 EXTERIOR WALL MOCKUP

A. Full exterior wall mockup including, but not limited to, both interior and exterior components as listed follows. Refer to mockup details in the project drawings.
1. Foundation wall
2. Wall framing
3. Wall exterior sheathing
4. Waterproofing, flashings, vapor barrier and air barrier materials.
5. Wall insulation and drainage plane material.
6. Stone base, soffit and wall panels
7. Shingle system, including strapping, supports ties and accessories for shingles
8. Flashings
9. Wall opening with fenestration as indicated, framed with all finish materials, head, sill, flashings, blocking and trim. Size opening as indicated on mockup drawings.
10. Aluminum window unit.
11. Aluminum-Framed Storefront unit.
12. Sealant-filled joints in each exterior wall in colors selected by Architect.
13. Transition strips and sealants to demonstrate continuity of envelope including, but not limited to, air-barrier to window and air-barrier to door junctures, and movement joints (such as control joints, deflection joints, etc.). Sealants must be compatible with and seal to air-barrier materials.
14. Parapet coping
15. Overflow scupper opening

2.5 EXPOSED CONCRETE FLOOR MOCKUP

A. Mockup of interior concrete floor including, but not limited to, components as listed below.
1. Concrete surface
2. Concrete curing
3. Control joint
4. Construction joint
5. Concrete grinding / polishing
6. Concrete sealer

B. Size: 8 feet by 8 feet by full depth of slab

PART 3 - EXECUTION

3.1 CONSTRUCTION
A. Construct the Project Mock-up under the supervision of the General Contractor in the sequence required to allow observation and testing of each component and connection to abutting components before covering.

B. Utilize the supervisor and workmen approved for each component.

C. Notify the Owner a minimum of one (1) week in advance of the time each component and connection to abutting component will be available for testing.

D. Provide environmentally conditioned enclosure of the Project Mock-Up as required by specifications and recommended for each component large enough for construction, observation and testing of each component and connection to abutting component.

3.2 REMOVAL

A. The Project Mock-Up will be used as the basis of comparison for all work on the project represented.

B. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

C. After approval by Architect and at such time mutually acceptable to the Owner and General Contractor, de-construct and completely remove the Project Mock-up and dispose of in accordance with section 01 35 63 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL, 31 23 18.13 SOIL, FILL, BACKFILL, CU STRUCTURAL SOIL, AND CONSTRUCTION AND DEMO DEBRIS REMOVAL and perform work required to complete the project.

END OF SECTION
SECTION 01 14 11 - CONSTRUCTION OPERATIONS AND SITE UTILIZATION PLAN

PART 1 - GENERAL

1.1 SUMMARY

A. The Construction Operations Plan provides a coordinated construction environment to ensure an orderly, secure and safe operation within the existing park and the entire park property, consequently forming the basis for the Site Utilization Plan prepared by the General Contractor.

1. The Commission Representative and Parks will administer the operations plan activities. All Construction Operating issues shall be channeled through and require approval by the Commission Representative.

2. The Construction Operations Plan will be prepared based on the requirements of the project and in coordination with the existing park operations and program. The elements of this plan required for incorporation into the Site Utilization Plan are included in this section.

1.2 RELATED SECTIONS

A. Refer to drawings for information related to this section. Additional Specification Sections containing information that related to this section include, but are not limited to the following:

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

1.3 SUBMITTALS

A. Site Utilization Plan: Submit five (5) copies of the Site Utilization Plan required in Part 3.

1. Submit proposed revisions as deemed necessary

1.4 CONSTRUCTION OPERATIONS PLAN

A. Sequence of Work

1. Work is to be performed and completed in (5) five phases. Mobilization + site control, demolition + environmental activities, landscaping + site improvements, demobilization + associated restoration, and substantial completion of new construction + balance of work.

2. If building is occupied during construction, Contractor must take any and all necessary steps to prevent dust generated by construction activities from spreading in the field house throughout the entire duration of construction.

3. **Contractor must complete cleaning of all areas in the building affected by construction including, but not limited to, any and all areas where dust**
spread, no later than December 31st, 2018. The contractor must be aware that this is a finish cleaning and not limited to a construction cleaning.

B. Use of Site:

1. Deliveries: All deliveries prior to November 15th, 2018 shall be made through the State street construction entrance. Deliveries on and after November 15th, 2018 shall be made off State street onto CHA sidewalk adjacent to site. No contractor deliveries shall be done 7:30am to 8:30am, or 2:45pm to 3:45pm on school days. No contractor deliveries will be allowed on Sundays. No contractor deliveries will be allowed after 6:00pm on any given day.
2. Trailer mobilization and demobilization will be subject to delivery restrictions listed above in 1.4.B.1.
3. Working hours will be as follows: Monday through Friday 6:00am to 8:00pm, Saturdays 9:00am to 3:00pm, and Sundays 10:00am to 2:00pm.
4. All landscaping (grass, shrubs, flowers, trees, etc.), curbs, pavement and sidewalks damaged during construction shall be replaced in kind.
5. (6) Six spaces in CPD/CPS parking lot to the northwest. CHA and CPS will need to approve contractor path of travel. No deliveries at parking lot.
6. Dearborn Street will be unavailable to the contractor, except for mobilization and demobilization activities.
7. Contractor shall document all existing conditions prior to starting any work on site. Preconstruction photographs shall be submitted as a formal submittal prior to any work commencing. Photographs shall document both interior and exterior site conditions. Failure to document the existing conditions prior to work commencing will hold the contractor responsible for any damages in the event of a dispute. Final photographs shall be submitted at closeout.
8. A survey of the trailer / laydown area to the west of Dearborn Street will be required and submitted to Commission Representative prior to mobilization west of Dearborn.

C. Special Requirements:

1. Access to adjacent sidewalks and Dearborn Street.
2. Critical Programming Dates
3. Any other special requirements (i.e. student drop-off points, student/resident pedestrian paths, vehicle traffic patterns for pedestrians / contractors...)

1.5 GENERAL REQUIREMENTS

A. General Contractor shall review and be familiar with the site conditions through site visits.

B. General Contractor to obtain 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 clear all debris in construction area, including the trailer / laydown area, parking lot, adjacent sidewalk, site sidewalk, State Street, and Dearborn Street.
D. General Contractor is to provide and pay for all required permits for street access for truck delivery from the local and state jurisdiction.

E. 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.

F. General Contractor is to replace all removed trees, bushes, ground covers and grass on the Parks’ property used as part of the construction operations. Also concrete pavement walks and asphalt surfaces shall be restored to condition prior to construction.

G. 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 CPD or their 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.

1.6 PROTECTIVE FACILITIES

The contractor must provide, at a minimum, the temporary facilities required by the authorities having jurisdiction.

1. Site Fence: 8'-0" high, chain link fence, Contractor Obligations.
   a. Furnish, install and maintain to prevent unauthorized access to Site by people and animals.
   b. Locate fence where indicated on Drawings.
   c. Provide gates as required for access. Coordinate locations with Commission Representative.
   d. Do not remove until other security facilities, either temporary or permanent, are in place and in operation.

1.7 SECURITY PROCEDURES

The following security procedures must be followed by the Contractor.

A. Furnish and install fence as detailed per industry standards.

1. Fencing:
   a. Furnish, install, and maintain new temporary chain-link fence at boundary lines of all Sites included in this contract or added to this contract by change order. In addition, contiguous Site, the fence should surround the entire Site.
   b. Material:
      1) 9 gauge 2" galvanized steel mesh, 8 feet high
2) 3" outside dimension galvanized end posts with caps
3) 2" outside dimension galvanized line (intermediate) posts
4) 10 ft. max. center to center, with caps
5) 1-5/8" outside dimension galvanized top and bottom rails
6) 12 gauge min. galvanized ties
7) Required fittings for proper installation of above.

c. Method:

1) Unless otherwise indicated on the drawings, posts are to be set at a depth of no less than 3'0" below ground level and anchored in concrete to full depth. Posts shall be properly capped. End posts and line posts will be evenly spaced at a distance of no more than 10'-0" apart, center to center. Fence shall be erected with top and bottom rails of 1-5/8" o.d. and ties of no less than 12 gauge, securing the galvanized steel mesh to the rails. The bottom rail shall be placed at a distance of no greater than 2" from the bottom of the posts and shall be secured by the use of proper fittings to corner and intermediate posts. Top rail shall run continuously through line post caps and shall be fastened to end posts no less than 2" from the top by the use of proper fittings.

2) Galvanized steel mesh shall be 8 feet high installed on outside of posts with salvage edge on top. Ties to be 12 gauge min. spaced as per ASTM F567 “Practice for Installation of Chain-Link Fence”.

3) Gates: Double 8'-0" gate with welded frame and galvanized hinges and hardware and full height fabric as per specification. Locations and number as indicated. Coordinate installation of additional gates with Commission Representative. Additional gates to be installed at Contractor’s cost.

4) Opaque fabric mesh “shall be affixed to the construction site fence. Such fabric meshing shall be capable of allowing air to pass but impervious to dust and dirt. The fabric meshing shall be of a fineness such that no material over 1/8 inch in size or material splatters, laitance or other products of the construction operation shall pass through the mesh. Such mesh fabric shall be the full height of the fence and cover the entire length of the fence including any gated openings. The fabric meshing and fence shall not contain any advertisements.” Chicago Municipal Code Section 13-32-125(2)(a).

B. 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 at the conclusion of the project is the responsibility of the General Contractor.
PART 3 - EXECUTION

3.1 SITE UTILIZATION PLAN

A. General Contractor is to prepare and submit to the Commission Representative, and the AOR for approval a Site Utilization Plan based on the Construction Operations requirements outlined in this section. Mobilization on-site is not to occur until approval of the Site Utilization Plan is obtained. If requested by the Contractor, a preliminary meeting to review site elements and Construction Operations with the Commission Representative, AOR, and Park 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 format (36 x 48 inches) on 24 x 36 inch prints/plots. Modifications to the format and sheet size shall be permitted if pre-approved by the Commission 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 Park 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. Denotation of the limits of construction and required construction fencing including any existing fencing to remain.
5. Denotation of areas allowed for staging purposes: construction personnel parking, material storage, and construction trailer(s). Such activities are to only take place in areas designated.
6. Denotation of 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.
7. Denotation of areas allowed for site access gates.
8. Construction worker ingress/egress, material staging areas in the existing building.
9. Proposed locations of temporary protection, barricades, and temporary walls within the existing building.
10. Denotation of all temporary exits and path of travel.
11. 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 Parks.

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 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.

END OF SECTION 01 014 11
SECTION 01 35 59 - INDOOR AIR QUALITY REQUIREMENTS

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 SUMMARY

A. Section includes general requirements and procedures for compliance with Indoor Air Quality goals.

1. This project will track specific parameters identified herein but will not seek LEED certification.
2. Materials data and information is to be submitted by the Contractor in accordance with the Technical Specifications.

1.3 DEFINITIONS

A. Commission Representative: the person assigned, in writing, by the Executive Director to be the Commission’s Representative for the project
B. LEED: Leadership in Energy & Environmental Design.

1.4 SUBMITTALS

A. General: Technical Specifications contain Indoor Environmental Quality requirements specific to the Work of each of these Sections. Submit in accordance with the project specifications.
B. Indoor Air Quality Management Plans: Required as necessary to meet City and other regulatory requirements, and as specified herein. Plans shall include written narratives with back-up as indicated herein. Provide updates as part of monthly report.

2. Indoor Air Quality measures – Narrative description of applicable measures undertaken.
3. Product data on HVAC equipment indicating absence of CFC refrigerants and use of refrigerants with low ozone depletion and global warming potential.

   a. Product data for temporary filtration media.
   b. Product data for filtration media used during occupancy.
   c. Provide documentation confirming that smoking was not allowed inside the building during construction. (no smoking on CPS property is a CPS requirement)

5. Low-Emitting Materials

1.5 QUALITY ASSURANCE

   A. Contractor’s documentation shall be in compliance Technical Specifications.

PART 2 - PRODUCTS

2.1 LOW-EMITTING MATERIALS

   A. The General Contractor shall review the manufacturers and products listed in the Technical Specifications, and verify compliance with the applicable guidelines below.

   1. Adhesives & Sealants: Provide product data and MSDS for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24). Comply with the following limits:

   a. Wood Glues: 30 g/L.
   b. Metal to Metal Adhesives: 30 g/L.
   c. Adhesives for Porous Materials (Except Wood): 50 g/L.
   d. Subfloor Adhesives: 50 g/L.
   e. Plastic Foam Adhesives: 50 g/L.
   f. Carpet Adhesives: 50 g/L.
   g. Carpet Pad Adhesives: 50 g/L.
   h. VCT and Asphalt Tile Adhesives: 50 g/L.
   i. Cove Base Adhesives: 50 g/L.
   j. Gypsum Board and Panel Adhesives: 50 g/L.
   k. Rubber Floor Adhesives: 60 g/L.
   l. Ceramic Tile Adhesives: 65 g/L.
   m. Multipurpose Construction Adhesives: 70 g/L.
   n. Fiberglass Adhesives: 80 g/L.
2. Paints & Coatings: Provide product data and MSDS for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Or provide VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24). Comply with the following limits:

a. Flat Paints and Coatings: VOC not more than 50 g/L.
b. Nonflat Paints and Coatings: VOC not more than 150 g/L.
c. Primers: VOC not more than 50 g/L.
d. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
e. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
f. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
g. Floor Coatings: VOC not more than 100 g/L.
h. Shellacs, Clear: VOC not more than 730 g/L.
i. Shellacs, Pigmented: VOC not more than 550 g/L.
j. Stains: VOC not more than 250 g/L.

Provide product data for vinyl, linoleum, rubber and laminate flooring showing compliance with the FloorScore program requirements.

4. Composite Wood and Agrifiber Products: Provide product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Comply with the intent of LEED Credit EQ 3.1: Comply with ALL provisions of SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 1 Section "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.

2. Replace ALL air filters immediately prior to occupancy.

3. SMACNA IAQ protocols as follows:
   a. As air ducts, air handlers, air terminal units, grilles, diffusers, louvers, dampers, fans, filters and absorptive materials (gypsum board, ceiling tile, etc) have been delivered to the site, demonstrate method of protection while stored on site before installation.
   b. As air ductwork has been partially installed, demonstrate method of protection to ensure zero entrainment of construction dust/debris into partially installed ductwork.
   c. As air grilles, diffusers have been permanently installed; demonstrate method of protection to ensure zero entrainment of construction dust/debris into all air conveyance systems.
   d. At end of each work day, demonstrate cleaning of floors to mitigate dust/debris accumulation.

4. No smoking is allowed within the building and within 25 feet of building entrances once the building is enclosed. There is NO smoking on a School property.

3.2 MATERIAL AND CONSTRUCTION PROTECTION

A. Deliver, store and handle products and materials using methods that will prevent damage and deterioration and in accordance with manufacturer's recommendations. Deliver to minimize long term storage in undamaged condition in manufacturer's original unopened, undamaged containers complete with labels and instructions. Store products and materials subject to damage by the elements under cover in a weather tight enclosure above ground with
ventilation adequate to prevent condensation. Protect from freezing and moisture intrusion.

B. Inspect materials and products promptly upon arrival at the site for damage, soiling, contaminates and dampness and reject as appropriate.

C. Provide protection during the construction process to prevent moisture intrusion, freezing, dirt and debris within assemblies and extremes in temperature not common to the in-place use environment of the element. Do not allow food and drink or food and drink containers or material protective wrapping to be incorporated into the Work.

D. Install Work in sequence with sufficient time for curing and drying of each element before subsequent work upon which such work depends.

E. Promptly take measures to dry or remove and replace materials products and portions of the project that evidence absorption of moisture or are wet before incorporation proceeding with the work and incorporation or of such materials or products into the project.

END OF SECTION
SECTION 01 35 60 - SUSTAINABILITY REQUIREMENTS

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 SUMMARY

A. Section includes general requirements and procedures for compliance with Sustainability Metrics reporting.

1. This project will track specific Sustainability parameters identified herein but will not seek LEED certification.
   a. Sustainability parameters are in many cases based on LEED. Reference to LEED credit and prerequisite language is intended as guidance for Sustainability metrics requirements and reporting.

2. Materials data and information is to be tracked by the Contractor using tracking forms included with this section.

3. Monthly Contractor status report with updates to these tracking forms is required.

4. Backup information is to be maintained by the Contractor.

1.3 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. Commission Representative: the person assigned, in writing, by the Executive Director to be the Commission’s Representative for the project

C. LEED: Leadership in Energy & Environmental Design.

D. LEED Coordinator: individual provided by the Contractor with expertise and authority to manage and execute the Sustainability Documentation and Submittals for duration of the construction schedule.
E. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

F. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "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.

2. "Pre-consumer" 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.

1.4 SUBMITTALS

A. General: Technical Specifications Divisions 1 through 16 contain Sustainability requirements specific to the Work of each of these Sections. Submit additional Sustainability submittals required by other Specification Sections.

B. Sustainability submittals are in addition to other submittals where such submittals are required.

C. The Contractor shall compile all Sustainability Submittals, Plans, and Reporting in an organized manner with tabbed dividers. Submit compiled data as follows: (2) hard copy binders, (1) CD-Rom, and shall post electronically on the Owners online collaboration system as directed by the Owners Representative.

D. Project Materials Cost Data: Provide statement indicating total cost for building materials used for Project, excluding mechanical, electrical, and plumbing components, and specialty items such as elevators and equipment. Include statement indicating total cost for wood-based materials used for Project.

E. Sustainability Plans: Required as necessary to meet City and other regulatory requirements, and as specified herein. Plans shall include written narratives with back-up as indicated herein.

1. Provide Erosion and Sediment Control Plan in compliance with Div 01 Section 01 35 62 Erosion and Sediment Control Plan, specific to the site. Submit plan within fifteen days of NTP.

2. Waste Management Plan complying with Division 1 Section 01 52 40 "Construction Waste Management and Disposal." Submit plan within fifteen days of NTP.
3. Materials and Resources Plan:
   a. List of proposed materials with recycled content. Indicate total cost, 100% cost of post-consumer recycled content, and 50% cost of pre-consumer recycled content for each product having recycled content.
   b. List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
   c. List of proposed certified wood products and list of all wood products. Indicate each product containing certified wood, including its source and cost of certified wood products. Include total cost of all wood products.


F. Sustainability Progress Reports: Contractor is responsible for compiling and incorporating all information, data, etc. and submitting reports, in format identified by the Commission Representative, including cover sheet and tracking forms for each measure below, providing the status of actual construction and purchasing activities for the following:

1. Erosion Control measures / actions taken for the month.

2. Waste reduction progress reports complying with Division 1 Section "Construction Waste Management."

3. Recycled content – Materials procured (matrix)

4. Regional materials – Materials procured (matrix)

5. Certified wood products – Materials procured. (matrix)

6. Low-Emitting materials (matrix)

7. Indoor Air Quality measures – Narrative description of applicable measures undertaken for reporting period. Include selected photos confirming measures.

8. Commissioning activities for the month and upcoming activities.

G. Sustainability Documentation Submittals – Contractor is required to maintain documentation to reasonably support the Sustainability reporting.

1. Product Data for roofing materials indicating Solar Reflectance Index compliance for non-vegetated roof systems.
2. Product Data for interior and exterior lighting fixtures that stop direct-beam illumination from leaving the building site.

3. Product data on HVAC equipment indicating absence of CFC refrigerants and use of refrigerants with low ozone depletion and global warming potential.

4. Product Data for plumbing fixtures indicating flow rate (gallons per flush or gallons per minute).

5. 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 costs for each product having recycled content.

6. Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.


   a. Product data for temporary filtration media.
   b. Product data for filtration media used during occupancy.
   c. Provide documentation confirming that smoking was not allowed inside the building during construction. (no smoking on CPS property is a CPS requirement)

9. Low-Emitting Materials
   a. Provide submittals for materials as follows for compliance with section 2.4:

10. Contractor will provide and maintain documentation to demonstrate compliance with the Sustainability Plans, Sustainability Submittals and Sustainability Reporting, and will track this information using the example format provided in this Specification section.

1.5 QUALITY ASSURANCE

A. LEED Coordinator to have current LEED AP Accreditation and have a minimum of two similar projects (in size, scope and cost of work). LEED Coordinator experience is subject to Commission Representative approval, prior to engaging in the work.
PART 2 - PRODUCTS

2.1 RECYCLED CONTENT OF MATERIALS

A. Provide building materials with recycled content, and track post-consumer recycled content plus one-half of pre-consumer recycled content for all materials specified in the contract documents.

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.

2.2 REGIONAL MATERIALS

A. Provide building materials (track by cost) that are regional materials.

2.3 CERTIFIED WOOD

A. Provide wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

2.4 LOW-EMITTING MATERIALS

A. Comply with 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, including 2004 Addenda; or the Contractor, at its option, may submit manufacturer's product data demonstrating that all adhesives, sealants, and sealant primers installed in the building interior comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 VOC limits effective July 1, 2005 and rule amendment date of January 7, 2005, and that aerosol adhesives comply with Green Seal Standard for Commercial Adhesives GS-36 VOC limits effective October 19, 2000.

B. The General Contractor shall review the manufacturers and products listed in the Technical Specifications, and verify compliance with the applicable guidelines below.
1. Adhesives & Sealants: Provide product data and MSDS for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24). Comply with the following limits:

   a. Wood Glues: 30 g/L.
   b. Metal to Metal Adhesives: 30 g/L.
   c. Adhesives for Porous Materials (Except Wood): 50 g/L.
   d. Subfloor Adhesives: 50 g/L.
   e. Plastic Foam Adhesives: 50 g/L.
   f. Carpet Adhesives: 50 g/L.
   g. Carpet Pad Adhesives: 50 g/L.
   h. VCT and Asphalt Tile Adhesives: 50 g/L.
   i. Cove Base Adhesives: 50 g/L.
   j. Gypsum Board and Panel Adhesives: 50 g/L.
   k. Rubber Floor Adhesives: 60 g/L.
   l. Ceramic Tile Adhesives: 65 g/L.
   m. Multipurpose Construction Adhesives: 70 g/L.
   n. Fiberglass Adhesives: 80 g/L.
   o. Contact Adhesive: 80 g/L.
   p. Structural Glazing Adhesives: 100 g/L.
   q. Wood Flooring Adhesive: 100 g/L.
   r. Structural Wood Member Adhesive: 140 g/L.
   s. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
   t. Top and Trim Adhesive: 250 g/L.
   u. Plastic Cement Welding Compounds: 350 g/L.
   v. ABS Welding Compounds: 400 g/L.
   w. CPVC Welding Compounds: 490 g/L.
   x. PVC Welding Compounds: 510 g/L.
   y. Adhesive Primer for Plastic: 650 g/L.
   z. Sheet Applied Rubber Lining Adhesive: 850 g/L.
   aa. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
   bb. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
   cc. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
   dd. Other Adhesives: 250 g/L.
   ee. Architectural Sealants: 250 g/L.
   ff. Nonmembrane Roof Sealants: 300 g/L.
   gg. Single-Ply Roof Membrane Sealants: 450 g/L.
   hh. Other Sealants: 420 g/L.
   ii. Sealant Primers for Nonporous Substrates: 250 g/L.
   jj. Sealant Primers for Porous Substrates: 775 g/L.
   kk. Modified Bituminous Sealant Primers: 500 g/L.
   ll. Other Sealant Primers: 750 g/L.

2. Paints & Coatings: Provide product data and MSDS for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24).
Or provide VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24). Comply with the following limits:

1) Flat Paints and Coatings: VOC not more than 50 g/L.
2) Nonflat Paints and Coatings: VOC not more than 150 g/L.
3) Primers: VOC not more than 50 g/L.
4) Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
5) Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
6) Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
7) Floor Coatings: VOC not more than 100 g/L.
8) Shellacs, Clear: VOC not more than 730 g/L.
9) Shellacs, Pigmented: VOC not more than 550 g/L.
10) Stains: VOC not more than 250 g/L.

3. Flooring Systems: Provide product data for carpet products showing compliance with the Carpet and Rug Institute’s Green Label Plus program. Provide product data for vinyl, linoleum, rubber and laminate flooring showing compliance with the FloorScore program requirements.

4. Furniture & Furnishings: Classroom furniture including all student and teacher desks, tables, and seats introduced into the project space that has been manufactured, refurbished or refinished within one year prior to occupancy.

5. Composite Wood and Agrifiber Products: Provide product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Division 1 Section 01524 Construction Waste Management and Plan developed to meet the requirements of this section

3.2 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Comply with the intent of LEED Credit EQ 3.1: Comply with ALL provisions of SMACNA’s "SMACNA IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 1 Section "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace ALL air filters immediately prior to occupancy.
3. SMACNA IAQ protocols as follows:
   a. As air ducts, air handlers, air terminal units, grilles, diffusers, louvers, dampers, fans, filters and absorptive materials (gypsum board, ceiling tile, etc) have been delivered to the site, demonstrate method of protection while stored on site before installation.
   b. As air ductwork has been partially installed, demonstrate method of protection to ensure zero entrainment of construction dust/debris into partially installed ductwork.
   c. As air grilles, diffusers have been permanently installed; demonstrate method of protection to ensure zero entrainment of construction dust/debris into all air conveyance systems.
   d. At end of each work day, demonstrate cleaning of floors to mitigate dust/debris accumulation.

4. No smoking is allowed within the building and within 25 feet of building entrances once the building is enclosed. There is NO smoking on a School property.

3.3 MATERIAL AND CONSTRUCTION PROTECTION

A. Deliver, store and handle products and materials using methods that will prevent damage and deterioration and in accordance with manufacturer's recommendations. Deliver to minimize long term storage in undamaged condition in manufacturer's original unopened, undamaged containers complete with labels and instructions. Store products and materials subject to damage by the elements under cover in a weather tight enclosure above ground with ventilation adequate to prevent condensation. Protect from freezing and moisture intrusion.

B. Inspect materials and products promptly upon arrival at the site for damage, soiling, contaminates and dampness and reject as appropriate.

C. Provide protection during the construction process to prevent moisture intrusion, freezing, dirt and debris within assemblies and extremes in temperature not common to the in-place use environment of the element. Do not allow food and drink or food and drink containers or material protective wrapping to be incorporated into the Work.

D. Install Work in sequence with sufficient time for curing and drying of each element before subsequent work upon which such work depends.

E. Promptly take measures to dry or remove and replace materials products and portions of the project that evidence absorption of moisture or are wet before incorporation proceeding with the work and incorporation or of such materials or products into the project.

(Insert 01 35 603a Attachment A - Materials Credits Documentation Sheet)
(Insert 01 35 60b Attachment B - Low-Emitting Materials Credits Documentation Sheet)

(Insert 01 35 60c Attachment C) - **NOT USED**

(Insert 01 35 60d Attachment D - LEED Materials Table in Excel Spreadsheet Format)

(Insert 01 35 60e Attachment E – Sustainability Projects Metrics Capture form)

**END OF SECTION**
SECTION 01 35 62
EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Erosion and Sedimentation Control Program for the Project.

1.2 SUBMITTALS

A. Erosion and Sediment Control Plan

1. Submit erosion and sediment control drawings specific to the site within ten (10) days of Notice To Proceed (NTP). Show locations, types and details of erosion and sediment control features and construction.
2. Show the schedule of implementation coordinated with the construction schedule.
3. Include a narrative describing the program and maintenance.

B. Product Data

1. Silt Fence Geotextile Filter Fabric
2. Filter Baskets
3. Specialty Products

1.3 QUALITY ASSURANCE

A. Requirements: Create and implement an Erosion and Sedimentation Control plan, specific to the site, which conforms to the erosion and sedimentation requirements of the 2003 United States Environmental Protection Agency (EPA) Construction General Permit, OR local erosion and sedimentation control standards and codes, whichever is more stringent. The Construction General Permit outlines the provisions necessary to comply with Phase I and Phase II Of the National Pollution Discharge Elimination (NPDES) program.

B. Objectives:

1. Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting stock pits for reuse.
2. Prevent sedimentation of storm sewer or receiving streams.
3. Prevent polluting the air with dust and particulate matter.

PART 2 - PRODUCTS

2.1 Silt Fence:

A. Geotextile Filter Fabric: A nonwoven fabric consisting of previous sheets of propylene, nylon, polyester, or ethylene yarn. Certify material by manufacturer to meet the following requirements. Pre-assembled silt fencing may be substituted if it meets the above requirements.
<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Tensile Strength</td>
<td>ASTM D4632</td>
<td>90 lb</td>
</tr>
<tr>
<td>Maximum Elongation at 45 lb</td>
<td>ASTM D4632</td>
<td>50% Max</td>
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<tr>
<td>Apparent Opening Size</td>
<td>ASTM D4751</td>
<td>AOS&lt;60 mm</td>
</tr>
<tr>
<td>Minimum Permittivity</td>
<td>ASTM D4491</td>
<td>1x10^2 SEC^{-1}</td>
</tr>
<tr>
<td>Ultraviolet Exposure Strength Retention</td>
<td>ASTM D4355</td>
<td>70% @ 500h</td>
</tr>
</tbody>
</table>

B. Posts: Wood or steel and a minimum 5 ft long. Wood posts shall be at least 4 in. dia. Or nominal 2 x 2 in. Steel posts shall be round or “U”, “T”, or “C” shaped with a minimum weight of 1.33 lb/ft and projections for fastening wire to fence.

2.2 Wire Staples: 9 gage and minimum 1 in. long. INLET FILTER

A. FILTER BASKETS

1. CATCH-ALL (or equal)
   As manufactured by:
   METRO DETROIT
   Price and Company, Inc.
   29165 Wall Street
   Wixom, MI 48393-3525
   Toll Free: 866.960.4300
   Local T: 248.596.4300
   F: 248.596.4301
   E: geopro@priceandcompany.com

2.3 STRAW BALE BARRIERS

A. Baled hay or straw containing 5 ft3 or more of material. Securely bind bales with wire or nylon.

2.4 SPECIALTY PRODUCTS

A. Specialty products are available for protection of manholes.

2.5 CONSTRUCTION ENTRANCE

A. Aggregate size: AC-1 or CA-4

B. Geotextile fabric: shall meet the requirements of specification 592 Geotextile table 1 or 2, class I, II or IV of the Illinois Urban Manual.

2.6 Temporary Seeding Plants

A. Shall be selected from the following:

<table>
<thead>
<tr>
<th>TEMPORARY SEEDING SPECIES, RATES AND DATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
</tr>
<tr>
<td>Oats</td>
</tr>
<tr>
<td>Cereal Rye</td>
</tr>
<tr>
<td>Wheat</td>
</tr>
</tbody>
</table>
PART 3 - EXECUTION

3.1 GENERAL

A. Do not start operations until the erosion and sediment control plan has been submitted and features and in place.

B. Comply with “Quality Assurance” provisions of these specifications, the erosion and sediment control plan, and as follows to ensure the LEED credit SSP1 is achieved.

C. Schedule the Work in start to finish phases to minimize exposing the site to erosion.

D. Install erosion and sediment control features before site disturbance begins and immediately after new inlets are installed.

E. Do not allow storm water to flow into excavations and disturbed areas.

F. Do not discharge water into sanitary sewers, watercourses or offsite.

G. Do not discharge water-containing sediment in accordance with “Quality Assurance” 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.


I. Do not allow sediment to flow into vegetated areas.

J. Retain all sediment on the site. Provide temporary stone roadways at exits from the site to ensure mud run-off of tires before exiting.

K. Utilize the sizes of equipment appropriate to the task to minimize exhaust, noise and vibration.

L. Mist or provide other means to keep dust from being scattered to the air.

M. All sediment that gets onto public right-of-way must be removed immediately.

N. During dewatering operations, water will be pumped into sediment basins or silt traps. Dewatering directly to field tiles or storm sewer is prohibited.

O. Stock pile must be kept covered and watered for dust control.
3.2 INSTALLATION/APPLICATION/ERECTION

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. Silt Fences: Space posts 6 ft maximum for non-reinforced or 10 ft maximum for reinforced and securely install with at least 2 feet of post in the ground. Excavate trench approximately 4 in. wide and 4 in. deep along line of posts and upslope side of posts using wire staples, tie wires, or hog rings. Extend wire and fence into trench a minimum of 4 in. Attach geo-textile filter fabric directly to posts and wire reinforcement fence as required by wire, staples, or other means accepted by the ANL CFR. Install filter fabric in a manner such that fabric height above grade is 2 to 3 ft. Do not staple fabric to trees. Do not use fabric with defects or other damage. For manholes, the filter fabric can be placed around the lid and secured by the lid weight.

C. Construction Entrance: Construct with minimum dimensions of 14’ wide, 70’ length and 6” thickness of CA-1 or CA-4. Filter fabric shall be used under the aggregate to minimize the migration of stone into the underlying soil by heavy vehicle loads. See plans for location.

D. Temporary Seeding: Remove large rocks or other debris that may interfere with seedbed preparation or seeding operations. Prepare seedbed of 3 to 4 inches loose soil. If rainfall has caused the surface to become sealed or crusted, loosen, by suitable method, it just prior to seeding. Where pH is below 5.5 and seeding will not take place within 30 days, apply one and one half to two tons per acre of finely ground agricultural limestone. Seeding shall be evenly applied with a cyclone seeder, drill, culti-packer seeder or hydroseeder. Small grains shall be planted no more than one inch deep. Grasses shall be planted no more than one half inch deep.

END OF SECTION
SECTION 01 50 05 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:
   1. Sewers and drainage.
   2. Water service and distribution.
   3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
   4. Heating and cooling facilities.
   5. Ventilation.
   6. Electric power service.
   7. Lighting.
   8. Telephone service.

C. Support facilities include, but are not limited to, the following:
   1. Temporary roads and paving.
   2. Dewatering facilities and drains.
   3. Project identification and temporary signs.
   5. Field offices.
   6. Storage and fabrication sheds.
   7. Temporary stairs.
   8. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:
   1. Environmental protection.
   2. Stormwater control.
   3. Tree and plant protection.
   4. Pest control.
   5. Site enclosure fence.
   7. Barricades, warning signs, and lights.
   8. Covered walkways.
  10. Temporary partitions.
  11. Fire protection.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight;
and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to the Board or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. The Board’s construction forces.
2. Occupants of Project.
3. Architect.
4. Testing agencies.
5. Personnel of authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction, at Project site.

C. Water Service: Pay water service use charges, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.

D. Electric Power Service: Pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.

1.1 SUBMITTALS

E. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

F. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor’s Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

1.4 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA’s "Temporary Electrical Facilities,” and NFPA 241.

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
2. 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.
1.5 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to the Board, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before the Board's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

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


D. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry'.


F. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.

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

H. Paint: Comply with requirements in Division 09 Section "Painting."

I. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Field Offices: Prefabricated or Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading

C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

E. Drinking-Water Fixtures: [Containerized, tap-dispenser, bottled-water drinking-water units], including paper cup supply.
   1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

F. Heating Equipment: Unless the Board authorizes use of permanent heating 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, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

G. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

H. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they shall serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company, the Board, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
3. Obtain easements to bring temporary utilities to Project site where the Board’s easements cannot be used for that purpose.

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

1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to municipal system as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.

D. Water Service: Use of the Board's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to the Board. At Preliminary Acceptance, restore these facilities to condition existing before initial use.

1. Provide rubber hoses as necessary to serve Project site.
2. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot hose. Provide one hose at each outlet.
3. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
4. Provide pumps to supply a minimum of 30-psi static pressure at highest point. Equip pumps with surge and storage tanks and automatic controls to supply water uniformly at reasonable pressures.
E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.

3. Toilets: Install toilet facilities connected to local water and sewer lines. Provide lavatories, mirrors, urinals, and water closets. Provide only potable-water connections. Provide individual compartments for water closets. Provide suitable enclosure with nonabsorbent sanitary finish materials and adequate heat, ventilation, and lighting.

4. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.

   a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.

5. Drinking-Water Facilities: Provide bottled-water, drinking-water units.

   a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

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 from that specified that shall not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.

G. 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 from that specified that shall not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

H. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.

1. Install electric power service underground, unless overhead service must be used.
2. Install power distribution wiring overhead and rise vertically where least exposed to damage.

3. Connect temporary service to the Board's existing power source, as directed by electric company officials.

I. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths shall not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

2. Provide warning signs at power outlets other than 110 to 120 V.

3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.

4. Provide metal conduit enclosures or boxes for wiring devices.

5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions. Provide temporary power for Park District lighting that will have power interrupted during provision of new electrical service.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

2. Provide one 100-W incandescent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.

3. Provide one 100-W incandescent lamp every 50 feet in traffic areas.

4. Provide one 100-W incandescent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.

5. Install exterior-yard site lighting that shall provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

6. Install lighting for Project identification sign.

K. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.

1. Provide additional telephone lines for the following:

   a. In field office with more than two occupants, install a telephone for each additional occupant or pair of occupants.

   b. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.

   c. Provide a separate telephone line for the Board's use.

   d. Install a telephone on every second or third story of construction.

2. At each telephone, post a list of important telephone numbers.
a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Architect's office.
e. Engineers' offices.
f. The Board's office.
g. Principal subcontractors' field and home offices.

3. Provide voice-mail service on superintendent's telephone.
4. Provide a portable cellular telephone for superintendent's use in making and receiving telephone calls when away from field office.
5. Install a coin-operated telephone station at a convenient grade-level location for convenience of personnel.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
   2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
   3. Maintain support facilities until near Preliminary Acceptance. Remove before Preliminary Acceptance. Personnel remaining after Preliminary Acceptance will be permitted to use permanent facilities, under conditions acceptable to the Board.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas within construction limits indicated on Drawings.
   1. Provide level, graded, well-drained subgrade of satisfactory soil material, compacted to not less than 95 percent of maximum dry density in the top 6 inches.
   2. Provide gravel paving course of subbase material not less than 3 inches thick; roller compacted to a level, smooth, dense surface.
   3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.

D. Dewatering Facilities and Drains: Comply with requirements in applicable Division 02 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that shall not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.

3. Remove snow and ice as required to minimize accumulations.

E. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.

1. Prepare temporary signs to provide directional information to construction personnel and visitors.

2. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.

3. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.

4. Project Sign: Furnish and install a project sign, 4'-0" x 8'-0" x 1/2 inch thick, in location will be determined by the AOR at the project site.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.

2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project shall produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

G. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.

H. Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of ten (10) persons at Project site. Keep office clean and orderly.

1. Furnish and equip offices as follows:
   a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
   b. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
   c. Coffee machine and supplies, including regular and decaffeinated coffee, filters, cups, stirring sticks, creamer, sugar, and sugar substitute.
   d. Provide a room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, twelve (12) folding chairs, and 4-foot- square tack board.
2. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
3. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer. Paint interior walls with two coats of interior latex-flat wall paint.
4. Provide resilient floor covering and painted gypsum wallboard walls and acoustical ceiling. Provide operable windows with adjustable blinds and insect screens.
5. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F. Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F.
6. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.

I. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
   1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
   2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

J. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

K. Temporary Elevator Usage: Refer to Division 14 Sections for temporary use of new elevators.

L. Existing Elevator Usage: Use of the Board's existing elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to the Board. At Preliminary Acceptance, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
   1. 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.

M. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes shall be undamaged at time of acceptance.

N. Existing Stair Usage: Use of the Board's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to the Board. At Preliminary Acceptance, 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, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that shall minimize complaints from persons or firms near Project site.

B. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.

D. Tree and Plant Protection: Comply with requirements in Division 02 Section "Tree Protection and Trimming."

E. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project shall be free of pests and their residues at Preliminary Acceptance. Obtain extended warranty for the Board. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that shall prevent people, dogs, and other animals from easily entering site except by entrance gates.

   1. Set fence posts in compacted mixture of gravel and earth.
   2. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
   3. Maintain security by limiting number of keys and restricting distribution to authorized personnel. [Provide the Board with one set of keys.]

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

H. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics,
and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-thick exterior plywood.

I. Covered Walkway: Erect a structurally adequate, protective, covered walkway for passage of persons along adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct covered walkways using scaffold or shoring framing.
2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
3. Extend back wall beyond the structure to complete enclosure fence.
4. Paint and maintain in a manner approved by the Board and Architect.
5. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-thick exterior plywood.

J. 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 not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.

K. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire-retardant plywood on construction side.
2. Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inch studs, 2 layers of 3-mil polyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of 3-mil polyethylene sheets, extending sheets 18 inches up the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inch fire-retardant plywood.
   a. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
3. Insulate partitions to provide noise protection to occupied areas.
4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
5. Protect air-handling equipment.
6. Weatherstrip openings.

L. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
   a. Field Offices: Class A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-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.
7. Provide hoses for fire protection of sufficient length to reach construction areas. 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.
8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 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. Protect from damage caused by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

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

C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Preliminary Acceptance.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Preliminary Acceptance. 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 the property of Contractor. the Board reserves right to take possession of Project identification signs.

2. Remove temporary paving not intended for or acceptable for integration into permanent paving. 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 Preliminary Acceptance, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 01 Section "Closeout Procedures."

END OF SECTION 01 50 05
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 Drawings.

   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 two private offices and one common area, and one toilet. The two 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. (2) - wall mounted mail holders

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. 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 Color Laser Multifunction Image CLASS C5000-Series 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 ½” x 11” and 11” x 17” format paper throughout duration of project.
16. 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.

17. Internet Access: Provide an unlimited Internet access account to achieve a minimum of 50MB 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 gates location 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 drawings.

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 the Commission Representative.

END OF SECTION
SECTION 01 52 40
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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 SUMMARY

A. This Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous demolition and construction waste.
   2. Recycling nonhazardous demolition and construction waste.
   3. Disposing of nonhazardous demolition and construction waste.
B. Related Section: 01 35 60.1 – LEED Requirements

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
D. Downcycling: Creating less valuable products from waste materials. For example, turning nylon face fiber into car parts or carpet padding, including nylon face fiber in recycled backings, or using carpet for waste-to-energy.
E. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
F. Repurposing: Reusing the product in another application. Interface assists in facilitating the donation of used carpeting to charities and other nonprofit organizations.

G. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

H. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

I. Upcycling: Turning waste materials into more valuable products. For example, using waste PET (plastic from soda bottles) to create Terratex panel fabric.

1.4 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of a minimum of 75 percent by weight of total waste generated by the Work.

B. Documentation to achieve LEED MR credit 2 and any other applicable standards / requirements.
   1. Site clearing and environmentally impacted waste, and soils, do not contribute to achievement of LEED credit and should not be included as part of LEED documentation.

1.5 SUBMITTALS

A. Waste Management Plan: Submit Plan within 15 days of date established for the Notice to Proceed.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, or as directed by the Commission Representative, submit Progress Report. Include separate reports for demolition and construction waste. Include the following information:
   1. Material category.
   2. Generation point of waste.
   3. Total quantity of waste in tons
   4. Quantity of waste salvaged, both estimated and actual in tons
   5. Quantity of waste recycled, both estimated and actual in tons
   6. Total quantity of waste recovered (salvaged plus recycled) in tons
   7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
   8. Receiving point for waste that is recycled or otherwise diverted from landfill.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices. Submit concurrently with waste reduction progress reports.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices. Include manifest, weight tickets, receipts and invoices. Submit concurrently with waste reduction progress reports.

H. LEED Submittal: LEED form for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. Final Waste Report(s) from hauler, disposal sites.

I. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.

J. 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


B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:

   1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste.
Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

E. Forms: Prepare waste management plans and logs on forms similar to those included at end of Part 3. Contractor may use the forms included or forms used successfully in the past by the Contractor on LEED projects with approval from Architect and Owner. All information/content/categories in the sample forms included shall be in the final forms.

1. Contractor shall include all backup to information on forms.
2. Contractor to separate soils, landscape debris, environmentally impacted materials from total calculation.
3. Contractor shall define any and all materials marked as “inert”.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
   1. Distribute waste management plan to everyone concerned within three days of submittal return.
   2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
   2. Comply with Division 01 requirements for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. 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.

B. Salvaged Items for Sale and Donation:
1. General: Salvaged items are to be removed from the project site to destination or Contractor’s storage facility by the Contractor. No direct salvage from site by other parties.

2. Salvage Incentives: Revenues, savings, rebates, tax credits, and other incentives received for salvaged waste materials not to be returned to the Owner shall accrue to the Contractor.

C. Salvaged Items for Owner'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 Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. 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.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.
2. Crush concrete and screen to comply with requirements in Division 02 Sections for use as satisfactory soil for fill or subbase.
C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
   1. Pulverize masonry to maximum 1-1/2-inch (38-mm) size.
      a. Crush concrete masonry and screen to comply with requirements in Division 02 Sections for use as satisfactory soil for fill or subbase.
   2. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.
   1. Structural Steel: Stack members according to size, type of member, and length.
   2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

G. Plumbing Fixtures: Separate by type and size.

H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

I. Lighting Fixtures: Separate lamps by type and protect from breakage.

J. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

K. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:
   1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
   3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
   4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction in accordance with Section 02316.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Do not cross contaminate contaminated materials with clean construction materials.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them in accordance with Section 02316.

END OF SECTION 01524
SECTION 01 56 11

GENERAL DUST, FUME AND ODOR CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Dust and fume emission control is required to maintain a healthful learning environment for students, maintain good public relations with neighbors and employees, prevent damage, minimize cleaning and maintenance costs, and to comply with regulations and laws. All contractors (including subcontractors, lower-tier subcontractors, and suppliers) who perform work or provide services at Chicago Public School facilities are required to control dust and fume emissions from their operations and/or activities.

1.2 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. Architect of Record (AOR) means the entity that assembles the overall documents and bid package, and approves the completed work.

C. Board Authorized Representative means the entity responsible for overall project coordination and completion.

D. Chicago Public Schools (CPS) means the owner of the property and the authority ordering the work specified herein.

E. General Contractor (GC) or in case of stand alone projects Abatement Contractor means 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.

F. HEPA Filter means 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.

G. IDPH means the Illinois Department of Public Health.

H. Managing Environmental Consultant (MEC) designs the environmental work, maintains the documents, conducts oversight, and reviews the environmental work, submittals, and reports.

I. MSDS means Material 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.

J. Plasticize means to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.

K. Personal Protective Equipment (PPE) means the protective suits, head and foot covers, gloves, respirators and other items used to protect persons from potential hazards.
L. Work Area means the area or areas where work is being conducted.

1.3 WORK INCLUDED

A. The work includes the control of all nuisance or noxious dust, vapors, fumes, odors or emissions caused by construction, demolition, renovation, restoration, or related activities including, but not limited to sawing, cutting, grinding, sanding, abrading, sweeping, crushing, scraping, gluing, prying, plowing, heating, finishing, painting, welding, torch cutting or burning, or any other related processes at CPS facilities that can create noxious dust, fumes or odors.

B. No visible emissions or unreasonable odors shall be permitted outside the work area.

C. All products to be used at CPS facilities that could potentially emit dusts, fumes, vapors or odors, etc. shall be submitted to the CPS Environmental Coordinator, MEC and/or Board Authorized Representative with accompanying MSDS for approval prior to the use of the product.

1.4 LAWS, REGULATIONS, AND STANDARDS.

A. The Contractor is responsible for compliance with all applicable federal, state, county and municipal 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:

4. 11-4-2170: Chicago Building Code- Demolition and renovation safeguards.
5. 11-4-2190: Chicago Building Code: Sandblasting, grinding and chemical washing of buildings, facilities or other structures - Dust minimization--Containment, wetting or vacuuming; plan required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 BARRIERS OR WORK AREA ISOLATION

A. Contractors shall prevent the spread of dust, fumes and odors from their immediate work areas by:

1. Erecting dust-tight barriers between indoor work areas and adjacent occupied areas. Construction barriers may be used for this purpose if suitably constructed to prevent dust, fume or odor migration.
2. Closing and or covering windows, intake vents, louvers, or other building openings in the immediate vicinity of outdoor work, sufficient to prevent dust, fume or odor migration into the building interior. If such openings cannot be adequately sealed by closing, then poly sheeting, tape, or other impermeable covers shall be used.
3. The contractor shall provide a filtered, local exhaust system for the isolated work area.

B. Contractor is prohibited from creating other hazardous or uncomfortable conditions for building occupants, such as very hot, humid, cold, or other conditions created by ventilation system alterations or blockages, closed or open windows in hot or cold weather conditions.

C. Contractor is responsible for making itself familiar with building conditions and shall take care to isolate its work area in such a manner that building occupant activities and comfort are not unreasonably disrupted.

3.2 DUST, FUME AND ODOR CONTROL

A. Dust, fume or odor release shall be prevented by a suitable means, including but not limited to:

1. Tools equipped with shrouds, HEPA filter equipped vacuum pickups.
2. Alteration, shut down, or isolation of building ventilation systems in the immediate work vicinity.
3. Shrouding around work activities.
4. Shrouding stages, scaffolds, or other work platforms.
5. Local exhaust ventilation systems exhausted to the outside of the building.
6. Wet work methods.

B. It is the Contractor’s responsibility to select the means and methods it considers most suitable to achieve dust, fume and odor control.

C. In the event that dust or fumes escape from the work area or create dirty conditions or contamination to nearby building spaces or grounds, the Contractor is responsible for all costs associated with the cleaning, testing and/ or repair deemed necessary by the Board Authorized Representative.

END OF SECTION
SECTION 015639 – TREE AND LANDSCAPE PROTECTION

PART 1 - GENERAL

1.01 Description

A. General

1. The Contractor is responsible for ensuring the ongoing protection of all landscaped areas within the scope of work, including adjacent areas that may be impacted including access and egress routes. Existing landscaping including trees, shrubs, lawns, planting beds, etc. shall be adequately protected by the Contractor so as to avoid destruction and/or damage as a result of operations by the Contractor.

2. Before beginning work, the contractor will be required to meet with the District Forester at the site to review all work procedures, access routes, storage areas, and tree and landscape protection measures.

3. Any proposed changes to agreed-upon work procedures, access routes, storage areas, and/or tree and landscape protection measures must be reviewed and approved by the District Forester prior to implementation of any proposed changes.

1.02 Tree and Landscape Protection Zones

A. General

1. The location, limits and extent of tree and/or landscape protection zones are to be determined in the field by the CPD Forester prior to any work being performed.

2. Driving, parking, dumping, stockpiling and/or storage of vehicles, equipment, supplies, materials, debris, spoils, waste or washout water within tree and/or landscape protection zones is strictly prohibited.

3. All underground utilities, drain and/or irrigation lines are to be routed OUTSIDE the landscape protection zone. If underground lines must traverse the protection area, they shall be tunneled or bored below the root zones.

B. Tree and Landscape Protection Fencing

1. Tree and/or landscape protection zones are to be enclosed by 4 ft. high orange plastic construction fencing secured to steel posts on max. 6 ft. spacing.

2. All tree and landscape protection fencing must be in place prior to any work being performed on site, including delivery of materials or supplies, vehicular traffic, installation of security fencing, etc.

3. Tree and landscape protection fencing is to be maintained intact, by the Contractor, throughout the duration of the work and until all site work has been completed. Removal or relocation of protection fencing must be approved by the District Forester. Fences may NOT be relocated or removed without the written permission of the District Forester.

C. Temporary Access Over Root Zones
1. Where temporary haul or access routes must pass over the root area of trees to be retained, a 6-inch thick “access route” of an approved cushioning material shall be put in place to protect the root zones.

2. The location and route of the temporary “access route” must be approved by the District Forester prior to any work being performed.

3. The “access route” material shall be replenished as necessary to maintain a uniform 6-inch depth. Failure to maintain the depth of cushioning material will be considered a violation of the contract and may result in the assessment of fines and/or damages.

4. Vehicular traffic must be confined to the defined “access route;” failure to confine vehicular access to the defined “access route” will be considered a violation of the contract and may result in the assessment of fines and/or damages.

1.03 Tree and Landscape Damage

A. General

1. Trees, shrubs, lawns and/or other landscaping destroyed or damaged by the actions of the Contractor or any of the Contractor's subcontractors or agents shall be replaced or restored to its previous condition, including repair of ruts, new topsoil and regrading, at the sole expense of the Contractor, to the standards of work set forth in these specifications and to the satisfaction of the Park District. All repaired lawn areas are to be sodded.

2. Failure to comply with any of the provisions set forth in this specification by the Contractor or any of the Contractor's subcontractors or agents, whether resulting in obvious landscape damage or not, will be considered a violation of the Contractor's Contract with the Park District.

3. Examples of landscape violations include, but are not limited to:
   a. Failure to erect and/or maintain landscape protection fencing.
   b. Storage or dumping of materials, equipment or debris within landscape protection zones.
   c. Driving and/or parking on non-paved surfaces, particularly under trees and/or on lawn areas.
   d. Damage to trees, shrubs, lawns, planting beds and other landscape elements caused by the action, or consequence of an action, by the Contractor or any of the Contractor's subcontractors or agents.
   e. Pruning of trees, branches, limbs or other woody material by any personnel other than a Certified Arborist.

4. Fines
   a. The Park District may assess fines against the Contractor in response to a documented violation.
   b. Generally, fines are assessed at $500.00 per violation per day.
   c. Violations which are ongoing will be fined at a rate of $500.00 per violation per day until resolved to the satisfaction of the Park District.

5. Damage Liability
a. When damage to Park District property has been documented, the Park District may assess monetary damages against the Contractor in an amount which represents the estimated cost to the Park District, as determined by the Park District, to repair, replace or otherwise remediate damage done to Park District property by the Contractor. This assessment is in addition to any fines assessed for the same violation.

B. Damage or Injury to Trees

1. Damage or injury to trees includes, but is not be limited to: breakage, gouging, stripping, skinning, inappropriate pruning or cutting to bark, limbs, branches, trunks and/or roots, and/or compaction, dumping or flooding of roots or root zones.

2. Fines and Damages
   a. Lethal damage: Contractor will be charged the sum of $250.00 per caliper inch of trunk diameter, measured one foot above ground line, for any tree removed without authorization or damaged to such an extent that it must be removed.
   b. Non-lethal damage: Contractor will be charged the sum of $100.00 per square inch of surface area damaged or injured.
   c. The District Forester will make the final determination as to the extent of any damage, square inches of injury and whether the damage is extensive enough to require the removal of the damaged tree.

PART 2 - EXECUTION

2.01 Tree and Landscape Protection Zones

A. General
   1. The location, limits and extent of tree and/or landscape protection zones are to be determined in the field by the CPD Forester prior to any work being performed.
   2. All tree and landscape protection zones must be identified and all fencing or other approved measures in place prior to any project-related activity being performed on site, including delivery of materials or supplies, vehicular traffic, installation of security fencing, etc., and must be maintained intact throughout the duration of the work.

B. Tree and Landscape Protection Fencing
   1. See Tree Preservation Drawing L1.0 for layout and installation of fence.
   2. Materials
      a. Fabric: To be 4 ft. high orange plastic construction fencing, securely fastened to posts with durable ties.
      b. Posts: 6 ft long steel post, to be installed on maximum 6 ft. spacing, driven 2 feet into the ground; final orientation to be straight and plumb.
   3. Fencing is to completely enclose all protected zones.
   4. Fencing is to be maintained intact at all times. Fencing will not be considered intact if fabric is missing, torn, or no longer attached to posts, posts are bent, broken,
missing or otherwise non-functional, or if any other circumstances are present which compromise the integrity of the protection zone.

C. Temporary Access Over Root Zones

1. Approved temporary haul or access routes are to be constructed of a 6-inch thick layer of an approved cushioning material, such as shredded mulch or non-limestone gravel.

2. The material, location and route of the temporary “access route” must be approved by the District Forester prior to any work being performed.

3. Delivery of the cushioning material to the “access route” location and installation of the cushioning material must be done either by hand or with small bobcat-type machines to prevent compaction of the root zones.

4. The cushioning material shall be replenished as necessary to maintain a uniform 6-inch depth.

5. Removal of the cushioning material must be done either by hand or with small bobcat-type machines. All of the material must be completely removed. Where small machinery is used to remove the bulk of the material, removal of material in contact with the soil surface must be done by hand, and in such a way as to minimize disturbance of the soil surface and prevent damage to surface or feeder roots.

2.02 Tree and Landscape Protection During Demolition and/or Construction Activities

A. General

1. The Contractor is required to meet with the District Forester at the site prior to beginning work to review all work procedures, access and haul routes, and tree and landscape protection measures.

2. The District Forester shall be on site during all operations within protection zones. 24-hour notice must be given to District Forester, requesting his presence for work scheduled within the tree protection zone.

3. Work determined to have occurred within protection zones without the presence and approval of the District Forester will be considered a violation of the Contractor’s Contract with the Park District.

4. Any damage to trees due to the Contractor’s activities shall be reported to the District Forester within 6 hours so that proper remedial action can be taken.

B. Staging and Work Activities

1. No grade changes, including cutting (soil removal) or filling (deposition of soil) will be allowed within tree protection zones or on the root zones of trees.

2. Demolition, removal, repair, construction or other work on structures or underground features within protection zones shall be accomplished using the smallest equipment possible, operated from outside the protection zone.

3. Temporary vehicle clearance:

   a. Where temporary clearance is needed for access, tree branches shall be tied back to hold them clear of the clearance zone. Tie backs shall be done in such a manner as to prevent any cracking or breakage of branches or skinning of bark.
b. All tree pruning required for clearance during construction must be approved by the District Forester. All pruning is to be performed by a Certified Arborist.

4. Chemical treatments

a. All herbicides, insecticides, pesticides or other chemicals proposed for use on the project site must be safe for use around trees, not easily transported by water, labeled for the use intended and approved for use by the District Forester.

b. All chemicals used on the project site must be used and disposed of according to the labeled directions. Landscape damage resulting from improper use or disposal will be considered a violation of the Contractor’s Contract.

5. Spoil from trenches, basements, or other excavations shall not be placed within tree protection zones, either temporarily or permanently.

6. No burn piles or debris pits shall be placed within tree protection zones. No ashes, debris, or garbage may be dumped or buried within the tree protection zone.

C. Tree Removals

1. All trees to be removed from within the project area shall be removed by a Certified Arborist.

2. Trees shall be cut near ground level and the stump ground out to a clear depth of eighteen inches below grade, or as otherwise specified.

3. Trees to be removed from project areas not within tree protection zones must be felled and removed in such a way as to avoid damage to trees(s) and understory to remain.
   a. Tree(s) to be removed which have branches extending into the canopy of tree(s) to remain must be removed in a manner that causes no damage to the branches, limbs, trunk or bark of trees(s) and understory to remain.
   b. Trees to be removed shall be felled so as to fall away from tree protection zones and to avoid pulling and breaking of roots of trees to remain. If roots are entwined, the District Forester may require first severing the major woody root mass before extracting the trees. This may be accomplished by cutting through the roots by hand, with a vibrating knife, rock saw, narrow trencher with sharp blades, or other root-pruning equipment as approved by the District Forester.
   c. Extraction of downed trees within protection areas shall occur by lifting the material out either by hand or with equipment staged outside the tree protection zone. Dragging or skidding across the ground will not be permitted.

D. Pruning

1. All pruning shall be performed by a Certified Arborist.

2. Standards
   a. All pruning shall be in accordance with the Tree Pruning Guidelines (International Society of Arboriculture) and/or the ANSI A300 Pruning Standard (American National Standard for Tree Care Operations) and adhere to the most recent edition of ANSI Z133.1
   b. Guidelines:
      1) Interior branches shall not be stripped out.
2) Pruning cuts larger than 4 inches in diameter, except to remove dead wood, shall be avoided.

3) Pruning cuts that expose heartwood shall be avoided whenever possible.

4) No more than 20 percent of the foliage shall be removed within any single tree.

3. Root Pruning

a. Any grading, construction, demolition, or other below-ground work which may reasonably be expected to encounter tree roots must be monitored by the District Forester.

b. All root pruning is to be performed by a Certified Arborist.

c. Before grading, excavation or trenching for project work adjacent to tree protection zones, trees shall be root pruned to a depth of 24 inches as follows:

1) A 24” deep trench shall be manually dug one (1) foot outside the tree protection zone perimeter.

2) As roots are exposed, they shall be cleanly cut with a hand saw, vibrating knife, rock saw, narrow trencher with sharp blades, or other root-pruning equipment approved by the District Forester.

d. Any roots damaged during grading or construction shall be exposed to sound tissue and cut cleanly with a saw.

E. Brush Removal

1. Any brush clearing required within the tree protection zone shall be accomplished with hand-operated equipment.

2. Removal of all downed brush within protection areas shall occur by lifting the material out either by hand or with equipment staged outside the tree protection zone. Dragging or skidding across the ground will not be permitted.

3. Where approved by the District Forester, brush removed from the project site may be chipped and chips spread underneath trees within the tree protection zone to a maximum depth of 6 inches, leaving the trunks clear of mulch.

2.03 Clean-Up and Disposal

A. General

1. Upon completion of work, the Contractor is responsible for ensuring that all landscaped areas within the scope of work, including adjacent areas that may have been impacted, are clean and free of trash or debris.

2. All landscaped areas are to be restored to their previous condition, to the satisfaction of the Park District.

3. All excess material, debris and/or waste generated by the Contractor’s operations is to be disposed of properly, off Park District property, by the Contractor.

END OF SECTION 01 56 39
SECTION 01 57 15 - INTEGRATED PEST MANAGEMENT DURING CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Provide supervision, labor, materials, reporting and equipment necessary to facilitate an Integrated Pest Management (IPM) program for the construction duration.
   2. Prevent the ingress of rodents and pests during construction.

B. Related Sections:
   1. Drawings.
   2. Book 1: Project Information, Instructions to Bidders, and Execution Documents.

1.2 DEFINITIONS

A. Integrated Pest Management (IPM): An approach to pest control that utilizes regular monitoring and record keeping to determine if and when treatments are needed.

B. Integrated Pest Management (IPM): An approach to pest control that utilizes regular monitoring and record keeping to determine if and when treatments are needed.

C. Integrated Pest Management Plan (IPMP): The IPMP monitors, identifies, assesses injury levels, sets action levels, implement treatments, and monitors results.

D. Integrated Pest Management Coordinator (IPMC): individual provided by Contractor to develop and oversee the IPMP and to oversee pesticide application on PBC property.

E. Pesticide: any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.

F. Rodents and Pests: means arthropods, rodents, roaches, nematodes, snails, insects, termites, snakes and other vermin that adversely affect readiness, building operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

G. Architect Of Record (AOR): means any person or firm employed by the Commission for the purpose of designing the project.

H. Commission Representative (CR): means the person assigned, in writing, by the Executive Director to be the Commission’s Representative for the project.

1.3 PERFORMANCE REQUIREMENTS

B. EPA Registration of Pesticide Products in accordance with the Federal Insecticide Fungicide and Rodenticide Act (FIFRA).

C. City of Chicago Department of Public Health.

D. When there is a conflict between applicable regulations, the most stringent will apply.

1.4 SUBMITTALS

A. Qualification Data: For Contractors IMPC.

B. IPMP Initial: All aspects of the IPMP shall be in accordance with Federal, State, and the City of Chicago laws and regulations. The Contractor’s initial IPMP submittal shall be submitted within 30 days of Contractors mobilization to the project site and shall include, but not necessarily be limited to, the following items:

3. Proposed Service Schedule for each building, site, or phase.
4. Commercial Pesticide Applicator Name, Address, Phone contact, Certificates or Licenses.
5. List of existing buildings or structures within 50 feet of limits of construction.
6. Site locator map on 11x17 size showing each building, site, or phase.

C. IPMP Updates: The Contractor is responsible for maintaining a pest control logbook. The Contractor’s IPMP shall be updated monthly for the duration of the project and shall include, but not necessarily be limited to, the following:

1. All contents of IPMP Initial submittal.
2. Records pertaining to routine inspections for signs of pests.
3. Records pertaining to responses to pest emergencies.
4. Record of recommendations for structural and procedural modifications necessary to achieve pest prevention.
5. Records of the control measures performed, all pesticides used, surveillance and trapping components used, labels and MSDS sheets, brand names.
6. Monthly update to include dates and times Contractor’s IPMC visited the site, names of personnel who applied the pest control pesticides and set up trapping devices.
7. Contractor’s personnel training meeting minutes.

D. Final Acceptance Affidavit.

1.5 QUALITY ASSURANCE

A. IPMC Qualifications: Contractor to provide the services of an Illinois licensed and certified exterminator company with minimum 10 years experience, whose principal business is pest control.
B. Training of Personnel: The Contractor's personnel shall be trained that IPM is being implemented on the project. Conduct a pest control meeting for all personnel prior to commencing IPM activities. Conduct additional meetings for new personnel and when site conditions change. Include in the training and meeting agenda: familiarization with the methods of installation, care of devices and instruments used for monitoring, anticipated hazardous or toxic chemicals or other regulated contaminants when applicable. Contractor shall keep meeting notes to include in the IPM updates.

C. Pesticide Treatment Plan:

1. Comply with Federal, State, and Local pest management record keeping and reporting requirements.
2. Reporting: Include and update records in the IPM the sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment.
3. Application of all pesticides shall be by an Illinois licensed and certified exterminator with minimum 5 years experience on projects of similar size and scope.

1.6 FINAL ACCEPTANCE

A. Before final acceptance of the building, the Contractor shall provide a statement in affidavit form, signed by the IPMC that the building premises are free from rodents and pests, and that all pesticides and related control devices and instruments have been properly removed or disposed of in accordance with label directions

1.8 DELIVERY, STORAGE AND HANDLING

A. Pesticide Delivery and Storage:
1. Deliver pesticides to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses. Store pesticides according to manufacturer's instructions and under lock and key when unattended.
2. Licensed Applicator may bring pre-mixed product in EPA approved compressed sprayer-type container providing product is listed in the IPMP and follows all EPA manufacturer label requirements.

B. Pesticide Handling Requirements: Formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions and use the clothing and personal protective equipment specified on the labeling for use during all phases of the application. Furnish Material Safety Data Sheets (MSDS) for all pesticide products for owners use.

PART 2 - PRODUCTS

2.1 EXTERMINATION CONTRACTOR

A. Select from the following Firms:
1. Alpha Omega Pest Control Corp.
2. Anderson Pest Control
3. Orkin Pest Control
4. Quality Excellence Pest Control, Inc.
5. Smithereen Exterminating Co.
6. Rose Pest Control

PART 3 - EXECUTION

3.1 EXAMINATION
A. Comply with all applicable laws, rules and regulations.

3.2 PROTECTION
A. Provide egress, barricades, signage and warnings as may be required by the IPMC during IPM operations.

3.3 CLEANING
A. Remove all pesticides, related control devices and instruments in accordance with label directions and the IPMC.

3.4 PERSONAL PROTECTION AND EQUIPMENT
A. Apply pesticides using an Illinois licensed and certified exterminator in accordance with EPA label restrictions and recommendations.
B. The Licensed Applicator shall wear clothing and personal protective equipment as specified on the pesticide label.
C. The CR will designate locations for water used in formulating. Do not allow the equipment to overflow.
D. Inspect all equipment for leaks, clogging, wear, or damage and repaired prior to application of pesticide.
E. Clean all previously used equipment prior to bringing it onto the project site. Ensure that the equipment is free from residuals.

3.5 PESTICIDE USE
A. The Contractor shall adhere to the following minimum rules for pesticide use in accordance with the IPMP:
1. Minimize environmental pollution and damage that may occur as the result of Pest Control measures.
2. Protect the environmental resources within the project boundaries, and those affected outside the limits of permanent work, during the entire duration of the project.
3. Comply with all applicable environmental Federal, State, and local City of Chicago laws and regulations. Any delays resulting from failure to comply with environmental laws and regulations shall be the Contractor’s responsibility.
4. Do not apply any pesticide product that has not been included in the IPMP.
5. Do not store any pesticide product in any area on the construction site not specified in the IPMP.
6. Pesticide application shall be according to need and not by schedule.
7. When pesticide use is necessary, employ the least hazardous material, most precise application technique, and minimum quantity of pesticide necessary to achieve control.

3.6 RODENT CONTROL

A. The Contractor shall adhere to the following minimum rules for rodent control in accordance to the IPMP:

1. Trapping Devices: All such devices shall be in protected areas so as not to be affected by routine operations. Trapping devices shall be checked on a schedule approved by the IPMC.
2. All rodenticides shall be placed either in locations not accessible to children, pets, wildlife, and domestic animals, or in EPA-approved tamper-resistant bait boxes.
3. Use of Bait Boxes: All bait boxes shall be maintained in accordance with EPA regulations, lids shall be securely locked or fastened shut, bait boxes shall be securely attached or anchored to the floor, ground, or wall, or in EPA-approved tamper resistant boxes labeled on the interior with IPMC business name and address.
4. The Contractor shall be responsible for disposing of all trapped rodents and all rodent carcasses in an appropriate manner.

END OF SECTION 01 57 15
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 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.3 DEFINITIONS

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

1.4 QUALITY ASSURANCE

A. General: Contractor shall take reasonable care prior to all cutting and drilling in order to minimize unintended damage to concealed conduits, cables, pipes, reinforcing steel, etc. In circumstances where the absence of such concealed elements is not established conclusively, utilize detection and mapping technology, e.g., X-ray or Sub-surface Interface Radar (SIR), to locate any such elements that may be present before proceeding with the cutting or drilling work.

B. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

C. 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:
   1. Air or smoke barriers.
   2. Fire-protection systems.
   3. Control systems.
   4. Communication systems.
   5. Conveying systems.
   6. Electrical wiring systems.
   7. Operating systems of special construction in Division 13 Sections.
D. Miscellaneous Elements: Do not cut and patch elements or related 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. Miscellaneous Elements include the following:
1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.

E. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces 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.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing and In-Place Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, shall match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to prevent interruption of services to occupied areas.
1. If existing services to occupied areas must be interrupted, coordinate and receive approval of the interruption of services prior to starting work.

3.3 PERFORMANCE

A. 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 existing 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. Cutting: Cut existing 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 as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing 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.

C. 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 possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that shall eliminate 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 existing 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, apply primer and intermediate paint coats 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 existing 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.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION
SECTION 017419

Revise this Section by deleting and inserting text to meet Project-specific requirements.

SOIL, FILL, CU STRUCTURAL SOIL/ STONE & CONSTRUCTION & DEMOLITION DEBRIS REMOVAL

PART 1 - GENERAL

1.1 Applicability:

A. These environmental requirements apply to all Chicago Park District (CPD) properties, including but not limited to field houses, open spaces, landscape areas, pathways, playgrounds, ball fields, basketball and tennis courts, parkways, and parking lot areas.

1.2 Introduction

A. Related Documents: All terms and conditions of the Contract apply to this Section.

B. Work included: This specification is for the excavation, stockpiling, loading, hauling, removal, and disposal of any soils (including non-special waste soils and non-hazardous special waste soils), fill, backfill, top soil, CU structural soil/stone, and/or construction and demolition debris from CPD properties. The contractor shall perform the work under this Section in accordance with all applicable local, county, state, and federal regulations. The work shall include the following:

   1. Removal and disposal
      a. Excavation of soils (including non-special waste soils and non-hazardous special waste soils), fill, backfill, top soil, CU structural soil/stone, and/or construction and demolition debris materials to the depth required to complete the proposed site preparation/construction work activities as specified in the Architect/Engineer drawings and specifications.
      b. Perform analytical testing by an IEPA-accredited laboratory for waste stream authorizations as necessary to secure authorization to dispose of the material at an appropriately permitted disposal facility.
c. Collect samples only from the excess materials that require offsite disposal. Under no circumstances shall the contractor sample any material that is to remain onsite without authorization directly from the CPD.

d. Obtain authorization from a permitted disposal facility – either a Clean Construction & Demolition Debris facility or a Subtitle D landfill. Authorization indicating acceptance of materials at the facility must be signed by the owner or authorized representative of the permitted disposal facility and state that the facility complies with all local zoning codes and all local, state, and federal rules and regulations, that all required laboratory analyses have been received by the facility, and that the facility has agreed to accept the soils (including non-special waste soils, and non-hazardous special waste soils), fill, backfill, top soil, CU structural soil/stone, and general construction and demolition debris materials. The authorization shall further state that the soils (including non-special waste soils and non-hazardous special waste soils), fill, backfill, top soil, CU structural soil/stone, general construction and demolition debris materials are being accepted for permanent placement on site, and that the material will not be removed from the site unless required by a local, state or federal authority. Note that the CPD will not supply a signed LPC-662 form or any other clean soil certification form. If the contractor wants to dispose of the material at a CCDD facility, the contractor shall be responsible for completing the LPC-663 form and all associated requirements. If applicable, the CPD will sign a non-special waste certification form for Subtitle D landfill disposal.

e. Load and transport all materials to the approved permitted disposal facility.

f. Prepare daily reports, transport manifests, weight tickets and receipts (as applicable) prior to starting any soil removal activities.

g. Provide copies of all daily reports, transport/waste manifests, weight tickets, and disposal receipts (as applicable) to the CPD Authorized Representative on a daily basis documenting proper disposal of soils (including non-special waste soils and non-hazardous special waste soils), fill, backfill, top soil, CU structural soil/stone, and general construction and demolition debris materials.

1.3 DEFINITIONS

A. Agency means Illinois Environmental Protection Agency (IEPA).

B. Board Authorized Representative means the person or entity designated as the official representative of the owner in connection with a project.
C. Clean Construction & Demolition Debris means uncontaminated broken concrete without protruding metal bars, bricks, rock, stone, reclaimed or other asphalt pavement, or soil generated from construction or demolition activities. CCDD may include uncontaminated broken concrete without protruding metal bars, bricks, rock, stone, or reclaimed or other asphalt pavement that has been painted (“painted CCDD”) if the painted CCDD is used as fill material at a CCDD fill operation in accordance with Section 1100. 212 the Illinois Environmental Protection Act. Clean construction or demolition debris does not include uncontaminated soil generated during construction, remodeling, repair, and demolition of utilities, structures, and roads provided the uncontaminated soil is not commingled with any clean construction or demolition debris or other waste. Uncontaminated soil may include incidental amounts of stone, clay, rock, sand, gravel, roots, and other vegetation.

D. CU structural soil/stone means a uniformly blended mixture of crushed stone, clay, loam and/or hydrogel.

E. Fill means any earthen or non-earthen materials including but not limited to any sediment, granular or cohesive non-native earthen materials, cinders, ash, wood, and brick, concrete, and asphalt fragments, glass, and building debris encountered above naturally occurring undisturbed soils or bedrock in built-up areas.

F. General construction and demolition (C&D) debris means non-hazardous, uncontaminated materials resulting from construction, remodeling, repair, and demolition of utilities, structures, and roads as defined in Public Act 92-0574, The Environmental Protection Act, 415 ILCS 5 Section 3.160 and regulated under Title 35: Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board; Subchapter i: Solid Waste and Special Waste Hauling. C&D debris may include soil, wall coverings, reclaimed asphalt pavement, rock, plaster, glass, non-hazardous painted wood, drywall, plastics, non-hazardous coated wood, non-asbestos insulation, bricks, wood products, roofing shingles, concrete, and general roof coverings.

G. Permitted Subtitle D landfill means any solid waste landfill facility in any state licensed and/or permitted to accept non-hazardous waste.

H. IEPA means Illinois Environmental Protection Agency.

I. IDOT means Illinois Department of Transportation.

J. Manifest means the form provided or prescribed by IEPA and used for identifying name, quality, routing, and destination of special waste during its transportation from point of generation to the point of disposal, treatment, or storage.
K. Hazardous waste means a waste, or combination of wastes, which has been identified by characteristics or listing as hazardous pursuant to Section 3001 of the Resource Conservation and Recovery Act of 1976, P.L. 94-580, 40 CFR part 261, Illinois Environmental protection Act 415 ILCS 5/3.220, and Section 809.103 of Title 35: Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board. A waste is classified as hazardous if it exhibits any of the following characteristics: 1) ignitability, 2) corrosivity, 3) reactivity, or 4) toxicity, and as defined in Illinois Administrative Code Title 35, Section 721.103 (35 IAC 721.103).

L. MSDS means Material Safety Data Sheet, required by OSHA for any substances that are toxic, caustic, or otherwise potentially hazardous to workers.

M. Non-Special Waste mean a non-hazardous industrial-process or pollution-control waste that is not a liquid (as determined by paint-filter test SW-846 Method 9095); not regulated asbestos-containing material as defined in 40 Code of Federal Regulations, Section 61.141; does not contain polychlorinated biphenyls (PCBs) regulated in accordance with 40 Code of Federal Regulations, Part 761; is not formerly hazardous waste rendered non-hazardous; and does not result from shredding recyclable metals (e.g. auto fluff).

N. OSHA means Occupational Safety and Health Administration.

O. Soil means any granular or cohesive materials designated for removal as specified in the Architect/Engineer drawings and specifications and includes soils that are determined to be non-special and special waste.

P. Special waste means any wastes as defined in Title 35: Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board; Subchapter i: Solid Waste and Special Waste Hauling; Part 808: Special Waste Classifications; Subpart A: General Provisions; Section 808.110, AND Any wastes as defined in Title 35: Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board; Subchapter i: Solid Waste and Special Waste Hauling; Part 809: Non Hazardous Special Waste Classifications; Subpart A: General Provisions; Section 809.103.


R. Storm water means water deposited at the site in the form of rain, snow or other natural weather event.
S. TACO means TIERED APPROACH TO CORRECTIVE ACTION OBJECTIVES per 35 Illinois Administrative Code 742.

T. Top soil means soils or black dirt used to promote vegetative growth.

U. USEPA means United States Environmental Protection Agency.

1.4 Submittals

A. Copies of the following submittals shall be prepared and submitted to the CPD Authorized Representative at contractor’s own cost:

1. Soil, fill, backfill, CU structural soil/stone, construction and demolition debris removal
   a. Soil Management Plan outlining proposed excavation work sequences and procedures to separate each type of material to be removed from the site from clean materials. The Soil Management Plan shall show the locations of each type of material to be stored on site, location of clean materials to be stored at the site for reuse, and location of material to be stored on site for future disposal. The Soil Management Plan shall also include information regarding concrete and brick recycling procedures and name and address of the concrete and brick recycling sites that will be used as part of this project.
   b. Name, address and telephone number of the permitted disposal facility where soils (including non-special waste soils and non-hazardous special waste soils), fill, and/or construction and demolition debris are to be treated, stored, or disposed. This submittal must be made prior to removal of any materials from the site. This information should include, at a minimum, the following:
      1) Facility name and address and telephone number
      2) Site contact
      3) Facility identification number issued by Illinois, U.S. EPA, or other state licensing agencies
      4) USEPA disposal site ID numbers (if applicable)
      5) State and/or local operational permit number(s) for the impacted construction and demolition debris disposal sites
   c. Letter of authorization from the facility where soils (including non-special waste soils and non-hazardous special waste soils), fill, general or clean construction and demolition debris are to be deposited prior to removal from the site. The authorization must be signed by the permitted disposal facility representative and state that the facility complies with all local zoning codes and all local, state, and federal rules and regulations, that all required laboratory analyses has been received by the facility, and that the facility has agreed to accept the soils (including non-special waste soils, and non-hazardous special waste soils), fill, and/or construction and
demolition debris materials. The authorization shall further state that the soils (including non-special waste soils and non-hazardous special waste soils), fill, and construction and demolition debris fill materials are being accepted for permanent placement on site, and that the material will not be removed from the site unless required by a local, state or federal authority.

d. Copies of analytical results for each waste stream to be removed from the site as applicable. The name and address and telephone number of the laboratory that will be used by the contractor to perform analytical testing for waste stream authorization. The laboratory contracted to perform the analytical testing must be IEPA-accredited for the analysis being requested.

e. Storm Water Management Plan - prior to commencing work, the contractor shall provide a liquid materials handling plan. This plan shall stipulate provisions for dewatering, pumping, collection, temporary storage, and discharge or disposal of storm water, perched water and other liquids, contaminated and/or uncontaminated, at the site so as to facilitate soil removal and minimize disposal costs for contaminated fluids.

f. Copies of all daily reports, transport/waste manifests, weight tickets, and receipts (as applicable) to the CPD’s Authorized Representative and/or Project Manager on a daily basis.

1.5 Submittal Review

A. Review of submittals or any comments made does not relieve the contractor from compliance with the requirements of the drawings and specifications. 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. The contractor is responsible for confirming and correlating all quantities and dimensions; electing techniques of construction; coordinating the work; and performing the work in a safe and satisfactory manner.

1.6 Notifications

A. The contractor shall notify the CPD Authorized Representative no less than forty-eight (48) business hours prior to loading and transporting any materials from the site.
1.7 Recordkeeping

A. The contractor shall provide documentation of labor, equipment, materials and disposal laboratory analysis used for soil removal, when requested by the CPD Authorized Representative.

PART 2 - PRODUCTS

2.1 Removal of Soil, Fill, CU Structural Soil/stone, and Construction and Demolition Debris

A. The contractor shall furnish all necessary means, products, tools, and equipment required to remove soil (including non-special waste soils and non-hazardous special waste soils), fill, backfill, CU structural soil/stone and/or construction and demolition debris from the site as directed by the CPD Authorized Representative.

PART 3 - EXECUTION

3.1 Authorizations

A. Obtain authorization from the permitted disposal facility owner where soils (including non-special waste soils and non-hazardous special waste soils), fill, backfill, CU structural soil/stone and/or construction and demolition debris are to be transported, stored, or disposed. The authorization must be signed by a facility representative and shall state that the facility has received a copy of one or more laboratory analyses of representative sample(s) collected from the site by the contractor and has agreed to accept the material. The authorization shall further state that the facility agrees to accept the material for permanent placement on their site and that the material will not be removed from their site unless required by a local, state or federal authority. The authorization shall further state that the facility complies with all local zoning codes, state, federal and local laws, rules, and regulations.

B. Obtain prior authorization from Board Authorized Representative to backfill excavations and utility lines, and apply top soil. All backfill, CU structural soil/stone, and top soil shall comply with site specific project specifications.

C. Haulers for transportation of soils, backfill and top soil shall hold, and present upon request, a current valid Commercial Driver's License (CDL). Non-hazardous special wastes and hazardous wastes must be hauled by an IDOT-approved, licensed, and permitted transporter and must be visible during transportation.
3.2 Material Sampling

A. Soil, fill, backfill, CU structural soil, construction and demolition debris
   1. The contractor shall collect sufficient amount of representative sample(s) from each type of material being removed from the site for analytical testing to obtain authorization for the ultimate disposition of the materials. The contractor is responsible for acquisition of any required permits and payment of all fees.
   2. The contractor shall collect samples only from the excess materials that require offsite disposal. Under no circumstances shall the contractor sample any material that is to remain onsite without authorization directly from the CPD.
   3. The contractor shall be responsible for obtaining liquid samples as needed for characterization for liquid disposal offsite or disposition onsite as applicable. The contractor is responsible to the acquisition of any required disposal permits and the payment of any fees associated with liquid disposal.
   4. The contractor shall submit the soil and liquid samples (as applicable) to the laboratory and pay for the cost of analyzing the constituents required for the ultimate disposition of soils and liquids.
   5. The CPD or authorized representative may collect samples for laboratory analysis or field Photo-ionization Detector (PID) screening, or liquid samples for laboratory analysis. The contractor shall provide the necessary equipment and manpower to assist the CPD or authorized representative to collect materials to be sampled at no additional cost to the project.
   6. The contractor shall immediately notify the CPD or authorized representative and if any materials, (solid or liquid) requiring special handling (i.e., stained soil, soil with odors, or liquids) are encountered.
   7. All excavated soils, liquids, and other material shall be removed from the site in accordance with applicable federal, state, and local regulations.

3.3 Excavation

A. The contractor shall perform excavation of soils (including non-special waste soils and non-hazardous special waste soils), fill, backfill, CU structural soil/stone and/or construction and demolition debris as directed by the CPD Authorized Representative.

B. All excavation shall be performed in accordance with OSHA requirements and guidelines. The contractor shall be responsible for its worker’s health and safety.
3.4 Hauling

A. The contractor shall remove soils, dusts, rocks, etc. from the exterior of trucks, trailers, or other heavy equipment leaving the site before they leave the site.

B. The contractor shall clean the tractor-trailers or trucks that are loaded with materials for off site placement/salvage by removing clinging soils, or rocks from the exterior of the equipment.

C. The contractor shall not create dust and shall maintain adequate dust suppression equipment on site if conditions warrant.

D. The contractor shall maintain streets clean and free of mud and dirt.

E. The contractor shall conduct soil (including non-special waste soils and non-hazardous special waste soils), fill, backfill, CU structural soil/stone and/or construction and demolition debris removal in a manner that ensures minimum interference with roads; streets, walks and other adjacent occupied and used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from the applicable governing agency and Board Authorized Representative. Provide alternate routes around closed or obstructed traffic ways if required by the governing agency.

3.5 Transportation

A. The contractor shall remove soils, dusts, rocks, etc. from the exterior of trucks, trailers, or other heavy equipment leaving the site before they leave the site. The contractor shall provide and complete copies of all daily reports, weight tickets and receipts (as applicable) for transportation and ultimate off site placement of materials removed from the property to the Board Authorized Representative, review and signature as required.

3.6 Dust Control

A. The contractor shall control dust by all necessary means, including but not limited to covering trucks, stockpiles and open materials, watering haul roads, sweeping paved roads, and limiting the speed of all on-site vehicles.

3.7 Liquid (Water) Management

A. The contractor shall subscribe to a weather notification system and manage the work so as not to accumulate storm water on the site during excavation.
B. Prior to commencing work, the contractor shall provide a Storm Water Management Plan. The Storm Water Management Plan shall stipulate provisions for dewatering, pumping, collection, temporary storage, and discharge or disposal of storm water, perched water and other liquids, contaminated and/or uncontaminated, at the site so as to facilitate soil removal and minimize disposal costs for contaminated fluids.

C. The contractor shall ensure that contamination of water, perched water and previously uncontaminated water or perched water does not occur by preventing the contact of such liquid with materials that exceed Title 35: Environmental Protection Subtitle G: Waste Disposal Chapter I: Pollution Control Board Subchapter F: Risk Based Cleanup Objectives, Part 742, Tiered Approach To Corrective Action Objectives, Appendix B, Table A values for 35 ILL. ADM CODE 740 APPENDIX A Target Compound List (TCL) parameters. Earthen berms, plastic (polyethylene) sheeting, pumping, and other such means, as specified in the approved Storm Water Management Plan, may be used.

D. If the contractor, through negligence, allows storm water to contact materials that exceed Title 35: Environmental Protection Subtitle G: Waste Disposal Chapter I: Pollution Control Board Subchapter F: Risk Based Cleanup Objectives, Part 742, Tiered Approach To Corrective Action Objectives, Appendix B, Table A values for 35 ILL. ADM CODE 740 APPENDIX A Target Compound List (TCL) parameters, the water must be disposed of as water that exceeds Title 35: Environmental Protection Subtitle G: Waste Disposal Chapter I: Pollution Control Board Subchapter F: Risk Based Cleanup Objectives, Part 742, Tiered Approach To Corrective Action Objectives, Appendix B, Table A values for 35 ILL. ADM CODE 740 APPENDIX A Target Compound List (TCL) parameters. The contractor will be responsible for the additional costs incurred for any disposal analysis and disposal costs.

3.8 Quality Control

A. Visual inspections and damage repairs shall be made daily by the contractor and/or as directed by the CPD Authorized Representative to assure that erosion, drainage and containment control measures are functioning properly.

B. The contractor shall take all necessary precautions to protect structures, equipment, pavement, walks and utilities against movement or settlement during the course of work.

C. Damages: Promptly replace or repair any damage caused to adjacent pavement, utilities or facilities by removal operations at no additional cost. Work shall be performed to the satisfaction of the Board Authorized Representative.
D. Utility services: Maintain existing utilities and protect against damage during removal operations.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Contract Unit Pricing

A. Volume determination and pricing shall in accordance with the contract documents.

END OF SECTION 017419
SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing the Board's personnel in the operation and maintenance of systems, subsystems, and equipment.

1.2 SUBMITTALS

A. Training Session Matrix: One month prior to Preliminary Acceptance submit to the AOR and Board Authorized Representative a training session matrix that indicates all required training sessions and proposed dates and blocks of time for each. This matrix shall be used to confirm scheduling of all required training sessions with the end user.

B. Sign-off sheets: Submit copies of proposed sign-off sheets for each training session a minimum of 10 days prior to the scheduled training. Sign-off sheets are to include the following information:

   1. Name of training session
   2. Date of training
   3. Beginning/Ending time
   4. Detailed, itemized summary listing all areas of training for that session.
   5. Listing of hand-out materials distributed at the session.
   6. Signature lines for Trainer, Contractor, and CPS personnel being trained.

      a. Signature by CPS personnel evidences training received only to the extent listed on the sign-off sheet summary.

C. Demonstration and Training Videotape: Submit three (3) copies at end of each training module.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.4 COORDINATION

A. Coordinate instruction schedule with the Board's operations and schedule through the Board Authorized Representative. Adjust schedule as required to minimize disrupting the Board's operations and to ensure attendance by designated CPS representatives.

B. Coordinate content of training modules with content of emergency, operation, and maintenance manuals. Provide copies of this coordinated material at each training session.
PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized doors.
2. Equipment, including athletic equipment, food-service equipment and residential appliances.
3. Fire-protection and alarm systems
4. Intrusion detection systems.
5. Heat generation.
6. Refrigeration systems.
7. HVAC systems.
8. HVAC instrumentation and controls.
9. Electrical service and distribution.
10. Lighting equipment and controls.
11. Communication systems
12. Operable panel partition systems

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:

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:
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning.
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct the Board’s personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. The Board Authorized Representative will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times as approved in the training schedule matrix. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. The training schedule shall be coordinated through the Board Authorized Representative.

C. Signoff Sheets: At the conclusion of each training module obtain sign-offs using the approved sign-off sheets. Executed sign-off sheets are to be submitted as part of the closeout documentation evidencing compliance with training requirements.

D. Demonstration and Training Videotape: 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.

E. Cleanup: Collect used and leftover educational materials and give to the Board. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01 79 00
## Asbestos and Lead

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Component</th>
<th>Walls</th>
<th>Ceiling</th>
<th>Floor</th>
<th>Response Action</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal/brick</td>
<td>Walls and ceilings</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>ACM Removal and disposal of transite panels and pipe and pipe fitting insulation</td>
<td>Gross removal to be performed in accordance with specification section 02 82 14. Asbestos contractor (AC) to demolish soffit to access pipe insulation.</td>
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<tr>
<td>Brick</td>
<td>Chimney</td>
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<td></td>
<td>X</td>
<td>ACM Removal and disposal of exterior flashing around chimney</td>
<td>Removal to be performed in accordance with specification section 02 82 14.</td>
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<tr>
<td>Wood/brick</td>
<td>windows</td>
<td>X</td>
<td>X</td>
<td></td>
<td>ACM Removal and disposal of exterior window caulk</td>
<td>Removal to be performed in accordance with specification section 02 82 14.</td>
</tr>
<tr>
<td>Metal/plaster/wood</td>
<td>Windows, ceilings, trim,</td>
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<td></td>
<td></td>
<td>Remove component and properly dispose of</td>
<td>Removal component as a whole. Ceilings and trim can be demolished with building since the paint is intact. Proper disposal of waste.</td>
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<tr>
<td></td>
<td>window grills</td>
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<tr>
<td>Category</td>
<td>Items</td>
<td>Response Action</td>
<td>Comments</td>
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<td>-----------------------------------------------------------------------------------------------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PCBs</td>
<td>Fluorescent Light Ballasts</td>
<td><strong>Hazardous and Universal Waste Removal Management:</strong> Contractor shall be responsible for the safe handling and disposal of any PCB containing light ballasts per Specification 02 86 13</td>
<td>All light ballasts shall be treated and disposed as PCB containing unless label confirms non-PCB containing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>Fluorescent Light Bulbs, CF Bulbs, and Thermostat</td>
<td><strong>Hazardous and Universal Waste Removal Management:</strong> Contractor shall be responsible for the safe handling and disposal of any mercury containing bulbs and thermostats, etc. per Specification 02 86 13.</td>
<td>Refer to Architect’s drawings for locations of work.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dust, Fumes and Odors</td>
<td>All work</td>
<td><strong>Dust, Fume and Odor Control:</strong> The General Contractor and all subcontractors shall be required to protect the building during all work activities that will create dust, fumes and odors in accordance with Specification 01 56 11.</td>
<td>Refer to Architect’s drawings for locations of work.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 02 26 00
HAZARDOUS MATERIALS ASSESSMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings
   B. Project Information, Instructions to Bidders, and Execution Documents
   C. Standard Terms and Conditions for Construction Contracts

1.2 APPLICABILITY
   A. This environmental summary is for information purposes only.

1.3 INTRODUCTION
   A. Related Work
      1. Section 02 24 01 Environmental Scope Sheets
   B. Description of Work: This environmental summary is for information purposes only.

1.4 AVAILABLE ENVIRONMENTAL ASSESSMENT DOCUMENTS
   A. An asbestos materials testing report completed by Environmental Consulting Group, Inc. (ECG) in July 14, 2016.
   B. A lead-based paint inspection report completed by Environmental Consulting Group, Inc. (ECG) in July 13, 2016.
   C. A hazardous materials inspection report completed by Environmental Consulting Group, Inc. (ECG) in July 14, 2016

1.5 SITE DESCRIPTION

The building is about 2,000 square feet. See architects building description for additional information.

1.6 ENVIRONMENTAL CONDITIONS
   A. ECG performed an asbestos-containing material (ACM) and hazardous material survey at the field house. The ACMs identified included pipe insulation, pipe fittings, window glazing, and transite ceiling and wall panels.
B. The hazardous materials identified during the survey included fluorescent bulbs, ballasts, mercury thermostat, and computer equipment.

C. The lead-based paint sampling identified several components such as orange painted window grills, white painted ceilings and ceiling trim, and white and beige painted windows being coated with lead based paint.

PART 2 - PRODUCTS  (Not Used)

PART 3 - EXECUTION  (Not Used)

PART 4 - QUALITY CONTROL  (Not Used)

END OF SECTION 02 26 00
SECTION 024116 - 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 buildings and site improvements
   2. Removing below-grade construction.
   3. Disconnecting, capping or sealing, abandoning in place and removing site utilities.

B. Related Sections:
   1. Division 02 Sections for requirements related to existing hazardous and environmentally sensitive materials
   2. Section 011000 "Summary" for use of the premises and phasing requirements.
   3. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
   4. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
   5. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.
   6. Section 330500 "Common Work Results for Utilities" for shutting off, disconnecting, removing, and sealing or capping utilities.

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 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified refrigerant recovery technician.

B. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail measures proposed to protect adjacent buildings to remain including means of egress from those buildings and emergency vehicle access to those buildings.

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 Section 013233 "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.


D. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be demolished.
   2. Review structural load limitations of existing structures.
   3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review and finalize protection requirements.
   5. Review procedures for noise and dust control.
   6. Review procedures for protection of adjacent buildings.
   7. 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 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
   2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
      a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

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: Hazardous materials are present in buildings and structures to be demolished. A report on the presence of hazardous materials is provided in the Project Manual. Examine report to become aware of locations where hazardous materials are present.
1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. 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 operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS
A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 DEMOLITION CONTRACTOR

3.2 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 Section 013233 "Photographic Documentation."
D. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
3.3 PREPARATION

A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
   3. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

C. Existing Utilities: See plumbing and electrical Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of demolition.

E. 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.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
   2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
      a. Provide at least 72 hours’ notice to occupants of affected buildings if shutdown of service is required during changeover.
C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "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.

3.5 DEMOLITION, GENERAL

A. General: Demolish indicated buildings and 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 fire watch during and for at least 2 hours after flame cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.
3.6 DEMOLITION BY MECHANICAL MEANS

A. Salvage: Items to be removed and salvaged are indicated on Drawings.

B. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
   1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

C. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 10 feet (3 m) outside footprint indicated for new construction. Abandon utilities outside this area unless indicated otherwise.
   1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Section 312000 "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.

3.7 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.
   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.
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.
   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 cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.8 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS
   A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
   B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
   C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.9 SITE RESTORATION
   A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory fill materials according to backfill requirements in Section 312000 "Earth Moving."
   B. 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.

3.10 REPAIRS
   A. Promptly repair damage to adjacent buildings caused by demolition operations.
3.11 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 Section 017419 "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.

3.12 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116
SECTION 02 82 13

ASBESTOS ABATEMENT - PRIOR TO DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 02 24 01 Environmental Scope Sheets.

1.2 APPLICABILITY

A. These environmental requirements apply to all Public Building Commission (PBC) 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.

1.3 INTRODUCTION

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.

1.4 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) means 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 means Asbestos Containing Material.

D. Architect on Record (AOR) means any person or firm employed by the Commission for the purpose of designing the project.

E. Asbestos Abatement Supervisor, hereinafter referred to as “Supervisor” means any person who supervises asbestos abatement workers. This person must be trained, accredited, and meet OSHA competent person criteria for asbestos abatement.

F. CDPH means Chicago Department of Public Health.

G. Chicago Public Schools (CPS) means the Owner of the property and the authority ordering the work specified herein.
H. Commission means the Public Building Commission of Chicago, a municipal corporation organized under the Public Building Commission Act of the State of Illinois, as amended, or its duly authorized officers or employees.

I. Commission Representative means the entity responsible for overall project coordination and completion.

J. Competent person means 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.

K. Contractor means 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.

L. Drawings are those enumerated in the Schedule of Drawings, and additional drawings and sketches, if any, incorporated into the Contract by a bulletin issued by the AOR or Change Order as the Work progresses.

M. Environmental Consultant (EC) means 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.

N. Environmental Project Manager (EPM) is the project manager selected by the EC to perform environmental monitoring and act on behalf of the EC for CPS or its agents on the project.

O. HEPA Filter means 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.

P. IDPH means the Illinois Department of Public Health.

Q. OSHA means the federal Occupational Health and Safety Administration.

R. Plasticize means to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.

S. PPE (Personal Protection Equipment) means the protective suits, head and foot covers, gloves, respirators and other items used to protect persons from asbestos or other hazards.


U. SDS means Safety Data Sheets, required by OSHA for any chemical in the workplace that could be expected to cause an exposure to workers during normal use or in emergency situations.

1.5 SCOPE OF WORK.

A. Refer to Contract Drawings and Environmental Scope Sheets in Section 02 24 01.

1.6 WORK INCLUDED

A. 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. Related work may be shown in other related documents, prepared by others, if applicable, and as listed below:

B. 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. All interior abatement work shall be completed under a full, negative pressure containment with attached decontamination unit and waste-out unit according to the asbestos abatement drawings.

C. 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 Commission Representative.

D. Compliance with all applicable laws, regulations, standards, and these specifications. In the case of a conflict, the Contractor shall comply with the most stringent.

E. All licenses, accreditations, permits, fees, notifications, reports, or other documents required by law, regulation, this specification, or the documents.

F. 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.

1.7 LAWS, REGULATIONS AND STANDARDS

A. The following laws, regulations, and standards are incorporated by reference:

2. 29 CFR 1926: US OSHA Construction Standards  
3. 29 CFR 1926.1101: US OSHA Asbestos Construction Standards  
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.

1.8 ASSESSMENT, MONITORING, TESTING AND ANALYSIS

A. The EC 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 EC shall:
   a. Verify CPS 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.

2. During the work, the EC shall:
   a. Observe the work with sufficient frequency to ensure contractor compliance with the specifications.  
   b. 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.  
   c. Collect air samples in and around the Work Area, as needed, to verify exposure conditions.  
   d. The EC 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.

3. Upon completion of the work, the EC shall:
   a. Visually inspect for visible debris. Contractor shall be required to re-clean the area or portions of areas until no visible debris remains.  
   b. Conduct final clearance testing as required.  
   c. 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.

1.9 SUBMITTALS BY THE CONTRACTOR:

A. 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.
3. OSHA compliance air monitoring records generated during the project.
4. Waste shipment records.
5. Worker license and certification log.
6. Safety Data Sheets (SDS) for chemicals used on site.
7. Work plan and schedule.

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 Chicago Public Schools for buildings where asbestos abatement will take place. The AC shall provide copies of all regulatory notices to the CPS Environmental Services Manager 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 CPS and the EPM.
PART 2- PRODUCTS

2.1 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.

2.2 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

3.1 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.

3.2 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.

3.3 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.
3.4 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.

3.5 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.

D. 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.

   1. 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.

E. 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.

3.6 PROHIBITED ACTIVITIES

A. Dry removal or dry sweeping, except:

   2. During freezing weather. In this case, temperature and weather conditions must be recorded at the start, during, and at the end of the shift.
   3. On roofs with 3:1 slope or greater. In this case, roofing shall be removed in an intact condition, as much as possible.
   4. For roofing areas of less than 25 square feet.
   5. 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.

3.7 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.
   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.

2. Secure the Work Area from entry by unauthorized persons.

B. Exterior Preparation:

1. 6 mil plastic sheeting shall be placed over the ground, foundation, or other surfaces below the abatement area.

2. Unauthorized entry shall be prevented by using appropriate barriers, such as warning tape, fencing, or other suitable barriers.

3. 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.

4. All electric power in the Work Area shall be protected with ground-fault circuit interrupters.

3.8 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 midrails designed to provide fall protection, or full-body safety harnesses shall be worn and tied off to a secure anchor point.
   b. Workers in manlifts shall wear full body harnesses and tie to the tie-off point provided on the manlift 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.

B. Roofing:

1. 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.

   a. The Contractor shall take care to minimize the amount of roofing material damage.
   b. 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.

2. Built-up roofing and asphalt shingles:

   a. Power cutting machines shall be equipped with a HEPA-filtered dust collection system or shall be misted during use.
   b. Dust generated by the cutting operation shall be collected with HEPA vacuums or wet cleaning methods.

3. Rigid roofing materials, such as cement asbestos shingles: remove intact and minimize breakage.

C. Transite, Galbestos sheeting (galvanized metal with a baked-on asbestos paint), Asbestos/Cement pipe, or other rigid panels shall be removed using wet methods.

D. Other:

1. 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.

2. 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.

3.9 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 Contract 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.

C. Removing items from the Work Area:
1. Packaged asbestos wastes shall be HEPA-vacuumed before removing from the Work Area.

D. 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.

E. Shipment of items from the project:

1. Decontaminated tools and equipment may be shipped by normal carrier to warehouse, another jobsite, or other destination.
2. For asbestos wastes:
   a. Line shipping container with 6 mil poly prior to loading packaged friable asbestos wastes.
   b. Post NESHAP placards during loading of friable asbestos wastes.
   c. Execute the NESHAP-required Waste Shipment Record (WSR) to be signed by the generator, transporter, and landfill. All WSRs shall be returned to the EC within 30 days of shipment.
   d. Only landfills approved and permitted for accepting asbestos wastes may be used for disposal.

END OF SECTION 02 82 13
SECTION 02 82 14
ASBESTOS ABATEMENT - INTERIORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Section 02 24 01 Environmental Scope Sheets

1.2 APPLICABILITY
A. These environmental requirements apply to all Public Building Commission (PBC) projects. These specifications apply for all demolition, construction and renovation projects that require the removal and disposal of asbestos containing material from the inside of a building in accordance with all applicable regulations.

1.3 INTRODUCTION
A. Asbestos abatement 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). These specifications address or reference the requirements for complying with IDPH, 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.

B. Exterior building spaces are not subject to IDPH rules unless the abatement procedures involve interior spaces of the building. Roofing, exterior transite sheeting, asbestos siding, asbestos-containing paint, caulking, glazing, flashings, cements, or other products installed on the building exterior are subject to OSHA and NESHAP rules which, in many cases are less rigorous than IDPH requirements. Abatement of these items is specified in separate, related specification sections.

1.4 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) means 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. Architect on Record (AOR) means any person or firm employed by the Commission for the purpose of designing the project.
D. Asbestos Abatement Supervisor, hereinafter referred to as “Supervisor” means any person who supervises asbestos abatement workers. This person must be trained, accredited, and meet OSHA competent person criteria for asbestos abatement.

E. CDPH means Chicago Department of Public Health.

F. Chicago Public Schools (CPS) means the Owner of the property and the authority ordering the work specified herein.

G. Commission means the Public Building Commission of Chicago, a municipal corporation organized under the Public Building Commission Act of the State of Illinois, as amended, or its duly authorized officers or employees.

H. Commission Representative means the entity responsible for overall project coordination and completion.

I. Competent person means 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 means 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. Environmental Consultant (EC) means 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.

L. Environmental Project Manager (EPM) is the project manager selected by the EC to perform environmental monitoring and act on behalf of the EC for CPS or its agents on the project.

M. HEPA Filter means 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.

N. IDPH means the Illinois Department of Public Health.

O. OSHA means the federal Occupational Health and Safety Administration.

P. Plasticize means to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.

Q. PPE (Personal Protection Equipment) means the protective suits, head and foot covers, gloves, respirators and other items used to protect persons from asbestos or other hazards.

S. SDS means 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. Work means 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.

V. Work Area means the area or areas where asbestos abatement is being conducted.

W. Work Site means 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.

1.5 SCOPE OF WORK

A. Refer to Contract Drawings and Environmental Scope Sheets in Section 02 24 01.

1.6 WORK INCLUDED

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. Related work may be shown in other related documents, prepared by others

1. Division 02 Section "Exterior Asbestos Abatement."

B. Removal of friable and non-friable asbestos-containing materials listed in the bid documents, including pre-cleaning, moving of furnishings, establishing regulated areas, isolating the Work Areas, protection of adjacent areas, 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 Architect of Record and the Commission Representative.
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, minimize concentrated lead waste volume, and produce the least amount of total waste. That sequence will generally be:

1. Cleanup of lead dust, flakes, chips, and residues most likely to fail a TCLP test. If both lead and asbestos debris are present and mixed together, they may be cleaned up and disposed together.
2. Cleanup and removal of failed or delaminated friable asbestos-containing debris, if any.
3. Removal of friable asbestos materials and cleanup of visible residues.
5. Removal of non-friable asbestos items. 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 with both the lead and asbestos-bearing items 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 final decontamination processes are combined, the more stringent cleanup procedures shall apply for both.
9. Waste disposal:
   a. Hazardous waste: loose paint flakes, chips, and dust; lead-specific cleaning supplies; contaminated soil; combined final decontamination supplies; disposable suits, gloves, head covers, and foot covers; other items that fail a TCLP or other RCRA test.
   b. Special waste: friable 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; concrete and lumber with or without tile or mastic attached; demolition debris, and other general wastes.
   d. All asbestos-containing or lead-bearing wastes, regardless of classification, shall be disposed in a landfill approved by the IEPA 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. Contractor is required to fully comply with IDPH rules and these specifications unless a variance is granted by IDPH. Any variances obtained by the EC will be listed in the bid documents.

G. All licenses, accreditations, permits, fees, notifications, reports, or other documents required by law, regulation, this specification, or the bid documents.

H. Provide project closeout documentation to the APM within thirty (30) days after final clearance. This documentation shall include, but is not limited to, submittals specified elsewhere in the specifications.
1.7 LAWS, REGULATIONS AND STANDARDS

A. The following laws, regulations, and standards are incorporated by reference:

1. 105 ILCS 105: Illinois Asbestos Abatement Act
4. 29 CFR 1926: US OSHA Construction Standards
5. 29 CFR 1926.1101: US OSHA Asbestos Construction Standards
6. ASHARA: US EPA Asbestos School Hazard Abatement Reauthorization Act
10. 11-4-2170 Chicago Building Code- Demolition and Renovation Safeguards
11. 11-4-2150 Environmental Standards related to demolition, renovation, asbestos abatement and maintenance, sandblasting, chemical washing, and grinding of buildings or other structures

1.8 ASSESSMENT, MONITORING, TESTING AND ANALYSIS

A. The EC will perform inspection, testing and design services prior to the start of Work, and during the project, and will perform testing, inspection, and monitoring services during the Work and upon its completion:

1. Prior to the start of the Work, the EC shall:
   a. Identify suspect materials and confirm their asbestos content through review of the school’s management plan or by testing.
   b. Design the project and address any design changes if requested by the AOR/Board Authorized Representative.
   c. Collect background air samples before conditions are disturbed. Background samples will be analyzed by Phase Contrast Microscopy (PCM).
   d. Review and approve the pre-abatement submittals submitted by the AC.

2. During the Work, the EC shall:
   a. Enter the Work Area at least every two hours to inspect the Work procedures and Work Area integrity.
   b. Maintain a daily log to record the day’s events, problems, corrective actions.
   c. Collect air samples inside and outside the Work Area, and in the breathing zone of representative persons.
   d. The EC will stop the Work if airborne asbestos concentrations outside the Work Area exceed 0.01 f/cc or the background sample levels, whichever is higher. The Work may restart when the source of fiber release has been identified and corrected. Contractor shall be responsible for cleaning and decontaminating the outside area if caused by the asbestos abatement activities.
   e. Observe/document smoke testing of the containment by the Contractor.
f. Review original worker licenses and maintain weekly submittals from the AC.
g. Notify the EC’s project designer if design changes are needed before execution.

3. Upon completion of the Work, the EC shall:

   a. Inspect for visible debris. Contractor shall be required to re-clean the area or portions of areas until no visible debris remains and the Work Area is dry.
   b. Perform aggressive clearance testing by Transmission Electron Microscopy (TEM) when the ACM in a Work Area is 260 linear feet, 160 square feet, or 35 cubic feet of volume or more, as required by AHERA and IDPH Section 855.170. The sample set shall include at least 5 inside samples, 5 outside samples, 2 field blanks and 1 sealed blank. Note: Large complicated, or multi-floor contiguous Work Areas connected by corridors, stairways, or other connections shall be tested using additional inside the Work Area samples. For clearance of multiple mini containments containing a total removal quantity greater than 160 square feet or 260 linear feet, a combined PCM/TEM final clearance procedure may be used. The first part of the procedure shall involve the collection and analysis of one PCM sample from within each mini containment. The second part shall involve the collection and analysis of five (5) TEM samples within the mini containments having the highest PCM analysis results. If there are five or fewer mini containments to be sampled, then only TEM sampling shall be conducted. A minimum of five (5) TEM samples shall be collected. All requirements of 40 CFR 763 Subpart E, Appendix A shall apply.
   c. Perform aggressive clearance testing by PCM when the ACM in a Work Area is less than 260 linear feet, 160 square feet, or 35 cubic feet of volume.
   d. Collect and analyze samples in accordance with AHERA Appendix A procedures and IDPH rule section 855.470.
   e. Prepare and submit the IDPH “Project Manager’s Summary Report Form” within 10 days of final clearance.
   f. Prepare and submit the Project Manager Report to the IDPH within 60 Working days of clearance testing. The final Project Manager is responsible for completion of 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. For interior work, this would allow reduced OSHA monitoring frequency.
   2. Analysis may be performed on site.

C. Credentials required for testing and analysis of PCM final clearance 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 performed.
1.9 SUBMITTALS BY THE CONTRACTOR

A. To CDPH at least 10 working days before commencement of Work:

2. Written permission from building Owner authorizing Contractor to commence work

B. To IDPH, IEPA, CDPH, EC and AOR at least 10 working days before commencement of Work (if required per quantity of materials being abated):

1. IDPH Asbestos Notification on current form, including inspector license number and landfill permit number.
2. Written permission from building Owner authorizing Contractor to commence abatement.
3. Building Owner asbestos abatement notification to building occupants and CPS.
4. School Floor Tile Project Notice, when applicable.

C. To EC and AOR at least five days prior to commencement of Work:

1. Documentation of arrangements of transport and disposal, landfill name and location, handling procedures and PPE at the landfill, prepared and signed by the landfill.
2. Drawings or sketches for layout and construction of isolation barriers and decontamination units.
4. Manufacturers’ certifications that all HEPA vacuums, negative air pressure equipment, and other local exhaust ventilation equipment conform to ANSI Z9.2-79.
5. Written notifications to rental companies for any rental equipment used.
6. Results of any performance tests for encapsulants, if applicable.
7. OSHA Exposure Assessment, if available.
8. Laboratory and analyst credentials for Contractor OSHA samples.
9. Safety Data Sheets (SDS) for chemicals used on site.
10. Work Plan and Schedule.

D. To EC and AOR on the first day of abatement Work:

1. Original Contractor, supervisor, and worker licenses along with a copy each.
2. Initial Course Accreditation and current refresher accreditation for each supervisor and worker.
3. Physician’s Written Opinions for workers and supervisors.
4. Fit test documentation for all employees, agents.

E. To EC and AOR weekly during the abatement Work:

1. Job progress reports detailing abatement activities, progress compared to schedule, problems and actions taken, injury reports, and equipment breakdowns.
3. Work Site Entry logs.
4. Manometer readable tape for negative pressure differentials for each negative pressure worker enclosure or a log of digital readout.
5. Filter Change logs for respirators, HEPA vacuums, negative air machines, and other engineering controls.
6. OSHA compliance air monitoring data.
7. Worker license and certification log.

F. Prior to beginning Work, the AC shall submit required notifications to applicable regulatory agencies and receive an Owners Authorization and Notice to Occupants from Chicago Public Schools for buildings where asbestos abatement will take place. The AC shall provide copies of all regulatory notices to the Commission Representative, PBC Deputy Director of Environmental Services, CPS Environmental Services Manager 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 all parties listed above.

PART 2 - PRODUCTS

2.1 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 a 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.
4. Buffers are not permitted.

2.2 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

3.1 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 and most recent annual refresher training certificate at the jobsite at all times for all Contractor personnel.
2. An IDPH-licensed supervisor (competent person) shall be present at the Work Site at all times when Work under these specifications is being conducted.
3. Current fit testing documentation.

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.

3.2 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.
C. The permissible level of airborne fibers in areas adjacent to the Work Area is 0.01 f/cc or background level, whichever is higher, as determined by PCM.

1. Work shall immediately cease in any Work Area where the airborne fiber concentrations exceed this level.
2. The source of outside contamination shall be determined, and corrective measures (e.g. wet cleaning, changes in work practices, negative pressure containment) shall be implemented to prevent recurrence.
3. The Contractor shall be responsible for cleanup of contamination in adjacent areas caused by the asbestos abatement activities at no additional cost to the building Owner.

3.3 EXPOSURE ASSESSMENT AND MONITORING

A. The Contractor shall make an assessment of the airborne exposures. Assessment shall conform to 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, or
3. In the absence of an exposure assessment, the Contractor shall perform the Work in full negative pressure containment with Type C pressure-demand respirator with auxiliary SCBA escape bottle.

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.
   a. 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 reinstituted if exposures are unknown or are expected to exceed the PEL.
3. Daily, if exposures are above the PEL.

3.4 RESPIRATORY PROTECTION

A. Respiratory protection shall be worn by all persons potentially exposed to airborne asbestos fibers from the start of the abatement project until all areas have passed clearance air monitoring, in accordance with all applicable laws, regulations and standards specified elsewhere in the specifications.

B. Contractors must have a respiratory protection program in compliance with all applicable laws, regulations and standards specified elsewhere in the specifications.
3.5 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) shall include:
   1. Full body disposable suits, headgear, and footwear.
   2. Gloves.
   3. Safety glasses
   5. Non-disposable footwear and clothing shall remain in the Work Area and shall be disposed of as contaminated waste when the job is completed.
   6. Authorized visitors shall be provided with suitable PPE.

3.6 PROHIBITED ACTIVITIES

A. Dry removal or dry sweeping.

B. Use of compressed air for cleaning.

C. Use of high speed power tools not equipped with a HEPA-filtered local exhaust system.

D. The abatement Contractor shall not execute abatement activities without asbestos abatement design drawings that have been signed by an IDPH licensed Asbestos Designer are on the job site. Any and all changes to containment layout and placement shall not be executed until revised design drawings that have been approved and signed by an IDPH licensed Asbestos Designer are on the job site.

E. Buffers cannot be used to remove mastic.

3.7 WORK AREA ISOLATION AND PREPARATION

A. General Preparation:
   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.
      d. OSHA Asbestos Construction Standards (29 CFR 1926.1101) in the clean room.
      e. Entry and Exit Log.
f. 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.

2. Secure the Work Area from entry by unauthorized persons.
3. Separate Work Areas from Occupied Areas.
   a. Seal off all doorways and corridors which will not be used for passage during Work.
   b. Install IDPH required separation barriers per section 855.430 (a) in all openings larger than 4 ft by 8 ft, consisting of wood or metal framing, a sheathing material such as plywood or drywall at least 5/8” thick on the work side, and double-layer 6-mil poly, both sides. Edges shall be caulked at the floor, ceiling, walls, and fixtures to form an air-tight seal.
   c. If the school is not totally occupied (see Section 855.430), the sheathing material may be omitted.

4. Separate Occupied areas from Secured Areas.
   a. Install IDPH barriers per section 855.430 (b).

B. Interior Preparation:
   1. Shut down and lock out electric power to all Work Areas. Provide temporary power from an outside source with ground-fault circuit interrupter (GFCI) at the source.
   2. Shut down and isolate heating, cooling, and ventilating air systems. Remove HVAC filters, package and dispose as asbestos waste.
   3. Pre-clean movable objects with HEPA vacuums or wet cleaning and remove from the Work Area to a location designated by the EC where friable ACBM is involved.
   4. Pre-clean fixed items which must remain in the Work Area with HEPA vacuums or wet cleaning where friable ACBM is involved.
   5. Wrap all fixed objects and equipment which will remain in the Work Area with a minimum of one layer of six mil poly.
   6. Remove/protect carpeting per environmental scope sheets.
   7. Pre-clean the Work Area with HEPA vacuums or wet cleaning.
   8. Seal off all windows, corridors, doorways, skylights, ducts, grilles, diffusers, and other penetrations or openings in walls, ceilings and floors with 6-mil poly and tape.
   9. Cover floors with two layers of fire-retardant 6-mil poly with seams staggered and taped, and extending 12” up walls. Cover walls with two layers of 4-mil poly, with each wall poly overlapping each floor poly layers by 12”.
   10. Asbestos materials shall not be disturbed during the preparation phase.
   11. Suspended ceilings shall remain in place until preparation phase is complete.
   12. Maintain emergency and fire exits.
13. Install a five chamber Worker Decontamination Enclosure System, consisting of clean room, shower room, and dirty room separated by airlocks at least 3’ wide, all with curtained doorways, of sufficient size to serve the size of the crew, and with all features required by IDPH rules.

a. Where a remote decon unit is used (i.e. non-friable ACBM and TSI glovebag operations), the AC shall:

   1) Set up the decon unit within the Work Area barriers.
   2) Establish a negative pressure of at least 0.02” water column (wc) between the dirty room and adjacent spaces, including the clean room.
   3) Provide at least 4 air changes per hour within the decon unit.
   4) Use a double suiting procedure where the workers proceed to the Work Area exit, HEPA-vacuum gross debris from their persons using a “buddy system” put on a clean suit (either over their dirty suit or after removing the dirty suit), assure that their footwear are free of ACM contamination, and follow a designated path to the remote decon unit.
   5) Once in the decon unit, follow normal decontamination procedures.

14. Install an Equipment Decontamination Enclosure System, consisting of a washing station and a holding area, with curtained doorways and a lockable door.

15. Maintain a negative pressure of at least 0.02” water column (wc) between each contained area and adjacent spaces 24 hours a day using negative air machines vented to the outside, from the start of abatement work to final clearance. Backup negative air machines shall be available onsite in case of machine failure.

16. Once operational, the system shall be inspected daily with smoke tubes by the Contractor. Damages and defects shall be repaired immediately upon discovery.

C. Exterior Preparation (for areas that interface with interior work):

   1. 6 mil plastic sheeting shall be placed over the ground, foundation, or other surfaces below the abatement area.
   2. Unauthorized entry shall be prevented by using appropriate barriers, such as warning tape, fencing, or other suitable barriers.
   3. Nearby air intakes, grilles, and other openings into the building interior shall be sealed off with poly and tape.
   4. The Contractor shall be responsible for cleanup of any adjacent areas that become contaminated as a result of the abatement activities at no additional cost to the building Owner.

3.8 ABATEMENT PROCEDURES

A. Removal:

   1. Asbestos materials shall be adequately wetted and kept adequately wet during removal.
   2. ACM waste shall be bagged or containerized as it is removed.
   3. Work Areas shall be kept wet until visible material is cleaned up.
B. Encapsulation:

1. Damaged or missing areas of existing materials shall be repaired with non-asbestos substitutes, where appropriate.
2. Loose or hanging ACM shall be removed using appropriate removal procedures.
3. Bridging encapsulants shall be applied in accordance with manufacturer’s instructions.
4. Penetrating encapsulants shall be applied to penetrate existing materials to the substrate.
5. Encapsulants shall be applied with airless spray equipment.
6. Encapsulated ACM shall be labeled as asbestos to prevent future unprotected disturbance.

C. Enclosure:

1. Locations where openings for hangers, supports, framing, or other attachments must be made in the ACM must be misted with water and kept damp to reduce airborne fiber release. Tools used to drill, cut, or otherwise disturb the ACM during attachment installation shall be equipped with a HEPA-filtered local exhaust system.
2. Loose or hanging ACM shall be removed using removal procedures.
3. Damaged areas shall be repaired with non-asbestos materials.
4. Utilities or other items requiring access shall be relocated outside of the enclosure area. Once enclosures are installed, they shall not be opened or disturbed.
5. Enclosure materials shall be impact resistant and provide an airtight barrier.
6. Enclosures shall be labeled that they contain asbestos materials to prevent future unprotected disturbance.

3.9 CLEANING AND DECONTAMINATION

A. Cleaning and decontamination of abatement areas, excluding glovebag areas, are as follows:

B. All visible accumulations of ACM, debris, tools, and unnecessary equipment shall be removed from the Work Area.

C. First clean:

1. Wet clean all surfaces and remove excess water.
2. Wait 12 hours before proceeding further to allow dust and fibers to settle.
3. Remove outer layer of poly and dispose as ACM waste.
4. Completion of First Clean shall be determined and documented by the EC.

D. Second clean:

1. Wet clean all surfaces and remove excess water.
2. Wait 12 hours before proceeding further to allow dust and fibers to settle.
3. Remove inner layer of poly and dispose as ACM waste.
4. Critical barriers on windows, doors, penetrations, and other openings shall remain in place and negative air system shall remain in continuous operation until final clearance tests have passed.
5. Completion of Second Clean shall be determined and documented by the EC.
E. Third clean:
   1. Wet clean all surfaces and remove excess water.
   2. Wait 12 hours before proceeding further to allow dust and fibers to settle.
   3. Remove all tools, cleaning materials, remaining wastes from the Work Area. Tools and equipment shall be cleaned before removal.
   4. Third Clean shall be determined and documented by the EC.

F. Visual inspection: EC and Contractor shall jointly inspect the Work Area for visible residue and excess water and, if observed, repeat the clean/12 hour wait cycle until residues are not detected and Work Area is dry.

G. Apply lock-down encapsulants where specified in the bid documents.

H. EC will inform AC if the Work Area is ready for final clearance testing.

3.10 FINAL CLEARANCE

A. Final clearance testing (aggressive methods) shall be performed after 12 hours have lapsed since the final cleaning, and when visual inspection has been completed and no visible water or condensation remains.

B. Work Areas with 260 linear feet or 160 square feet or more of ACM shall be tested using aggressive sample collection methods and TEM analysis, as required by AHERA and IDPH Section 855.170. The sample set must include at least 5 inside samples, 5 outside samples, 2 field blanks, and 1 sealed blank. NOTE: Large, complicated, or multi-floor contiguous Work Areas connected by corridors, stairways, or other connections may be tested with a larger “inside” sample set rather than full, multiple TEM tests, so long as the inside sample distribution is reasonably representative of the Work Area conditions.

C. Work Areas with less than 260 linear feet or 160 square feet may be tested using aggressive sample collection methods and analyzed by PCM.

D. If final clearance test(s) fail, the AC is responsible for repeating the cleaning sequence as necessary until final clearance tests are successful. All expenses associated with the collection and analysis of additional final clearance tests are the responsibility of the AC.

3.11 SPECIAL PROCEDURES:

A. Less stringent requirements may apply in a number of cases.

B. Variances from IDPH Regulations. Variances may be requested and approved by the IDPH. These less stringent procedures may only be used when they have been requested by the Project Designer and approved by the IDPH on a case-by-case basis.

   1. Variances that have been applied for the project will be listed in the bid documents. These variances may or may not be approved by the IDPH.
2. The Contractor is encouraged to request additional variances it believes will be beneficial to the project. Such requests shall be submitted to the Project Designer/EC as a value engineering proposal which references the IDPH regulation section, describes the procedure variations, includes information which supports the efficacy and benefits of the alternative procedures, and offers appropriate cost savings.

3. Otherwise the Contractor is required to fully adhere to the requirements of this specification. Failure to obtain a variance shall not constitute a change in the requirements of these documents.

C. Operations and Maintenance Procedures where minor areas of ACM must be disturbed for building repairs or require repair in areas of Work, such as drilling holes in walls or floors, cleaning small areas to allow installation of fixtures, smoke detectors, utilities, etc. The bid documents shall state if these procedures are allowed or required for a particular project or task.

1. Submit an asbestos notification to the IDPH for quantities over 3 linear or square feet.
2. Licensed abatement workers are required, but a licensed abatement Contractor is not mandatory for Work less than 3 linear or square feet.
3. Shut down heating, cooling, or ventilating air systems to prevent fiber dispersal to other areas.
4. Seal off openings in the Work Area, including windows, doorways, vents, and other openings with 6 mil poly sheeting and tape.
5. Lay an impermeable drop cloth under the Work Area.
6. Wear appropriate PPE and at least a 1/2 mask APR respirator. Note that OSHA still requires an exposure assessment and respirators that are appropriate for the expected airborne fiber concentrations.
7. Use wet removal methods.
8. Wet clean Work Area, leaving no visible residue.
9. Seal off any frayed ends of material remaining on an active utility or building structure to remain.
10. Package and dispose of asbestos-containing waste as specified in the waste disposal Article of the specifications.

D. Glovebag Procedure. Glovebags may be used to remove pipe and duct insulation.

1. Normal IDPH Notification requirements apply to quantities of more than 3 linear or square feet.
2. Glovebag removal shall require a single layer, 6 mil poly tent containment (mini-containment) with negative pressure air filtration.
3. Monitoring will be performed for each contained area by the EC:
   a. 1 personal sample
   b. 1 area sample
   c. 1 area sample at each negative pressure machine exhaust
4. Glovebag construction shall be 6 mil poly with seamless bottom, suitable for the intended use (straight runs, fittings, elbows, vertical pipes, etc.) without modification.
5. At least two licensed workers shall perform glovebag operations.
6. Workers shall wear full body PPE and at least a 1/2 mask APR respirator. Note here, too, that OSHA still requires an exposure assessment and respirators that are appropriate for the expected airborne fiber concentrations.

7. Prior to use, all loose or damaged material adjacent to the operation shall be wrapped in two layers of 6 mil poly or otherwise be rendered intact.

8. Work Practices shall include:
   a. Installation to completely cover the circumference of pipe or other structure. Pipe insulation diameter shall not exceed 1/2 the bag working length above the glove sleeves.
   b. Smoke test for leaks and seal any leaks prior to use.
   c. Glove bag shall be single use and not moved once it is placed.
   d. Wet removal methods on the materials to be removed and wet cleaning to remove all visible ACM from the pipe or structure surfaces.
   e. Not to be used on surfaces having temperatures greater than 1500F.
   f. Spray down the interior surfaces of the bag, substrate, and removed ACM.
   g. First and second cleaning, waiting at least 12 hours following each cleaning.
   h. Wet down remaining ACM surfaces or seal with encapsulant.
   i. Seal off the lower portion of the bag containing the ACM waste by twisting several times and sealing with tape.
   j. Collapse glovebag with a HEPA vacuum.
   k. Slip a 6 mil poly waste disposal bag over the glovebag, detach the bag from the pipe, and gooseneck-seal it in the waste disposal bag.
   l. Dispose in accordance with this specification.

E. Resilient Floor Covering. Removal of resilient floor covering shall be performed by, as a minimum, those trained in accordance with OSHA Class 2 requirements, using heat guns, infrared heat machines or other methods that remove the floor covering in whole pieces. Buffing machines may not be used for removal of mastic. The Contractor shall insure that no damage is caused to the area or equipment below the floor. Abatement procedures are as follows:

1. Submit the Floor Tile Project Notice at least 10 working days prior to the beginning of all asbestos resilient floor covering abatement projects.
2. Post signs so that the Work Area cannot be entered from any direction without observing a sign.
3. Isolate the Work Area from areas to remain occupied.
4. Install barriers of six mil plastic sheeting sealed with duct tape at all openings in the Work Area.
5. Install a curtained doorway at the entry to the Work Area, lock out electrical power to the room and supply required power with ground fault interruption protected circuits.
6. Wear, as a minimum, half-faced dual cartridge NIOSH-approved respirators and double disposable suits.
7. Remove floor covering without causing excessive breakage. Work shall stop and appropriate IDPH design, project management and air sampling will be put in place if excessive breakage occurs.
8. Dispose of floor covering and debris as asbestos waste.
9. HEPA vacuum the Work Area thoroughly following completion of the removal.
10. HEPA vacuum surface of protective clothing and dispose of clothing as asbestos waste.
11. Personal air monitoring shall be performed by the Contractor in accordance with OSHA.
F. Electrical Wiring Insulation: Removal of the electrical wiring insulation shall be performed by licensed asbestos abatement Contractor under full-containment. This Work is considered gross removal Work. All Work shall be performed in compliance with laws, regulations, and standards specified elsewhere in the specifications. If IDPH approves any variances for this project, they will be provided to the abatement Contractor prior to the start of the project. The abatement shall be performed as follows:

1. Contractor shall provide submittals as specified elsewhere in the specifications.
2. The Contractor Supervisor shall inform all abatement workers about electrical safety and require them to work in accordance with all applicable safety requirements while working on and around electrical system components.
3. Work Area shall be isolated and prepared as per procedures specified in Part 3 of these specifications.
4. Contractor shall verify that electrical power to wiring within the Work Area is locked out /tagged out for the duration of the project until final air clearance is achieved. Contractor shall verify that a competent person has de-energized, locked out, tagged out and tested the electrical lines involved in this project to ensure lock out/tag out was successful. Water shall not be sprayed around wiring and/or other electrical system components. Moist rag or mops shall be used as needed. Contractor shall keep Work Area free of any standing water throughout this project.
5. Disconnect wire at both ends without cutting wire or otherwise disturbing wire insulation. Remove wires intact, by pulling them from one access point (preferably at the panel or switch) and rolling them up directly into an asbestos waste bag (or a glove-bag, where feasible).
6. HEPA vacuum shall be used continuously while wires are being pulled out, in order to minimize the airborne dispersal of asbestos fibers. Wet rags shall be utilized to moist the wiring insulation as the wire is being pulled out and rolled-up in order to minimize the release of asbestos fibers.
7. The conduit and other surfaces which were in contact with wires shall be cleaned utilizing HEPA Vacuum. Moist rags/sponges shall be pulled through the conduits so as to clean the conduit surfaces after wires have been pulled out of the conduit.
8. Cleaning and Decontamination of Work Area shall be performed as specified in Part 3 of these specifications. Contractor shall keep the Work Area free of any standing water throughout this project. Water shall not be sprayed around wiring and/or other electrical system components. HEPA vacuum and moist rags shall be used for cleanup and decontamination.
9. Clearance of the Work Area shall be performed as specified in Part 3 of these specifications.

3.12 WASTE DISPOSAL AND EQUIPMENT LOAD-OUT

A. Preparing equipment for load-out:

1. Seal openings to prevent escape of internal contamination; or open up equipment, remove filters, and make equipment interiors accessible for cleaning and decontamination.
2. HEPA vacuum and wet wipe all equipment before removal.
B. Packaging asbestos wastes:

1. All asbestos-containing wastes, including removed ACM and debris, containment poly, critical barrier materials, suits, respirator filters, vacuum and negative air machine HEPA filters, water filters, and other asbestos-containing items shall be properly packaged for disposal.
2. Use double 6 mil plastic bags with “gooseneck” seal, or other impermeable containers.
3. Wrap large or irregular items in 2 layers of 6 mil poly sheeting, seal with tape, and affix required labeling.
4. Sharp, jagged, or other items (floor tiles, screws, nails, metal debris, wood etc.) 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 double bags or double layers of 6 mil poly.
5. Label containers:
   a. OSHA warning label.
   b. DOT performance-oriented hazardous material label.
   c. Name and address of generator and abatement location.

C. Removing items from the Work Area:

1. Packaged asbestos wastes, non-porous debris (such as ceiling grid, doors, hardware, and other items that can be decontaminated), and equipment shall be wet cleaned, moved into the equipment decontamination enclosure system, cleaned a second time, and moved into the holding area.
2. Containers and equipment shall be removed from the holding area by workers in clean PPE and respirators who enter from the uncontaminated side (outside). The equipment decontamination enclosure system shall not be used to enter or exit the Work Area.
3. Waste shall be placed in a cart and covered. A plastic runner shall be placed on the floor to the waste storage area. The loaded cart shall be carefully taken to and unloaded into the enclosed waste storage container.

D. 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.

E. Shipment of items from the project:

1. Decontaminated tools and equipment may be shipped by normal carrier to warehouse, another jobsite, or other destination.
2. For asbestos wastes:
   a. Line shipping container with 6 mil poly prior to loading packaged asbestos wastes.
   b. Post NESHAP placards during loading.
   c. Persons performing loading operations shall wear PPE and respirators.
   d. Containers and packages shall be tightly packed together to prevent shifting during transport. Large components or heavy items shall be secured to prevent shifting, and shall not be stacked on top of bags.
e. Execute the NESHAP-required Waste Shipment Record (WSR) to be signed by the generator, transporter, and landfill. All WSRs shall be returned to the EC within 30 days of shipment.

f. ACBM waste shall be transported from the Work Site directly to the landfill.

F. Disposal of packaged asbestos wastes:

1. Only landfills approved and permitted by Illinois for accepting asbestos wastes may be used for disposal.

3.13 DEMOBILIZATION

A. EC shall inspect the Work Area for evidence of visible debris prior to releasing the area for tear-down. Detection of contamination will require additional cleaning and re-testing of the Work Area.

B. Remove critical barriers and seals.

C. Restore previously-removed items, if specified in the bid documents:

1. Re-mount fixtures and other previously dismounted objects.
2. Return moveable objects to their original locations.
3. Install new filters in HVAC systems where filters were previously removed.
4. Re-establish electric systems and other utilities that were shut down or locked out.

D. A punch list walk-through shall be conducted for each cleared Work Area within two working days of clearance testing by the EC, Contractor, school engineer, principal, and AOR. All punch list items shall be completed within five working days of walk through.

END OF SECTION 02 82 14
SECTION 02 82 15
ASBESTOS ABATEMENT - EXTERIORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Section 02 24 01 Environmental Scope Sheets.

1.2 APPLICABILITY
A. These environmental requirements apply to all Public Building Commission (PBC) projects. These specifications apply for all demolition, construction and renovation projects that require the removal and disposal of asbestos containing materials from the outside of buildings in accordance with all applicable regulations.

1.3 INTRODUCTION
A. Exterior building spaces are not covered by Illinois Department of Public Health (IDPH) rules, except for covered hallways or porticos connecting buildings and outdoor mechanical systems which condition indoor air (such as air handling units, air conditioners, cooling towers, etc.), or when interior building spaces are involved.

B. Roofing, window replacement, exterior transite sheeting, galbestos siding, asbestos-containing paint, caulking, glazing, flashings, cements, or other products installed on the building exterior are subject to Occupational Safety and Health Administration (OSHA) and National Emission Standards for Hazardous Air Pollutants (NESHAP) rules which, in many cases are less rigorous than IDPH requirements. All exterior asbestos abatement activities shall be conducted from the exterior of the building. At no time shall any work activity be staged from the interior of the building. Abatement of roofing materials requires supervision by a competent person that can be employed by the roofing contractor (refer to definition of competent person below). Abatement of these items is specified in the specifications. Related paragraphs in the Interior Abatement Section may be referenced or included where relevant.

1.4 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) means 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 work in the specifications.

C. Architect of Record (AOR) means any person or firm employed by the Commission for the purpose of designing the project.
D. Asbestos Abatement Supervisor, hereinafter referred to as “Supervisor” means any person who supervises asbestos abatement workers. This person must be trained, accredited, and meet OSHA competent person criteria for asbestos abatement.

E. CDPH means Chicago Department of Public Health.

F. Chicago Public Schools (CPS) means the Owner of the property and the authority ordering the work specified herein.

G. Commission means the Public Building Commission of Chicago, a municipal corporation organized under the Public Building Commission Act of the State of Illinois, as amended, or its duly authorized officers or employees.

H. Commission Representative means the entity responsible for overall project coordination and completion.

I. Competent person means 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 means the entity responsible for performing the complete scope of work in the bid documents. The Contractor may elect to self-perform or subcontract out any portion of the work.

K. Environmental Consultant (EC) means 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.

L. Environmental Project Manager (EPM) is the project manager selected by the EC to perform environmental monitoring and act on behalf of the EC for CPS or its agents on the project.

M. Exposure Assessment is defined as a demonstration by the employer that employee exposure during an operation is or will be consistently below the Personal Exposure Limits set by OSHA.

N. HEPA Filter means 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 means the Illinois Department of Public Health.

P. OSHA means the federal Occupational Health and Safety Administration.

Q. Plasticize means to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.

R. PPE (Personal Protection Equipment) means the protective suits, head and foot covers, gloves, respirators and other items used to protect persons from asbestos or other hazards.

S. RCRA means the Resource Conservation and Recovery Act and associated regulations.
T. SDS means 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. Work means 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.

W. Work Area means the area or areas where asbestos abatement is being conducted.

X. Work Site means 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.

1.5 SCOPE OF WORK

A. Refer to Contract Drawings and Environmental Scope Sheets in Section 02 24 01.

1.6 WORK INCLUDED

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 AC, by submitting a bid for the Work, represents itself as knowledgeable and expert in the performance of the Work, and includes all things necessary to provide a complete and finished job, whether specifically mentioned or not. Related work may be shown in other related documents, prepared by others, if applicable, and as listed below.

1. Division 02 Section "Asbestos Abatement- Interiors."

B. Removal of friable and non-friable asbestos-containing materials listed in the bid 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.

C. Repair or replacement of damaged surfaces, fixtures, or furnishings to restore them to like new condition to the satisfaction of the Architect or Commission Representative or EC.

D. When the bid documents include lead and asbestos abatement items in the same spaces, typically windows, painted-over transite sheeting, and flashings, the work should be performed in the sequence and combinations that produce the most efficient results, minimize concentrated lead waste volume, and produce the least amount of total waste. That sequence will generally be:
1. Cleanup and removal of lead dust, flakes, chips, peeling paint, and residues most likely to fail a TCLP test.
2. Removal of asbestos materials and cleanup of visible residues.
4. Removal of non-friable asbestos items. 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 with both the lead and asbestos-bearing items intact.
5. Final cleanup and decontamination of the work space. Final air clearance (asbestos) and wipe samples (lead) may be performed concurrently.
6. When lead and asbestos final decontamination processes are combined, the more stringent cleanup procedures shall apply for both.
7. Waste disposal.
   a. Classified waste: loose paint flakes, chips, and dust; lead-specific cleaning supplies; contaminated soil; combined final decontamination supplies; disposable suits, gloves, headcovers, and footcovers; other items that fail a TCLP test.
   b. Special waste: friable asbestos-containing waste materials and lead-contaminated waste that has passed TCLP or other RCRA tests.
   c. Construction and Demolition (C&D) debris: non-friable asbestos-containing waste materials (such as, but not limited to intact transite, mastics, packing, caulking); lead-bearing architectural components where the paint is in intact condition.
   d. All asbestos-containing or lead-bearing wastes, regardless of classification, shall be disposed in an IEPA-approved landfill within the State of Illinois 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, fees, notifications, reports, or other documents required by law, regulation, this specification, or the bid documents.

G. Provide project closeout documentation to the Environmental Project Manager (EPM) within thirty (30) days after final clearance. This documentation shall include, but is not limited to, submittals specified elsewhere in the specifications.

1.7 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
5. 40 CFR Part 763 Subpart E - US EPA Asbestos Model Accreditation Plan (MAP): Appendix CInterim Final Rule
6. 11-4-2170: Chicago Building Code- Demolition and renovation safeguards
7. 11-2-2150: Environmental Standards related to the demolition, renovation, asbestos abatement and maintenance, sandblasting, chemical wasting, and grinding of buildings facilities or other structures.

1.8 ASSESSMENT, MONITORING, TESTING AND ANALYSIS

A. The EC will perform inspection, testing and design services prior to the start of work, and during the project, if necessary. The EC will also perform testing, inspection, and monitoring services during the work and upon its completion:

1. Prior to the start of the work, the EC shall
   a. Identify suspect materials and confirm their asbestos content through review of the school’s documentation or by testing;
   b. Design the project and address any design changes as requested. Approved changes shall be submitted to the IDPH, when necessary.

2. During the work, the EC shall:
   a. Observe the work periodically, with sufficient frequency to ensure Contractor compliance.
   b. Collect area air samples in and around the Work Area, as needed, to verify exposure conditions.
   c. 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; cleaning adjacent areas that become contaminated by the asbestos abatement activities.
   d. Make copies of contractor licenses from the originals.
   e. Complete design changes that are needed.

3. Upon completion of the work, the EC shall:
   a. Visually inspect for visible dust and debris, and verify the full completion of the work.
   b. Require contractor to re-clean the area or portions of areas until no visible debris remains.
   c. Perform clearance air sampling at the completion of the work activities, when necessary.

B. The AC shall provide OSHA compliance air monitoring to determine exposures to its employees in accordance with OSHA 29 CFR 1926.1101. Frequency of monitoring shall comply with OSHA requirements for the anticipated and actual exposure levels.

1. A written Exposure Assessment with air sampling and analysis conducted 6 months or less 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 these tasks.
2. Analysis may be performed on site.

C. Credentials required for testing and analysis of Phase Contrast Microscopy air samples:
1. Air sampling shall be conducted by an IDPH licensed Air Sampling Professional.
2. Accreditation by AIHA or AAR; or
3. Participation in the Proficiency Analytical Testing (PAT) program.

1.9 SUBMITTALS BY THE CONTRACTOR (SUBMITTED TO AOR AND EC):
   
   A. The following shall be submitted to the EC no less than 10 days prior to the start of the asbestos abatement work 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 with a copy to CDPH for asbestos abatement quantities less than 260 linear feet or 160 square feet. Submit ten (10) day CDPH notification for all asbestos work.
   
   1. Ten (10) day IEPA Asbestos Notification including inspector license number and landfill permit number.
   2. Evidence that all AC 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 licenses
      c. Current physician’s written opinion
      d. Current respirator fit test for negative pressure respirators when respirators are used.
   3. Copy of OSHA Exposure Assessment, with air sampling and analysis conducted 6 months or less prior to the start date of the abatement project.
   4. OSHA compliance air monitoring records generated during the project.
   6. Worker license and certification log.
   7. Safety Data Sheets (SDS) for chemicals used on site.
   8. 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 Chicago Public Schools for buildings where asbestos abatement will take place.

   D. The AC shall provide copies of all regulatory notices to the Commission Representative, PBC Deputy Director of Environmental Services, CPS Environmental Services Manager 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 all parties listed above.

   E. PRODUCTS

   1.10 TOOLS AND EQUIPMENT

   A. All equipment shall at least conform to minimum industry standards:

   B. Equipment:
1. Respirators shall be NIOSH approved for use with lead, asbestos, or other contaminants anticipated in the work.
2. 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. Ladders, scaffolding and all other rigging devices shall be constructed in a safe manner meeting all regulatory and permit requirements.
2. 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. Power tools shall also be grounded using a ground fault Circuit Interrupter (GFI) breaker or outlet.

1.11 MATERIALS

A. Installed materials which become a part of the work such as, but not limited to, encapsulants foam sealants and permanent enclosures shall be of good quality, non-lead-bearing, free of asbestos, and conform to the respective reinstallation specification sections.

1. Contractor shall ensure that encapsulants and sealants used as primers, basecoats, fillers or covering existing materials are compatible with the respective existing or reinstallation materials and their manufacturers’ warranties.

B. Abatement materials

1. Poly sheeting for all applications shall be 6 mil nominal thickness.
2. Tape shall be 2 inch or 3 inch 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 2 - EXECUTION

2.1 EMPLOYEE TRAINING, QUALIFICATION AND MEDICAL SCREENING

A. Supervisors and Workers shall be trained, accredited, and licensed in accordance with IDPH rules and regulations:

1. Contractor shall keep copies of current 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 work site 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 along with a current fit test certificate.

2.2 PERMISSIBLE EXPOSURE LIMITS

A. The OSHA permissible exposure limit (PEL) for worker exposure to airborne fibers is 0.1 f/cc as an 8-hour time-weighted average (TWA).

B. The OSHA short term excursion limit (STEL) for worker exposure to airborne fibers is 1.0 f/cc for a 30 minute sample.

2.3 EXPOSURE ASSESSMENT AND MONITORING

A. The AC shall make an assessment of the airborne exposures. Assessment shall conform to 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 these documents.
3. In the absence of an exposure assessment the contractor shall perform the work in full negative pressure containment with Type C pressure-demand respirator with auxiliary SCBA escape bottle.

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. Daily, if the exposures are, or are expected to be, above the PEL of 0.1 f/cc.
3. Periodically if the exposures are, or are expected to be, below 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 reinstituted if exposures are unknown or are expected to exceed the PEL.
5. Area Monitoring is required at the perimeter of the Work Area to verify that exposures to adjacent areas are below the PEL.

2.4 RESPIRATORY PROTECTION

A. Respiratory protection shall be worn by all persons potentially exposed to airborne asbestos fibers from the start of the abatement project until air monitoring analysis results prove otherwise.

2.5 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 shall wear appropriate PPE.

C. When the use of a Personnel Decontamination Enclosure System is deemed necessary by the EC, the AC shall follow all entry and exit procedures posted in the Personnel Decontamination Enclosure System.

D. Personal Protection Equipment (PPE) shall include:
   1. Full body disposable suits, headgear, and footwear.
   2. Gloves.
   3. Hard hats.
   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 required in the Work Area.
   6. PPE is required when exposures are, or are expected to be above the PEL.

E. A Personnel Decontamination (decon) Facility is required when worker exposures are expected to be above the PEL. The Decontamination unit may be remotely located if not feasible to locate adjacent to the Work Area.
   1. Establish a negative pressure of at least 0.02 inch water column between the dirty equipment room and adjacent spaces, including the clean room. Assume Negative Air Machines (NAM) operate at 80% design capacity.
   2. Provide at least 4 air changes per hour within the decon unit.
   3. All personnel shall use a double-suiting procedure for traveling between Work Areas and decon. Persons shall HEPA-vacuum the exterior of their disposable suits at the entry to the Work Areas, put on a clean suit over the existing suit, and proceed to the decon unit for shower decontamination and change into street clothes.

F. To exit, persons shall HEPA-vacuum down clothing at the Work Areas entry, and leave the Work Areas. 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 Areas.

2.6 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. 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 system.

D. Removing respirators or other PPE in the Work Areas.
2.7 WORK AREAS ISOLATION AND PREPARATION

A. General Preparation

1. Post 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.
2. Secure the Work Areas from entry by unauthorized persons.

B. Exterior Preparation

1. 6 mil plastic sheeting shall be placed over the ground, foundation, or other surfaces below the abatement area.
2. Unauthorized entry shall be prevented by using appropriate barriers, such as warning tape, fencing, or other suitable barriers.
3. Nearby air intakes, grilles, windows, and other openings into the building interior above, below, or beside the Work Areas that could be exposed to released airborne dust shall be closed or otherwise sealed off with poly and tape.
4. All electric power in the Work Areas shall be protected with Ground-Fault Circuit Interrupters.

2.8 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 protection shall be provided when working from exterior access:
   a. Scaffolding shall be equipped with handrails and midrails designed to provide fall protection, or full-body safety harnesses shall be worn and tied off to a secure anchor point.
   b. Workers in manlifts shall wear full body harnesses and tie to the tie-off point provided on the manlift basket whenever the basket is elevated from ground level.
   c. The contractor shall ensure that scaffolding, manlifts and the workers erecting and using the equipment meet all federal, state and local regulations and requirements including the acquisition of all required permits for the erection and use of such equipment.

B. Window Replacements: Asbestos-containing materials are most likely to be found in exterior caulking and glazing putty. Windows may be removed under the specifications if ACM is handled from the building exterior. If ACM materials must be accessed from inside the building or ACM wastes must be transported through the building interior, then IDPH-regulated requirements shall apply at no additional cost to the PBC. Refer to Division 02 Section "Asbestos Abatement - Interiors" if interior work is necessary. For exterior work:

1. Close windows and seal from the inside by covering with 6 mil poly and tape, or by applying tape directly to window joints and seams.
2. Any ACM not required to be disturbed for window removal should be left in place (e.g. window pane glazing).
3. ACM that must be disturbed (e.g. caulking at the edge of the window frame) must be removed completely, including three-dimensional residues.
4. Collect debris and deposit in asbestos waste bags as the work proceeds. Do not allow wastes to accumulate on surfaces.
5. Abate ACM and LBP on all window components to remain in place.

C. Roofing:

1. General: Remove ACM roof mastics, cements, underlayments, and flashings in an intact state to the extent feasible. 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.
   a. The Contractor shall take care to minimize the amount of roofing material damage, or;
   b. If the materials are rendered non-intact, the Contractor 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 Areas perimeter to determine that airborne asbestos fibers are not being released in concentrations above the PEL.

2. Built-up roofing and asphalt shingles:
   a. Power cutting machines shall be equipped with a HEPA-filtered dust collection system and shall be misted during use.
   b. Dust generated by the cutting operation shall be collected with HEPA vacuums or wet cleaning methods.

3. Rigid roofing materials, such as cement asbestos shingles: remove intact and minimize breakage.

D. Transite, Galbestos sheeting (galvanized metal with a baked-on asbestos paint), Asbestos/Cement pipe, or other rigid panels shall be removed using wet methods.

E. Other

1. Non-LBP and other 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.

2. Non-LBP, coatings, and other miscellaneous materials that must be removed from the substrate or that otherwise will 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.
2.9 CLEANING AND DECONTAMINATION

A. All visible accumulations of ACM, debris, tools, and unnecessary equipment shall be removed from the Work Areas.

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 which have been exposed to friable ACM or its dust is not permitted.

2.10 FINAL CLEARANCE

A. Cleaning may be discontinued when there is no visible debris and area air monitoring verifies that exposures are below the PEL. If any area air monitoring analysis results demonstrate results are at or above the PEL, the AC is responsible for repeating the cleaning as necessary until tests are satisfactory. All expenses associated with the collection and analyses of additional air monitoring tests are the responsibility of the AC.

2.11 WASTE DISPOSAL AND EQUIPMENT LOAD-OUT

A. Roofing waste may be loaded in bulk into lined enclosed receptacles, such as dumpsters or trailers. Receptacles shall be closeable and lockable to provide security and to prevent air emissions.

B. Packaged 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 gooseneck seal, or other impermeable containers.
   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.

C. Removing items from the Work Areas:
   1. Packaged asbestos wastes shall be HEPA-vacuumed before removing from the Work Areas.

D. 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.

E. Shipment of items from the project.
1. Decontaminated tools and equipment may be shipped by normal carrier to warehouse, another jobsite, or other destination.

2. For asbestos wastes:
   a. Line enclosed shipping container with 6 mil poly prior to loading packaged friable asbestos wastes.
   b. Post NESHAP placards during loading of friable asbestos wastes.
   c. Execute the NESHAP-required Waste Shipment Record (WSR) to be signed by the generator, transporter, and landfill. All WSRs shall be returned to the EC within 30 days of shipment.
   d. ACM waste shall be transported from the work site directly to the landfill.

F. Disposal of packaged asbestos wastes.
   1. Only landfills approved and permitted for accepting asbestos wastes may be used for disposal.

G. A punch list walk-through shall be conducted for each cleared Work Areas within two working days of clearance testing by the EC, Contractor, school engineer, principal, and AOR. All punch list items shall be completed within five working days of walk through.

END OF SECTION 02 82 15
SECTION 02 86 13
HAZARDOUS AND UNIVERSAL WASTE MANAGEMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Section 02 24 01 Environmental Scope Sheets

1.2 APPLICABILITY

A. These environmental requirements apply to all Public Building Commission (PBC) 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.

1.3 INTRODUCTION

A. 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.

B. 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.

1.4 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. Capacitor means device for accumulating and holding a charge of electricity and consisting of conducting surfaces separated by dielectric fluid.

C. CFR means 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.

D. Chemical Waste Landfill means 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.

E. Chicago Public Schools (CPS) means the Owner of the property and the authority ordering the work specified herein.
F. Commission means the Public Building Commission of Chicago, a municipal corporation organized under the Public Building Commission Act of the State of Illinois, as amended, or its duly authorized officers or employees.

G. Commission Representative means the entity responsible for overall project coordination and completion.

H. Component means all removable parts/materials which make up ballasts, bulbs, batteries, and other electrical equipment, a percentage of which can be recycled.

I. Container means any portable device, in which material is sorted, transported, treated, disposed of, or otherwise handled.

J. Contractor means 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. Disposal means 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.

L. Disposal Facility means 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.

M. Environmental Consultant (EC) means 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.

N. EPA Identification means the unique number assigned by the EPA to each generator or transporter of hazardous waste, and each treatment, storage or disposal facility.

O. Fluorescent light ballast means a device that electrically controls fluorescent light fixtures and that includes a capacitor containing 0.1 kg or less of dielectric.

P. 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.

Q. Facility means 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.

R. On-site means within the boundaries of a contiguous property unit.

S. OSHA means the federal Occupational Health and Safety Administration.

T. Landfill means 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.

U. Manifest means 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.

V. Polychlorinated Biphenyls (PCBs) means 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.

W. PCB Article Container means 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.

X. PCB Container means 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.

Y. PCB Item means 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.

Z. Recover Refrigerant means to remove refrigerant in any condition from an appliance without necessarily testing or processing it in any way.

AA. Recycle Refrigerant means 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.

BB. Reclaim Refrigerant means 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.

CC. Storage means 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.

DD. SDS means 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.

EE. Toxic Characteristic Leaching Procedure (TCLP) means 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.

FF. Transporter means 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.

1.5 SCOPE OF WORK

A. Refer to Contract Drawings and Environmental Scope Sheets in Section 02 24 01.

1.6 WORK INCLUDED

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. Related work may be shown in other related documents prepared by others, if applicable and as listed below:

1. Division 02 Section "Asbestos Abatement - Interior."
2. Division 02 Section "Asbestos Abatement - Exterior."

1.7 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.

1.8 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:


b. EPA: U. S. Environmental Protection Agency (EPA), including but not limited to the following:


iv. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Title 42, Section 103.


c. LABOR: Occupational Safety and Health Administration, including but not limited to:


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:

   
   
   
   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.


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.


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.

1.9 SUBMITTALS

A. Before start of any hazardous waste removal Work, the Contractor must submit a Hazardous Waste Management Plan to the EC fifteen (15) days prior to the start of Work.

B. During the Work, the Contractor must submit the following to the EC, 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 EC.

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 EC.

1.10 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 Commission 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 Commission 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 Commission Representative within 48 hours of the incident that indicates that all problems and issues have been satisfactory 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.

2. Hazardous Material Handling:
a. Procedures including a description of the method of transportation and storage of each type of hazardous material, for movement on and off site.
b. Contractor shall provide a description of procedures for on-site characterization of chemicals for consolidation prior to disposal/recycling.
c. The plan will include the following documentation for each transporter:
   i. A copy of state and local special waste and/or hazardous waste hauler licenses for each transporter must be provided in the Plan.
   ii. U.S. EPA Identification Number of waste hauler.
   iii. Current list of all transporting vehicles to be used including:
      a. Vehicles make, model and year.
      b. Serial number for each vehicle.
      c. Vehicle license number.
      d. Number of axels.
      e. Weight capacity of vehicle.
   d. A list of all licensed qualified truck drivers. Drivers should be able to provide their drivers 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.

3. 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:
      ii) Contact person and telephone number.
      iii) Copy of state license and permit.
      iv) 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.

4. 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.

5. 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.

6. 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.

7. In addition, the Plan will provide:
   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

2.1 EQUIPMENT/MATERIALS

A. Disposal Bags: Provide 6 mil (0.15 mm) thick leak-tight polyethylene bags.


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

3.1 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.


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 Commissionership 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.

3.2 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.

3.3 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:
      i. Hydraulic-lift elevators
      ii. Hydraulic trash compactors
      iii. Hydraulic loading dock lifts

2. 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.

3. 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.
4. 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.

5. Waste Type E: Refrigerants and CFCs
   a. Refrigerators and freezers.
   b. Air Conditioning units.
   c. Cryogenic Supplies.
   d. Bulk storage of refrigerants.

6. 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.

7. Waste Type G: Radiological Waste
   b. Equipment that uses a radioactive source including x-rays, mammograms, CAT scans, electron microscopes, scintillation spectrometers, etc.
   c. Smoke detectors.

8. Waste Type H: Lead-containing waste.
   a. Lead paint (liquid or containerized paint wastes).
   b. Lead-contaminated wastes (paint chips, loose debris, etc.).

9. Waste 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.

3.4 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:
   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.

2. 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.

3. Waste Type E – Refrigerants and CFCs:
   a. Reference Section 3.8 for details.

4. 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.

5. Waste Type G – Radiological Wastes:
   a. All radiological equipment shall be packaged and shipped in accordance with 32 IAC 341 regulations.

6. Waste Type H – Lead-containing Wastes:
   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.

3.5 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 CIRUMSTANCES WILL THE ACCUMULATED WASTE REMAIN ON SITE BEYOND NINETY (90) DAYS FROM THE DAY THAT ACCUMULATION IN THE CONTAINER WAS INITIATED.

3.6 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 Commission 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 Commission Representative.

3.7 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.
10. Gas cylinders and fire extinguishers.

3.8 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).
   b. For Refrigerant CFC-11 (Low-Pressure Refrigerants): Drums of steel construction and designated as 17C or 17E.

3. Open top and plastic drums shall not be used.

4. 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.

3.9 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).

3. 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.

PART 4 – MEASUREMENT AND PAYMENT

4.1 BASE CONTRACT PRICE – All work specified in this Section shall be included in the Base Contract Price, except as noted below.

END OF SECTION 02 86 13
SECTION 02 83 19.13

LEAD-BASED PAINT ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 02 24 01 Environmental Scope Sheets

1.2 APPLICABILITY

A. These environmental requirements apply to all Public Building Commission (PBC) 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.

1.3 INTRODUCTION

A. 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 Chicago Public Schools facilities. Abatement of all interior and exterior lead-bearing substances is covered by these specifications.

1.4 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) means 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) means any person or firm employed by the Commission for the purpose of designing the project.

D. CDPH means the Chicago Department of Public Health.

E. Chicago Public Schools (CPS) means the Owner of the property and the authority ordering the Work specified herein.

F. Commission means the Public Building Commission of Chicago, a municipal corporation organized under the Public Building Commission Act of the State of Illinois, as amended, or its duly authorized officers or employees.

G. Commission Representative means the entity responsible for overall project coordination and completion.
H. Contractor means 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.

I. Competent person means 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.

J. Drawings are those enumerated in the Schedule of Drawings, and additional drawings and sketches, if any, incorporated into the Contract by a bulletin issued by the Architect or Change Order as the Work progresses.

K. Environmental Consultant (EC) means 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.

L. Environmental Project Manager (EPM) is the person selected by the Environmental Consultant to perform environmental monitoring and act on behalf of the CPS or its agents on the project.

M. HEPA Filter means 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.

N. IDPH means the Illinois Department of Public Health.

O. Lead Abatement Contractor/Supervisor, hereinafter referred to as “supervisor” means 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.

P. Lead-Based Paint means paints or coatings that are lead bearing substances as defined by IDPH regulations referenced in Laws, Regulations and Standards specified elsewhere in the specifications.

Q. Lead Bearing Soil means soil containing an amount of lead in excess of applicable guidelines.

R. Lead Bearing Substance means 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.

S. OSHA means the federal Occupational Health and Safety Administration.

T. Plasticize means to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.


V. SDS means 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.

X. User or User Agency means the entity for which or on whose behalf the Commission has undertaken to cause the Work to be performed.

Y. Wet Cleaning means cleaning all surfaces with a phosphate-free lead dissolving detergent.

Z. Work means 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.

AA. Work Area means areas where lead abatement activities are conducted.

BB. Work Site means 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.

1.5 SCOPE OF WORK

CC. Refer to Contract Drawings and Environmental Scope Sheets in Section 02 24 01.

1.6 WORK INCLUDED

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. Related work may be shown in other related documents prepared by others, if applicable and as listed below:

1. Division 01 Section "Project Record Documents."
2. Division 02 Section "Asbestos Abatement - Interior."
3. Division 02 Section "Asbestos Abatement - Exterior."

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 Commission Representative, EC 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.

1.7 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
5. 29 CFR 1926: US OSHA Construction Standards

Williams Park Fieldhouse 02 83 19.13 - 4 LEAD-BASED PAINT ABATEMENT
PBC Project Number 11320
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)
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.

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 CPS or the PBC.

1.8 ASSESSMENT, MONITORING, TESTING, AND ANALYSIS

A. The EC 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 (µg/m3) 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.

1.9 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.
7. Worker license and certification log.
8. Safety Data Sheets (SDS) for chemicals used on site.
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 Chicago Public Schools for buildings where lead abatement will take place. The AC shall provide copies of all regulatory notices to the CPS Environmental Services Manager 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 CPS and the Commission Representative.

1.10 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

2.1 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.

2.2 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

3.1 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.
3.2 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), 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 (µg/g) of soil in high contact play areas.

3. 400 micrograms per gram (µg/g) of soil in other areas.

4. 40 micrograms per square foot (µg/sf) of surface area of dust on interior floors.

5. 200 micrograms per square foot (µg/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.

3.3 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 µg/m³ 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 µg/m³ 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 µg/m³ 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.

3.4 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.

3.5 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.

3.6 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

3.7 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 EC. 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. Sheetig 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. Sheetig 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.

3.8 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. Where existing lead-bearing substances may be disturbed by the installation of new work, they shall be removed sufficiently to prevent such disturbances.
3. 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.
4. 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.
5. 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 with 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. EC 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 EC 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.
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.

3.9 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 (µg/sf) on floors or 200 micrograms per square foot (µg/sf) on other surfaces by the EPM. At least 3 wipe samples per contained Work Area shall be
collected by the EC 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 CPS.

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 19.13
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Substructure.
2. Slabs-on-ground.
3. Concrete toppings.

B. Related Sections include the following:

1. Division 03 Section "Architectural Concrete" for general building applications of specially finished formed concrete.
2. Division 05 Section "Structural Steel Framing" for steel framing and post-installed concrete anchors.
3. Division 05 Section "Steel Decking" for metal decks.
4. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

A. General:

1. Review of submittals is of a general nature only, and the responsibility for conformance with intent of drawings shall remain with the Contractor. Review does not imply or state that the fabricator has correctly interpreted the construction documents.
2. All submissions shall be in accordance with the submission schedule developed and agreed between the Architect and Contractor at the commencement of the project. Submission shall include dates of order and delivery of materials to the shop and the site.

3. Shop drawing schedule shall allow adequate time for reviews. Reinforcing steel shall not be fabricated or placed before the shop drawings have been reviewed by the Architect and returned.

B. Product Data: For each type of product indicated, including ICC-ES for mechanical couplers.

C. Design Mixtures: Each concrete mix design to be used on the project shall be reviewed and approved by the Testing Agency and Architect prior to concrete being delivered to site. Submit proposed mix designs for each class of concrete on the Mix Design submittal form included at the end of this specification. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. For each concrete mixture, the following information shall be included: where the mix is to be used, all materials and admixtures including their source and proportions in the mix; Water content, water-to-cement ratio, slump, and aggregate grading; whether the mixture is appropriate for pumping; and total chloride content.

2. Provide shrinkage test results for mixes with shrinkage criteria showing that mix meets performance criteria. The mix design number must match with the mix design number shown on the test data.

3. Indicate compressive strength and method used to determine strength. The compressive strength of the concrete shall be proportioned per ACI. Include all calculations and tests required by ACI 318 Section 5.3 and 5.4. Laboratory test data must be submitted along calculations that show with each mix design meets the strength requirement. Mix design number must match the mix design number shown on the test data. Include all test results or past history back up data specific as part of the submittal. Test results within the past two years shall be used to indicate performance in accordance with past history.

4. Indicate amounts of mixing water to be withheld for later addition at Project site.

5. Each mix shall be stamped and signed by a Professional Engineer licensed in the State of Illinois.

D. Steel Reinforcement Shop Drawings: Placing drawings in accordance with SP 66 that detail fabrication, bending, and placement. Direct copies of the contract documents are not acceptable as a submission from the Contractor.

1. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Include any welding to be done.
2. Shop drawings shall make it clear where each bar is located. Beams, grade beams and walls shall be shown in elevation. On elevations show locations of sleeves and penetrations.

3. Check architectural, structural, mechanical, and electrical and other contract documents for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and any other items which are required to be cast in concrete, and make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

4. Show all areas of congestion. Identify where reinforcing steel will interfere with the placement of embedded items such as anchor bolts, anchors, inserts, conduits, sleeves and any other items which are required to be cast in concrete.

E. Submit schedule of concrete placement operations before commencing Work.

F. Show on one or more plans and/or elevations, locations of construction, contraction and expansion of joints, slab edges, curbs, equipment pads, depressions, sleeves and openings.

G. Formwork: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Design Criteria:
   a. Design of concrete formwork, shoring, reshoring and bracing shall be the sole responsibility of the Contractor and shall conform to Code requirements and shall be in accordance with the recommendations of ACI 347. Forms shall provide the required shape and dimensions specified on the Documents.
   b. Provide forms complete and of such strength and adequately braced so as to prevent any spreading, shifting or settling when concrete is placed to ensure finished concrete surfaces of the required tolerances.
   c. Forms shall be tight to prevent leakage or washing out of cement mortar from concrete.
   d. Bolts, rods, and other devices when used for internal ties and spreaders shall be of such construction that when the forms are removed, no metal shall be within 1 inch of the exterior concrete surfaces or within 1/2 inch of interior concrete surfaces.

2. Shop Drawing Requirements:
   a. Shop Drawings shall show location and layout of construction joints, reveals, slab edges, form joints, sleeves, openings, locations of tie holes or plugs, location of embedded items and blockouts, and all related details affecting Architectural quality.
   b. Shop Drawings will show dimensioned location to the face of formwork for walls, beams, columns, slab edges, slab depressions, etc.
c. Formwork details affecting Architectural finish quality shall be reviewed by the Architect.
d. Indicate where formwork release agent will be used, as applicable.
e. Where a mock-up is required, submit shop drawings of the mock-up.

H. Samples: For waterstops vapor retarder formwork, as requested by Architect.

I. Welding certificates.

J. Welding Procedures for all reinforcement welding.

K. Mill Test Reports: Submit steel producer's certificates of mill analysis for each heat or melt of reinforcing steel, including steel source, description, heat number, yield point, ultimate tensile strength, elongation percent, bend test and the chemical composition of each heat as determined by ladle analysis, before delivery of steel to site. Where steel is required to be welded, mill reports shall be used to help verify the weldability of the steel.

L. Qualification Data: For Installer manufacturer testing agency. Submit qualification of Concrete Foreman, showing 5 years experience with this type of concrete installation.

M. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Normal weight aggregate (per ASTM C33). Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity. Include evaluation of reactivity and the following:
   b. Cleaniness Value: Test Method NO. C 227; coarse aggregate only.
   c. Fineness: ASTM C117.
   g. Sieve Analysis: ASTM C136.
   h. Soundness: ASTM C88.
   i. Absorption for lightweight aggregate: Maximum 15%.

N. Product Test Reports and Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials, per ASTM C150.
2. Admixtures. Where more than one admixture is used, include certification that admixtures are compatible. Per ASTM C494 for each type used; include chloride ion content.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Welding Electrodes
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
11. Adhesives.
12. Vapor retarders.
15. Post-installed concrete anchors.

O. Submit a complete description of the system proposed for meeting the specified floor slab flatwork tolerances. Submit survey data from a minimum of two previous slab installations to demonstrate capability to satisfy specified tolerances.

P. Field quality-control test and inspection reports.

Q. Submit an affidavit identifying cementitious material used, including manufacturer's lot number, date of shipment by manufacturer, date of receipt by the concrete supplier, place of storage and date of use. If such information is not available, a sample of cementitious material used on the Project shall be taken for each day's pour and shall be tested as directed by the Architect.

R. Transit-Mix Delivery Slips

1. Keep record at the Site showing time and place of each pour of concrete, together with transit mix delivery slip certifying contents of the pour per ASTM C94. Include the time water was added to dry mix.
2. Make the record available for inspection at the Site and to the Architect for his review upon request.
3. Upon completion of this portion of the Work, deliver the record and the delivery slips to the Architect.

S. Complete minutes of preinstallation conference within (5) business days.

1.5 QUALITY ASSURANCE

A. Standards: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
2. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
3. ACI 318, "Building Code Requirements for Reinforced Concrete."
4. ACI SP-66, "Detailing Manual"
B. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

D. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
3. Shop and field testing and inspection of steelwork shall be performed by an inspector currently certified as an AWS Certified Welding Inspector.

E. Testing Agency: Shall be selected and paid for by the Owner, unless otherwise specified; re-testing paid for by the Contractor.

F. Contractor's Quality Control Plan: Quality Control includes the functions performed by the Contractor to ensure that the material and workmanship of concrete construction meets the project specifications and applicable standards. The Contractor shall submit a Quality Control Plan that addresses all inspection issues, including testing and inspection per ACI. The verification testing and inspection carried out by the Testing Agency does not relieve the contractor of the responsibility for conducting their own quality control/inspection program to ensure the requirements of the Contract Documents have been met. The Contractor's Quality Control Plan will be reviewed by the Testing Agency.

G. Quality Control Inspector Qualifications: Along with Quality Control Plan, Contractor shall submit written qualifications for all inspectors to be assigned Quality Control functions for concrete work.

H. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

I. Unidentifiable Reinforcing Steel: Tested by testing agency; paid for by Contractor:
1. Test reinforcing delivered to site which cannot be properly identified by
heat number and mill mark for compliance with ASTM A615 as follows:
   a. No. 8 Bar and Smaller: One tensile test and one bend test of each
      size per 7-1/2 tons, or portion thereof.
   b. No. 9 Bar and Larger: One tensile test of each size per 10 tons, or
      portion thereof.

J. Welding: Qualify procedures and personnel according to AWS D1.4,
"Structural Welding Code--Reinforcing Steel."
   1. Welders whose work fails to pass inspection shall be requalified before
      performing further welding.
   2. Firm specializing in furnishing and installing reinforcement shall have a
      minimum of 5 years experience on projects with requirements similar to
      this project and shall have sufficient production capacity.
   3. All welding shall be performed by operators who are qualified for the
      types of welds used. Each operator shall have been qualified within the
      preceding one year as prescribed by AWS. Welder qualification shall
      include passing the Charpy tests when specified for the electrode.
   4. Require welders to retake the qualification test if, as determined by the
      Architect, there is a reasonable doubt as to the proficiency of the welder.
      If the welder does not requalify, they shall not perform any welding on the
      project.

K. Concrete Testing Service: Engage a qualified independent testing agency to
perform material evaluation tests and to test concrete mixtures. When mixes,
are proportioned by trial batch method, engage a Laboratory conforming to
ASTM E329 and under direction of a Professional Engineer licensed in Illinois.

L. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints,
surface finish, texture, tolerances, and standard of workmanship. Mock-up
shall be constructed using the same mixes, materials, products, procedures
and methods as will be used for the permanent construction. See wiki
commentary.
   1. Build panel approximately 10x10 sq. ft. for formed surface lobby area in
      the location indicated or, if not indicated, as directed by Architect.
      Maintain sample panel exposed to view for duration of concrete work.
   3. Approved panels may become part of the completed Work if undisturbed
      at time of Substantial Completion.

M. Prefabrication and Preinstallation Conference: Conduct conference at Project
site to comply with requirements in Division 01 Section "Project Management
and Coordination."
   1. Before submitting design mixtures, review concrete design mixture and
      examine procedures for ensuring quality of concrete materials. Require
      representatives of each entity directly concerned with cast-in-place
      concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.
e. Laboratory responsible for field quality control.
f. Admixture manufacturer (s)
g. Concrete pumping subcontractor

2. During meeting, review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

3. The concrete contractor shall confirm that the proposed mix designs will enable him to properly place, pump, finish and achieve the required concrete quality specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement:

1. Deliver, store, and handle steel reinforcement to prevent bending and damage.[Avoid damaging coatings on steel reinforcement.]
2. Deliver reinforcing to Site properly bundled and tagged. Use tags that indicate bar size, lengths and marks corresponding to markings shown on shop drawings. Segregate so as to maintain identification after bundles are broken.
3. Store reinforcement in a manner that will prevent excessive rusting or fouling with/grease, oil, dirt, and other bond weakening materials.
4. Do not use damaged, reworked, or deteriorated material.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Formwork: Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

D. Concrete Materials:

1. Protect cement from moisture and rotate stock to ensure fresh materials.
2. Protect aggregates as necessary to maintain saturated condition when batched.
3. Storage methods should comply with ACI 301 4.1.4.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

A. A minimum of 50% of the wood materials used for formwork (e.g., dimensional lumber, plywood) shall be "FSC Certified" products which have been harvested in accordance with the "FSC Principles and Criteria" for well-managed forests developed by the Forest Stewardship Council (FSC) of Reston, VA.

B. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade 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.

C. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

D. For exposed surfaces not otherwise specified use Special exterior Type Douglas Fir, Grade AB plywood, conforming to NBS PS-1, minimum 3/4 in. thick and constructed so that finished concrete will be straight, smooth, dense, free from honeycombs, bulges, or depressions. Keep joints between plywood sections to a minimum and make tight and strongly backed so that adjoining edges remain flush and true.

F. Form Gaskets (for sealing form panel joints) Gaskets shall be closed cell, completely skinned, foam rubber or neoprene, with pressure sensitive paperbacked adhesive on surfaces to be bonded to forms. Gaskets shall be of sufficient thickness, widths and compressibility for specific use.

G. Form Sealer (Wood Forms): All form sealers shall be of a type which will not harmfully affect the appearance and/or utility of the concrete surface or the application of sealers, paint, vinyl fabric or any other finishes. In addition, form sealer shall prevent the development of bond or adhesion to concrete.

H. 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.


I. 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 1-1/2 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface and permit neat and solid patching at every hole.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

J. Expansion Joint Filler:

1. Fiber Type: Preformed asphalt impregnated fiber, ASTM D1751, 1/2 inch thick unless otherwise noted.
2. Cork Type: Preformed cork expansion joint, ASTM D1752. Type II, 1/2 inch thick unless otherwise noted.

K. Expansion Joint Sealant: ASTM C920, Type M, Class 2 5; two part polyurethane traffic grade sealant, gray color.

1. Horizontal Joints: Pourable, Grade P, Use T.
2. Vertical Joints: Nonsag, Grade NS, Use NT.

L. Foam Filler or High Density Styrofoam Fill: Expanded polystyrene foam, ASTM C578, Type IX, 1.9 pounds per cubic foot density.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars:

1. ASTM A615, Grade 60, deformed, unless noted otherwise.
2. ASTM A706, deformed, where bars are welded.


C. Tie Wire: American Wire 16 gauge or heavier black annealed wire.

D. Plain-Steel Wire: ASTM A82, [as drawn] [galvanized].

E. Deformed-Steel Wire: ASTM A496.

F. Plain-Steel Welded Wire Reinforcement: ASTM A185, plain, fabricated from as-drawn steel wire into flat sheets.


2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs. [Shop paint with iron oxide zinc chromate primer.]

B. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A775.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view or where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports, unless noted otherwise.
2. Where supports are placed against ground or atop vapor barrier use precast concrete blocks not less than 3 inches square with two 16 gauge embedded wires.
3. At Architectural Concrete and surfaces exposed to weather; CRSI Class 1 plastic protected.

D. Welding Electrodes: As required in AWS D1.4. As a minimum, use E90XX electrodes.

E. Deformed Bar Anchors: Nelson, flux filled deformed bar anchors, type D2L, as manufactured by Nelson Stud Welding Division of TRW or approved equal.

2.5 REINFORCEMENT FABRICATION

A. Fabricate reinforcing in accordance with ACI 301, 315 or CRSI "Manual of Standard Practice."
B. Bending:
   1. Do not bend or kink reinforcing except as shown on the Drawings.
   2. Minimum bend diameters and hook extensions as shown on the drawings or per ACI.
   3. In case of fabrication errors do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
   4. Reinforcing bars are to be bent cold, do not preheat, unless approved by Architect.
   5. Do not rebend reinforcement that has previously been bent within 6 inches of new bend except as allowed in section 3.3.2.8 of ACI 301.

C. Spirals: Provide a minimum of 1-1/2 finishing turns top and bottom.

D. Unacceptable Materials: Reinforcement with any of the following defects shall not be permitted in the Work and will be replaced without cost:
   1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
   2. Bend or kinks not shown on the Drawings or final shop drawings.
   3. Bars with reduced cross-section due to rusting or other cause.
   4. Bars with dirt, mud, grease or form release agent.

2.6 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C150, Type II, unless noted otherwise.
   2. Supplement Portland Cement with the following Supplementary Cementitious Materials (SCM):
      a. Fly Ash: ASTM C618, Class C or F.
      b. Slag Cement: ASTM C989, Grade 100 or 120.
      c. Silica Fume: ASTM C1240. [MasterLife SF 100 (formerly Rheomac SF100) by BASF Corporation or approved equal.]
      d. Metakaolin: ASTM C618. [MetaMax by BASF Kaolin, Part of BASF Corporation or approved equal.]
      e. The SCM producer shall have a minimum of 5 years experience in the production of acceptable SCM and shall practice an effective quality control program to guard against contamination of the SCM.
   3. Cementitious material used shall have at least 2 years of use with proposed aggregates without detrimental reaction.
   4. Alkali content shall not exceed 0.6% when tested in accordance with ASTM C114.
   5. The temperature of cement delivered to the plant shall not exceed 150 degrees F.
B. Silica Fume: ASTM C1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source[ with documented service record data of at least 10 years’ satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials].

1. Coarse Aggregate:
   a. Aggregate shall contain no thin or elongated pieces. Any piece having a major dimension more than 2-1/2 times the average thickness shall be considered thin or elongated.
   b. If shrinkage controlled concrete, Coarse Aggregate shall be crushed limestone, granite, or accepted equal.
   c. Alkali Silica Reactivity: Aggregate shall be considered non-reactive with documented satisfactory service record for a minimum of ten year period used in concrete with similar cementitious materials. In the absence of service record the aggregate shall be tested and will be considered non-reactive if it passes ASTM C1260 or ASTM C1293 per requirements of the Engineer of Record.
   d. Aggregates shall consist mainly of calcium or magnesium carbonate, e.g., limestone or dolomite, and containing 40 percent or less quartz, chert or flint.
   e. The maximum size used in a particular location shall be consistent with the form and dimensions of the section being placed, with the location and spacing of the reinforcing steel and with the method of vibration. The aggregate sizes shall be such as will produce dense, uniform concrete, free of rock pockets, honeycombs, or other irregularities.
   f. Combined aggregate gradation for slabs and other designated concrete shall be 8% to 18% for large top size aggregates (1-1/2-inch) or 8% - 22% for smaller top size aggregates (1-inch or 3/4-inch) retained on each sieve below the top size and above the No. 100.
   g. Recycled Crushed Concrete Aggregate: Crushed structural concrete is permitted for use as coarse aggregate when shown by testing to produce concrete of adequate strength and durability, and these are found acceptable to the Engineer of Record.

2. Fine Aggregate: Uniformly graded, clean sand, free from excessive fines, organic materials or other deleterious materials. Free of materials with deleterious reactivity to alkali in cement.

3. Combined Aggregate Gradation: Combined aggregate gradation for slabs and other designated concrete shall be 8% - 18% for large size aggregates (1 ½ in.) or 8% - 22% for smaller top size aggregates (1 in. or ¾ in.) retained on each sieve below the top size and above the No. 100.

D. Water: ASTM C1602 clean, free from deleterious matter. Non-potable water is acceptable if meets the chemical content limits of ASTM C1602
2.7 ADMI xTURES

A. General: Only if accepted by the Owner's Representative in accordance with ACI 318/318R 3.6 if they comply with requirements of ASTM C494. Where more than one is used, admixtures shall be compatible. Use of admixtures shall be consistent throughout Work.

1. Where specified herein do not use other admixtures without the written acceptance of the Architect.
2. Prohibited Admixtures: Admixtures containing intentionally-added chlorides are not permitted. Do not use admixtures that will negatively impact the visual finish of concrete exposed to view.

B. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other admixtures.

1. [Available] Products:
   a. Grace Construction Materials; Darex AEA or Daravair
   b. MasterAir AE 90 (formerly MB-AE 90), MasterAir AE 100 (formerly Micro Air) or MasterAir VR 10 (formerly MB VR Standard) by BASF Corporation or approved equal. Euclid Chemical Company (The); Air Mix

C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete.

   a. Grace Construction Products, W. R. Grace & Co.; "WRDA with Hycol"
   b. "MasterPozzolith" (formerly "Pozzolith") Series or "MasterPolyHeed" (formerly "PolyHeed") Series by BASF Corporation or approved equal.
   c. Euclid Chemical Company (The); "WR-75, WR-91 or Eucon MR"

2. Retarding Admixture: ASTM C494, Type B. [Available] Products:
   a. "MasterSet R" (formerly "Pozzolith") Series or "MasterSet DELVO" (formerly "DELVO") Series by BASF Corporation or approved equal.

3. Accelerating Admixture or Water-Reducing and Accelerating Admixture: ASTM C494, Type C or Type E. [Available] Products:
   a. MasterPozzolith AC 534 (formerly Pozzolith NC 534) or MasterSet AC 20 (formerly Pozzutec 20+) by BASF Corporation
   b. Accelguard 80, 90 or NCA by The Euclid Chemical Company
   c. Polarset by W.R. Grace
   a. Sika Corporation; "Sikament 30,"
   b. Euclid Chemical Company (The); "Eucon Retarder-75"
   c. "MasterSet R" (formerly "Pozzolith") Series or "MasterSet DELVO" (formerly "DELVO") Series by BASF Corporation or approved equal.

5. High-Range, Water-Reducing (Superplasticizers) Admixture: ASTM C494, Type F. [Available] Products:
   a. Grace Construction Products, W. R. Grace & Co.; "WRDA 19 or Daracem 100"
   b. Sika Corporation; "Sikament 300"
   c. MasterRheobuild 1000 (formerly Rheobuild 1000) or "MasterGlenium" (formerly "Glenium") Series by BASF Corporation,
   d. Euclid Chemical Company (The); "Eucon 37, 1037 or Plastol 5000"

   a. MasterSure Z 60 (formerly RheoTEC Z-60) by BASF Corporation or approved equal.

7. Alkali-Silica Reaction-Inhibiting Admixture: ASTM C494, Type S. Shall contain a nominal lithium nitrate content of 30 percent. [Available] Products:
   a. MasterLife ASR 30 (formerly ASRx 30 LN) by BASF Corporation or approved equal.

   a. "MasterMatrix VMA" (formerly "Rheomac VMA") Series by BASF Corporation or approved equal.

2.8 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513,[ with factory-installed metal eyelets,] for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. [Available] Manufacturers:
   a. Greenstreak.
   b. Progress Unlimited, Inc.
   c. Williams Products, Inc.
   d. Fosroc
   e. Adeka
2. Profile: As indicated.


2.9 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape. Plastic Vapor Retarder shall have a water-vapor transmission rate no greater than .012 perms (grain/h x ft² in x Hg) when tested in accordance with ASTM E96.

1. [Available] Products:
   a. Fortifiber Corporation; Moistop Ultra.
   b. Raven Industries Inc.; Vapor Block 10.
   c. Stego Industries, LLC; Stego Wrap, 15 mils.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

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

2.10 FLOOR AND SLAB TREATMENTS

A. Metallic Dry Shake Floor Hardener: Unpigmented, factory-packaged, dry combination of portland cement, graded emery aggregate and plasticizing admixture with emery aggregate consisting of no less than 60 percent of total aggregate content. Available products: EucoPlate HD, MasterTop 200 (Formerly Masterplate 200) by BASF Corporation, or approved equal.

B. Non-Oxidizing Metallic Floor Hardener: The specified non-oxidizing metallic floor hardener shall be formulated, processed and package under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a mixture of specially processed non-rusting aggregate, selected portland cement and necessary plasticizing agents. Provide one of the following: Diamond Plate by The Euclid Chemical Company, MasterTop 210 COR (Formerly Lumiplate) by BASF Corporation, or approved equal.

C. Mineral Dry-Shake Floor Hardener: The specified mineral aggregate hardener shall be formulated, processed and packaged under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a factory blended mixture of specially processed graded mineral aggregate, selected portland cement and necessary plasticizing agents. Available Products: Surfplex by The Euclid Chemical Company, MasterTop 100 (Formerly Mastercron) by BASF Corporation, or approved equal.
D. Liquid Sealer and Densifier: High performance, deeply penetrating concrete densifier; odorless, colorless, non-yellowing silicate based solution designed to harden, dustproof and protect concrete floors subjected to heavy vehicular traffic and to resist black rubber tire marks on concrete surfaces. The compound must contain a minimum solids content of 20% of which 50% is silicate. Available products: Euco Diamond Hard by The Euclid Chemical Company, Seal Hard by L & M Construction, MasterKure HD 210 WB (Formerly Kure-N-Harden) by BASF Corporation, or approved equal.

2.11 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete. Available products:

1. MasterKure ER 50 (formerly Confilm) by BASF Corporation or approved equal.

B. Absorptive Cover: AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film, fiber reinforced asphaltic vapor barrier building paper, or white burlap-polyethylene sheet.

1. Provide in a thickness of 42 mils; standard weight of 53 lbs./1000 ft²; tensile strength (machine direction) of 36 lbs./in.; and puncture resistance of 70 lbs.

D. Water: ASTM C1602 clean, free from deleterious matter. Non-potable water is acceptable if meets the chemical content limits of ASTM C1602.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1-D, dissipating. Sodium silicate compounds are prohibited.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, nondissipating[, certified by curing compound manufacturer to not interfere with bonding of floor covering]. Sodium silicate compounds are prohibited. Available products: Diamond Clear VOX or Super Diamond Clear VOX by The Euclid Chemical Company, or approved equal.

G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating[, certified by curing compound manufacturer to not interfere with bonding of floor covering]. Sodium silicate compounds are prohibited.

H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A. Sodium silicate compounds are prohibited.

I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A. Sodium silicate compounds are prohibited.
J. Curing and Sealing Compound: (VOC Compliant, 350 g/l): Liquid type membrane forming curing compound, clear styrene acrylate type, complying with ASTM C1315, Type I, Class A, 25% solids content minimum. Moisture loss shall be not more than 0.40 Kg/m2 when applied at 300 sq.ft./gal. Manufacturer's certification is required. Available products: Super Diamond Clear VOX, or Super Aquacure VOX by The Euclid Chemical Company, MasterKure CC 1315 (Formerly Kure 1315) by BASF Corporation, or approved equal.

2.12 RELATED MATERIALS


B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D2240.

C. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete. Available products: Duralcrete Series by The Euclid Chemical Company, Sikadur Hi-Mod Series by Sika, MasterEmaco ADH Series (Formerly Concresive) by BASF Corporation, or approved equal.

E. Post-Installed Concrete Anchors:


3. Grouted Dowels / Grouted Anchors: High strength non-shrink grout to anchor reinforcing steel or threaded rods in concrete shall be Hi-Flow Grout by The Euclid Chemical Company or MasterFlow 928 grout as manufactured by BASF Corporation, Sika Grout 212 as manufactured by Sika Corporation, or approved equal.

F. Reglets: Fabricate reglets of not less than 26 gauge, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

G. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 22 gauge, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
2.13 MORTARS AND GROUTS

A. Bonding Grout: Approximately 1 part Portland cement to 1 part fine sand passing a no 30 sieve and a 50/50 mixture of approved bonding admixture and water, mixed to a consistency of thick paint and not exceeding the w/cm of the concrete to be bonded.

B. Patching Mortar for exposed concrete shall be made of the same material and of approximately the same proportions as used for concrete, except that coarse aggregate shall be omitted and mortar shall consist of not more than 1 part Portland cement to 2-1/2 parts damp loose sand by volume.

1. Combine white and gray Portland cement as necessary to match color specified by Architect. Use no more mixing water than necessary for handling and placing.
2. Mix patching mortar in advance and allow to stand with frequent mixing with trowel without adding water until it has reached the stiffest consistency that will permit placing.

C. High Flow Grout:

1. Where high fluidity and/or increased placing time is required, use high flow grout.
3. When placed at a fluid consistency there shall be at least 95% bearing under an 18 inches x 36 inches base plate.
4. "Hi-Flow Grout" manufactured by The Euclid Chemical Company, "MasterFlow 928" manufactured by BASF Construction Products, or approved equal.

D. Epoxy grout for anchor reinforcing steel or threaded rods in concrete shall be MasterEmaco ADH 1490 (Formerly Concresive 1490) as manufactured by BASF Construction Products, or Sikadur 32 Hi-Mod as manufactured by Sika Corporation, or Epoxy 452 or E3G by Euclid Chemical Company, or approved equal.

E. Cementitious grout for anchor reinforcing steel or threaded rods in concrete shall be MasterFlow 928 grout as manufactured by BASF Corporation, Sika Grout 212 as manufactured by Sika Corporation, Hi-Flow grout by Euclid Chemical Company, or approved equal.

F. Drypack Mortar for Form Holes at Non-Architectural Grade Surfaces: Composed of 1 part Portland cement and 2 parts of fine aggregate and water. Match color of adjacent surfaces.
2.14 REPAIR MATERIALS

A. High Strength Flowing Repair Mortar: For forming and pouring structural members, or large horizontal repairs, provide the flowable one-part, high strength microsilica modified repair mortar with 3/8" aggregate. The product shall achieve 9000 psi @ 28-days at a 9-inch slump. [Available] products: MasterEmaco S 466 CI (Formerly Emaco S66 CI) by BASF Corporation, Eucocrete by The Euclid Chemical Company, or approved equal.

B. Patching Mortar:

1. Horizontal repairs, ASTM C928. [Available] Products:
   a. Euclid Chemical Co.: Euco Thin Top Supreme, Concrete Top Supreme
   b. Sika Chemical Corp.: Sikatop 121 or 122
   c. BASF Corporation: MasterEmaco T 310 CI (Formerly Emaco R310 CI)

C. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4000 psi i at 28 days when tested according to ASTM C109.
5. Bond Strength: Not less than [1000 psi] <Insert strength> at 28 days when tested according to ASTM C1042.
6. [Available] Products:
   a. Euclid Chemical Co.: Super Flo-Top
   b. BASF Corporation: MasterTop 110 SL (Formerly Mastertop 110 Plus)

D. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than [strength of substrate] [5000 psi] <Insert strength> at 28 days when tested according to ASTM C109.
5. [Available] Products:
   a. Euclid Chemical Co.; Thin Top Supreme or Tammspatch II
   b. BASF Corporation; MasterEmaco N 300 CI (Formerly Emaco R300 CI)

6. Product shall exhibit the following properties: Chaplin Abrasion Test - 0.0079-inches maximum at 28 days.

2.15 CONCRETE MIXTURES, GENERAL

   A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301. The mixes shall be submitted on mix design submittal form at the end of the specification.

   1. Procurement of concrete mix design is responsibility of Contractor.
   2. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

   B. Limit water-soluble, chloride-ion content in hardened concrete to the limits specified in ACI 318.

   C. Admixtures: Use admixtures according to manufacturer's written instructions.

      1. Use water-reducing admixture in concrete, as required, for placement and workability.
      2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
      3. Use accelerating or water-reducing and accelerating admixture in concrete, as required, for cold weather placement or when acceleration of setting time is required.
      4. Use high range water-reducing in all fiber concrete pumped concrete, self-consolidating concrete and any concrete with water/cementitious materials ratio below 0.50.
      5. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.16 CONCRETE MIXTURES

   A. Definition of Mix Properties:

      1. Concrete strength (f'_c) is the minimum compressive strength at 28 days, tested in accordance with ASTM C39.
      2. Aggregate size is the largest of the coarse aggregate.
      3. Slump shall be measured at the point of delivery in accordance with ASTM C143. Slump tolerance shall meet the requirements of ACI 117. Slump can be increased with use of a high-range water-reducer to improve workability of mix. After addition of high-range water-reducer, slump shall not exceed 9" at point of delivery.
4. Air content is by volume and may be plus or minus 1.5 percent at point of delivery.
5. Water/cementitious materials ratio is specified by weight.
6. Drying shrinkage limit is percentage change in length after 28 days of drying when tested as per ASTM C157 with 4 inches x 4 inches x 11 inches specimen moist cured 7 days prior to drying.

B. Foundations: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength (f'c): 4000 psi at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.45.
   3. Maximum Aggregate Size: 1 inch.
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Air Content: 5 percent.
   7. Minimum Compressive Strength (f'c): 4000 psi

C. Slab-on-Grade: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength (f'c): 4000 psi at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.45.
   3. Maximum Aggregate Size: 1 inch.
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Air Content: 5 percent.
   6. Shrinkage Limit: .045 percent at 28 days.

D. Normal Weight Concrete Fill in Decking: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength (f'c): 4000 psi at 28 days.
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Air Content: 2 percent.
   6. Shrinkage Limit: .045 percent at 28 days

E. "Quick-Dry" Concrete: This concrete is used in areas receiving applied finishes where rapid concrete drying is required prior to adhesive application. The floor finish shall be as required by the manufacturer of the specified floor coating or covering
   1. Maximum Water-Cementitious Materials Ratio: 0.40.
   2. Use high-range water-reducing admixtures.
   3. Air Content: 2 percent.

2.17 FABRICATING REINFORCEMENT

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

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

1. The batching plant shall be equipped with an electric metering device capable of determining moisture content of sand.
2. Begin the mixing operation within thirty minutes after the cement has been intermingled with the aggregates.
3. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes. Alternatively a retarding admixture may be used where results from testing can be provided for approval by the Engineer of Record.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MEETING

A. At least three weeks prior to commencement of concrete work, meet at the Project site to review the proposed mix designs, methods and sequence of concrete construction, standard of workmanship, material selection, testing and quality control requirements, placement procedures, off-site batching requirements, coordination of the work with other trades and other pertinent topics related to the Work. The meeting shall include the following:

1. Owner's Representative
2. Architect/Engineer
3. Construction Manager/General Contractor
4. Concrete Subcontractor
5. Owner's Testing Laboratory
6. Ready Mix Concrete Supplier
7. Admixture Manufacturer Representative
8. Formwork Manufacturer/Supplier
9. Lightweight Aggregate Supplier
10. Concrete pumping subcontractor
11. Any other subcontractor and/or material supplier including plumbing, waterproofing and electrical supplier or manufacturer required

B. The minutes shall include a statement by the concrete contractor indicating that the proposed mix design and placing techniques shall produce the concrete quality required by these specifications.

3.2 PREPARATION

A. Prior to Work specified in this Section, carefully inspect the installed Work of other trades and verify that such Work is complete to the point where this installation may properly commence.
B. Verify that forms may be constructed in accordance with all applicable codes and regulations, the referenced standards, and the design documents.

1. Ensure Excavations are sufficient to permit placement, inspection, and removal of forms.
2. Verify reinforcing steel has been inspected prior to concealing with formwork.
3. Verify geotechnical engineer has approved all foundation excavations.

C. The Contractor shall verify all dimensions prior to starting construction.

D. Coordinate:

1. Obtain necessary information for coordination of formwork with items to be embedded in concrete.
2. Coordinate size and location of openings in concrete. Obtain Architects approval for openings not shown on Structural Drawings.

E. Discrepancies:

1. Notify the Architect of any discrepancies or inconsistencies.
2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.3 FORMWORK

A. Mock-up: When a mock-up of the concrete is required, do not construct forms for concrete, other than for mock-up, until mock-up has been accepted.

B. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads and such that formwork can withstand excessive deflection when filled with wet concrete.

C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, camber and position indicated, within tolerance limits of ACI 117. Make proper provision for all openings, offsets, recesses, anchorage, blocking, and other features of the Work as shown or required. Provide openings as required for vibrators and concrete placing.

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

2. Class B, ¼ inch for rough-formed finished surfaces.

E. [See Drawings for boards, strips, or other methods of creating patterns and reveals on walls or columns. In these areas forms shall be such as to allow joints to occur in a reveal.]
F. Construct forms tight enough to prevent loss of concrete mortar. Tape all joints at forms for sandblasted finished concrete, including joints between plywood and trim strips.

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

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

H. 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.

I. 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.

J. Chamfer exterior corners and edges of permanently exposed concrete.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

L. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

M. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

N. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not allow excess form coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed.

3.4 EARTH FORMS

A. Earth Forms: Unless otherwise indicated or required by the Construction documents, concrete for foundations that will remain in permanent contact with the soil may be placed directly against vertical excavated surfaces provided the material will stand without caving and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as detailed on Drawings.
1. Where sides are unstable or excavations are not accurately cut tolerances of ACI 301, construct formwork to the extent required, at no additional cost to Owner.
2. Hand trim sides and bottom of earth forms; remove loose dirt prior to placing concrete.
3. Form footings to minimum extent shown on Drawings.

3.5 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. Ensure that embedded items are placed and held, during placing of concrete, to tolerances consistent with other items that will be attached to them.

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

B. Provide pipe sleeves when pipes pass through concrete. Fill voids in sleeves, inserts and anchor slots with readily removable material to prevent entry of concrete into voids.

C. No conduit shall be cast in concrete unless specifically indicated on the Structural Drawings.

D. Coring of concrete after placement is not permitted without prior approval by the Engineer of Record.

3.6 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 for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its specified design compressive strength, f’c. Where a minimum 7-day strength has been specified, formwork may be removed when the 7-day strength as been achieved.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
3. When forms are removed in less than 7 days, curing shall be continued as follows:
   a. Loosen form ties and run water down inside of form to keep concrete wet.
   b. Immediately following form removal, thoroughly wet surface.
   c. Continue curing as specified elsewhere in this specification.

B. Remove forms carefully to avoid damaging corners and edges of exposed concrete. Prying against the face of concrete shall not be allowed.

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.

E. Re-use of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtained if all of the forms were new.

F. All forms below ground surface, along with all shores and braces, shall be removed before backfilling.

3.7 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. The vapor barrier installation must be approved prior to the concrete placement.

3.8 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Wherever embedded items interfere with placing of reinforcement notify the Architect and obtain approval before placing any concrete. Do not bend or field cut bars around openings or sleeves.
   2. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete. Where there is a potential of rust staining adjacent finish surfaces, take necessary steps to prevent staining.

C. Accurately position, support, and secure reinforcement against displacement, particularly under the weight of workmen and the placement of concrete. Use bar supports in sufficient number, size and location to prevent vertical displacement of the reinforcement and gouging of the formwork. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Do not exceed the tolerances specified in ACI 117.
2. Reinforcement shall be held in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distance from form face. The use of wood supports and spacers inside the forms is not permitted.
3. Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowel may be tied, No 3 bars (minimum) shall be added to provide proper support and anchorage.
4. Do not place reinforcement in floor slabs or beams until concrete has been placed in columns and walls, except where bars extend down into columns or walls.
5. Use templates for placement of column dowels.
6. Where Drawings do not show the spacing of the reinforcing, the minimum clear spacing shall conform to ACI 318 Section 7.6.
7. Reinforcing partially embedded in concrete shall not be field bent except as shown on the Drawings or accepted by the Architect.
8. Wherever conduits, piping, inserts, sleeves, etc., interfere with placing of reinforcing steel, obtain acceptance of method of procedure before any concrete is placed. Bending of bars around openings or sleeves not permitted.
9. Weld reinforcing bars according to AWS D1.4, only where indicated on drawings. Welding is not permitted on bars where the carbon equivalent is unknown. Do not weld within 2 bar diameters of where bars have been bent cold. Welding material, wire cuttings and tramp metal shall be thoroughly cleaned from forms for exposed concrete before any concrete is placed.

D. Splicing: Make splices only at those locations shown on the Drawings or as accepted by the Architect. Splice locations not shown on the Drawings shall be approved in shop drawings before fabrication. Stagger splices in adjacent bars wherever possible.

E. Reinforcing shall be rigidly and securely tied with steel tie wire. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. If allowed, field bending or straightening shall be in accordance with section 3.3.2.8 of ACI 301.
G. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing plus 2 inches or 6 inches, whichever is greater. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

H. Install deformed bar anchors in accordance with the manufacturer's recommendations.

I. Install mechanical splices and reinforcing couplers in accordance with manufacturers' recommendations.

3.9 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Existing Concrete to New Concrete Joints

1. Chip keys and roughen existing concrete surfaces where new concrete abuts. Roughen surface by bushhammering, chipping or sandblasting to remove surface mortar and expose clean aggregate.
2. Drill and install dowels using epoxy grout in accordance with manufacturer's printed recommendations.
3. Prime surface with 10-mil layer of epoxy adhesive using a stiff brush. Place concrete while the epoxy adhesive is still tacky. Re-prime if necessary.

C. 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. In walls, do not space construction joints more than 60 feet apart in horizontal direction, maximum 20 feet apart in vertical direction unless otherwise shown. In framed slabs and beams, and on metal deck slabs, do not space construction joints more than 120 feet apart. In slabs on grade, do not space construction joints more than maximum 60 feet in any direction. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise shown.
3. Form keyed joints at all joints. Embed keys at least 1-1/2 inches into concrete.
4. 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.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

7. Roughen surface at all construction joints where key is not used and under baseplates. Roughen concrete surface while concrete is still green where possible. Do not leave laitance, loosened particles of aggregate or damaged concrete at surface. Forms and reinforcing shall be cleaned of drippings. Dampen contact surfaces of construction joints, leaving them free of standing water, before placing fresh concrete.

8. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

D. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on the architectural drawings. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

F. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.10 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Ensure that all foreign material has been removed from surfaces, including reinforcement and embedded items, against which concrete will be placed.
B. [The addition of water to the mix after leaving the plant is not permitted unless approved by Architect.] [The addition of water at the site is contingent upon full time inspection of the process by the owners testing laboratory and the acceptance of the Inspector. Comply with ACI 301, section 4.3.2.1.]

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Method: Convey concrete as rapidly and directly as practicable to preserve quality and to prevent segregation.
   1. Do not deposit concrete that has initially set. Retempering of concrete, which has partially set, is not permitted.
   2. Maximum time for discharge of concrete shall be per ASTM C94.

E. Sequence: Pour all walls and columns full height to designated construction joints. Pour all beams, and horizontal structures to designated construction joints. Construction joints to be made in walls only where indicated on the Drawings.

F. Placement: 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. Deposit concrete to avoid segregation.
   1. When placing is once started, carry it on as a continuous operation until placement of the panel or section is complete. Construction joints to be made only where indicated on the Drawings or on approved shop drawings. Prevent the formation of cold joints at other locations.
   2. Deposit concrete in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. Deposit concrete in a manner to avoid inclined construction joints.
   3. Particular care shall be used when starting a concrete pour to maintain the continuity of appearance. Use all means necessary to avoid blemishes, imperfections, or changes in the finish.

G. Consolidation: Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301. Use and type of vibrator shall conform to ACI 309, Guide for Consolidation of Concrete.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. Place vibrating element directly in concrete and not attached to either inside or outside of forms or to reinforcing steel.

3. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate. Do not over-vibrate concrete.

4. Consolidation is typically not necessary for self-consolidating concrete. However, the contractor shall have internal vibrators as recommended in ACI 301 on site in case internal vibration is needed due to delays in placement or the concrete has a lower than expected slump flow and has to be placed to prevent the formation of a cold joint. Prior approval by the Architect/Engineer shall be obtained if minimal vibration (external or internal) is required for proper consolidation due to congested reinforcement or space restrictions.

H. Initial Finishing:

1. Scree slab surfaces with a straightedge and strike off to correct elevations.
2. Where floor drains or floor slopes are indicated, slope slabs uniformly to provide even fall for drainage.
3. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

I. Fill Over Steel Deck:

1. At floor slabs, increase fill thickness as required to compensate for deflection of beams and deck at no additional cost to Owner. Obtain specified fill thickness at high points of the deck. Finish floor to specified tolerances for floor flatness and levelness, including at suspended fill on steel deck floors.
2. At roof, maintain specified thickness of concrete uniformly over deck. Slab need not conform to flatness and levelness tolerances.

J. 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 concrete is expected to be placed at air temperatures of less than 40 deg F, contractor shall review with Architect all special procedures that will be used including mix design modifications and methods of protection. This review shall occur prior to the expected extreme temperatures.
2. Provide sufficient protection material and equipment on the Project site in advance of the time when the mean daily temperatures are expected to drop below 40 degrees F.

3. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301. In addition, take precautions including, but not limited to:

   a. Use non-chloride, non-corrosive accelerating admixture in accordance with previously accepted submittals.
   b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   c. Do not use calcium chloride, salt, or other materials containing antifreeze agents unless otherwise specified and approved in mixture designs.

K. Hot-Weather Placement: Comply with ACI 305.1 and as follows:

   1. When concrete is expected to be placed at air temperatures of greater than 80 deg F, contractor shall review with Architect all special procedures that will be used including mix design modifications and methods of protection. This review shall occur prior to the expected extreme temperatures.
   2. Provide sufficient protection material and equipment on the Project site in advance of the time when the mean daily temperatures are expected to rise above 80 degrees F.
   3. When air temperature exceeds 80 deg F, take special precautions to prevent slump loss, rapid setting, and plastic shrinkage; including but not limited to:

      a. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
      b. Use set retarding admixture in accordance with previously accepted submittals.
      c. Use microsynthetic fibers in the concrete mixture to minimize plastic shrinkage cracking.
      d. Convey, deposit, finish and commence curing of concrete as rapidly as practicable.

   4. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

L. Mass Concrete: Comply with ACI 301 Section 8, and as follows:
1. When concrete dimensions are large enough to require that measures be taken to cope with generation of heat from hydration of the cement and attendant volume change that leads to cracking, contractor shall review with Engineer all special procedures that will be used including mix design modifications and methods of protection. This review shall occur prior to the batching of concrete.

2. The following types of hydraulic cement are acceptable for use in mass concrete construction, where the heat of hydration does not exceed 70 cal/g at 7 days per previous records, or the cement contains no more than 8% tricalcium aluminate:
   a. Portland cement Types II (MH), and V, as covered by ASTM C 150;
   b. Blended hydraulic cement Types P, IP, S, IS, I(PM), and I(SM), as covered by ASTM C 595 and ASTM C1157;
   c. Portion of Portland cement shall be limited to 300 lb/ycyd.

3. Take special precautions to control internal and surface temperature differentials, including but not limited to the following, at the Contractor’s option, and in compliance with ACI 207.4R where applicable:
   a. Chilled mixing water or chopped ice, provided water equivalent of ice is calculated to total amount of mixing water.
   b. Liquid nitrogen, insulating blankets, and/or precooling of coarse aggregate to 50 deg F.
   c. Use of air-entraining, water-reducing or set-controlling admixture in accordance with previously accepted submittals.
   d. Set-accelerating admixtures shall not be permitted.
   e. Embedded cooling coils shall be pre-approved by Architect.
   f. Evaporative cooling of surfaces by water curing.

4. Placing: Place mass concrete foundations in layers appropriate for the vibration equipment to be used to achieve proper consolidation. Layers shall be executed in a stepped fashion to produce setbacks of approximately 5 feet between forward edges of successive layers. When placing concrete in lifts, layer thickness shall be an even fraction of the lift height. The joint surface between lifts shall be sand- or high-pressure water-blasted clean and free from surface moisture before pouring next lift.

5. Consolidation: To ensure proper consolidation, the vibrators should penetrate the lower layer for 2 to 4 in. and be maintained in a vertical position at each penetration during vibration. To prevent imperfections along lift lines and layer lines at form faces, these areas should be systematically deeply revibrated as each layer advances from the starting form, along each of the side forms, to the other end form. Any visible clusters of separated coarse aggregate should be scattered on the new concrete before covering with additional concrete. During consolidation, the vibrators should remain at each penetration point until large air bubbles have ceased to rise and escape from the concrete.
3.11 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding 1/4 inch.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.12 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15. These values apply to all floors and slabs unless noted otherwise.

2. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17. These values apply to slabs-on-grade Slabs supporting modular office partitions, adhered flooring systems, or compact storage shelving must also comply with the manufacturer's tolerance requirements.

3. Slabs scheduled to receive wood flooring must also comply with tolerances required for installation of wood flooring. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch.

4. Fill or grind completed floors as necessary to achieve specified finish tolerances. Fill shall be with a self-leveling cementitious product capable of being tapered to a feathered edge.
   a. Repair any floor section measuring below either the minimum local F-number or the minimum local L-number.

E. Trowel and Fine-Broom Finish: While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistant aggregate over surface in 1 or 2 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-resistant aggregate.

H. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply dry-shake floor hardener at a rate of for the mineral aggregate hardener and at a rate of 150 lb/100 sq.ft. for the metallic and non-oxidizing metallic hardeners.

2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.

3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

I. Schedule of Concrete Finish Types, unless otherwise indicated on Drawings:

1. Formed Surfaces Not Exposed To View: Rough Formed.

2. Formed Surfaces Exposed To View At Building Interior: Smooth Formed.

3. Formed Surfaces Exposed To View At Building Exterior: Smooth Formed.

4. Formed Surfaces to Receive:

   a. Paint: Grout Cleaned.
   b. Waterproofing, Dampproofing: Smooth Formed.
   c. Veneer Plaster: Smooth Formed.

5. Exposed Interior Slabs: Trowel.


7. Slabs to Receive:

   a. Concrete Toppings: Float.
   b. Mortar Setting Beds: Scratch.
   c. Membrane Waterproofing: Float.
   e. Resilient Flooring: Trowel.
   g. Tile (thin-set): Fine Broom.

8. Exposed to View Curbs: Provide monolithic finish by stripping forms while concrete is green and steel-troweling surfaces to a dense, hard, finish with corners intersections and terminations slightly rounded.
3.13 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

E. Post-Installed Concrete Anchors

1. Install in accordance with the manufacturer's recommendations and ICC-ES reports.
2. Use washers on all bolts.
3. Use care to avoid cutting or damaging reinforcing bars.
4. When exposed to view in the final structure, bolts shall be of a length that will extend entirely through but not more than 1/4-inch beyond the nuts unless otherwise shown on the Drawings.

F. Install concrete fill on a continuous wire mesh of not less than 14 gage welded wire fabric, 2 inch square, supported approximately ½ inch above the bottom of pans. Screed concrete fill level and finish with wood float.

3.14 CONCRETE PROTECTING AND CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Where supplementary cementitious materials are used, extra precautions shall be taken to prevent premature drying.

C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
D. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

E. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

F. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven (7) days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven (7) days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a strippable or dissipating curing compound.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer’s written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
5. Interior slabs to receive resilient flooring: Cure only with moisture retaining cover. Strippable or dissipating curing compounds may be used on trowel finished surfaces.
6. Interior slabs to receive thin set of tile: Cure only with moisture retaining cover. Do not cure with curing compound.
7. Exterior Flatwork: Apply 1 coat of curing/sealing compound as soon as possible after finishing.

3.15 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than seven days' old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Polished Concrete Floor Treatment: Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
   1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
   2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
   3. Continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mockup.
   4. Control and dispose of waste products produced by grinding and polishing operations.
   5. Neutralize and clean polished floor surfaces.

C. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.16 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.17 CONCRETE SURFACE REPAIRS

A. Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval. Repair and replacement work will be done at Contractor's expense.

B. Defective Concrete is defined as concrete which is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets voids, spalling, exposed reinforcement, that has any sawdust, wood, or debris embedded in it, or is otherwise defective, and in the Architect's judgment these defects impair the proper strength or appearance of the work. Any concrete work not in accordance with the Specification and Drawings will be deemed to be defective.

C. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with polymer patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

G. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.18 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a [special inspector] [and] [qualified testing and inspecting agency] to perform field tests and inspections and prepare test reports.

B. Inspections:
1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Post-installed concrete anchors, per ICC-ES recommendations.
5. Verification of use of required design mixture.
6. Concrete placement, including conveying and depositing.
7. Curing procedures and maintenance of curing temperature.
8. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231, pressure method, for normal-weight concrete; ASTM C173, 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 mixture.

4. Water Content and W/cm: In accordance with AASHTO T318.

5. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

6. Density: ASTM C567, 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 mixture.

   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
   b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
   a. Test one set of field-cured specimens at 7 days and one set of specimens at 28 days.
b. A compressive-strength test shall be the average compressive strength from a set of specimens obtained from same composite sample and tested at age indicated.

c. Number of specimens in each set shall follow requirements of ACI 318 Section 5.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi, when the specified strength is 5000 psi or less; or by more than 10 percent of specified strength, when the specified strength is above 5000 psi.

11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28 -day tests.

12. Monthly charts and compressive strength, w/cm and air content will be sent to all parties on the pre-concrete conference distribution list.

13. Non-compliant Test Reports: All test reports indicating non-compliance should be e-mailed or faxed immediately to all parties on the test report distribution list. Copies shall be distinguishable from the originals.

14. Nondestructive Testing: Rebound hammer, ultrasonic, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

15. 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 C42 or by other methods as directed by Architect.

a. If test results indicate that compressive strength requirements have not been met, the Contractor shall justify that the load carrying capacity of the structure has not been reduced. Carry out tests of cores drilled from the area in question as directed by the Architect in accordance with ASTM C42 and ACI 318 Section 5.6.5.

b. If the compressive tests of the core specimens fail to show the compressive strength specified, the concrete shall be deemed defective and shall be replaced or adequately strengthened in a manner acceptable to the Architect. Perform load tests as outlined in ASTM C39, as directed by the Architect, on the questionable portion of the Work.
16. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.
17. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Reinforcing Steel

1. Notify the testing agency and the Architect at least 48 hours before concrete is to be poured or reinforcing is covered up.
2. Before any concrete is poured on any particular portion of the building, the reinforcing steel and form dimensions will be inspected by the Testing Agency. Any errors or discrepancies shall be corrected before concrete is placed.
3. In addition to other required inspections, the following are subject to [Special][Controlled] Inspection as per IBC Chapter 1704.4:
   a. Placement of Reinforcing Steel
   b. Welding of Reinforcing Steel
4. A special inspector from the Testing Agency shall be present during all field bending of reinforcement.
5. Installation of deformed bar anchors to be tested in accordance with Section 7.1 of AWS D1.1.
6. Welding of Reinforcement: There shall be continuous inspection during all welding of reinforcement. All butt welds to be inspected using radiographic testing. At the Owners option recognized non-destructive tests such as resistance, Magnetic Particle Examination, and Liquid Penetrant Inspection may be used to inspect the welds.
7. Comply with ICC-ES approvals with respect to special inspection required during installation.
8. Testing and inspection of mechanical splices and reinforcing couplers to conform to manufacturer’s recommendations and ICC-ES approval.

E. Survey and Adjustment: Continuously observe formwork operations, record such observations on a daily basis, and submit reports of the results. Instrument check forms before and during concrete placement to assure no movement has taken place. Make appropriate corrections to reposition displaced forms.

1. Measure floor and slab flatness and levelness according to ASTM E1155 within 48 hours of finishing.
2. Certify, by written report submitted on a weekly basis, for each level and story that the elevations, finish lines and building lines of the hardened concrete are within tolerances, as substantiated by transit survey; also that all embeds and inserts have been installed within tolerance.
3.19 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000
SECTION 033000.13 - CONCRETE MIX DESIGN SUBMITTAL FORM

CONCRETE MIX DESIGN SUBMITTAL FORM

Project: ____________________________________________________________

City: ______________________________________________________________________

General Contractor: ________________________________________________________

Concrete Contractor: ________________________________________________________

Concrete Strength (Class): ________________________________________________

Use (describe): ____________________________________________________________

Design Mix Information

Please check one

Based on Standard Deviation Analysis

Trial Mix Test Data

Design Characteristics:

Density _____________________ pcf

Strength _____________________ psi ([28][56] day)

Air _____________________ % specified

MATERIALS

<table>
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<th>Type/ Source</th>
<th>Specific Gravity</th>
<th>Weight/lb.</th>
<th>Absolute Vol. cu.ft.</th>
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<tbody>
<tr>
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<td>Fly Ash</td>
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<tr>
<td>Slag Cement</td>
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<td></td>
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<tr>
<td>Silica Fume</td>
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<tr>
<td>Other SCM</td>
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</tr>
<tr>
<td>Coarse Aggregate</td>
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### Concrete Mix Design Submittal Form

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<th>Fine Aggregate</th>
<th>Microsynthetic Fibers</th>
<th>Macrosynthetic Fibers</th>
<th>Steel Fibers</th>
<th>Water</th>
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<tr>
<td><strong>TOTAL</strong></td>
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<td><strong>27.0 cu. ft.</strong></td>
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* Water/Cement Ratio (lbs. water/lbs. cement) = ____________%*

**ADMIXTURES**

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<thead>
<tr>
<th>Manufacturer</th>
<th>Dosage oz/cwt</th>
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</thead>
<tbody>
<tr>
<td>Water Reducer</td>
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<tr>
<td>Air Entraining Agent</td>
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<tr>
<td>High Range Water Reducer</td>
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<tr>
<td>Non-Corrosive Accelerator</td>
<td></td>
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<tr>
<td>Other</td>
<td></td>
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</table>

**Slump before HRWR** ____________ inches

**Slump after HRWR** ____________ inches

**Standard Deviation Analysis (from experience records):**

<table>
<thead>
<tr>
<th># of Test Cylinders Evaluated:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Deviation:</td>
<td></td>
</tr>
</tbody>
</table>

**USE THE LARGER VALUE:**

f'' = f' + 1.34s or f'' = f' + 2.33s - 500 for 5000 PSI or less

f'' = f' + 1.34s or f'' = 0.90 f' + 2.33s for higher strengths

(Refer to ACI 301 for increased deviation factor when less than 30 tests are available)

**Laboratory Test Data**

<table>
<thead>
<tr>
<th>Compressive Strength</th>
<th>Age (days)</th>
<th>Mix # 1</th>
<th>Mix #2</th>
<th>Mix #3</th>
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<tbody>
<tr>
<td></td>
<td>7</td>
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<td>7</td>
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</tr>
<tr>
<td>[28][56]</td>
<td>psi</td>
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<tr>
<td>[28][56] average</td>
<td>psi</td>
<td>psi</td>
<td>psi</td>
<td></td>
</tr>
</tbody>
</table>

\[ F'_{cr} = f'_c + 1200 \text{ psi for 5000 psi or less} \]
\[ \text{Or } 1.10 f'_c + 700 \text{ psi for strength higher than 5000 psi at [28][56] days} \]

REQUIRED ATTACHMENTS:
- Combined Aggregate Gradation Report
- Standard Deviation Analysis of Compressive Strength Data or Trial Mixture Test Data

END OF SECTION 033000.13
SECTION 033000.23 - ADMIXTURE COMPATIBILITY CERTIFICATION LETTER

<table>
<thead>
<tr>
<th>Submitted by:</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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<td>Phone #:</td>
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<td></td>
</tr>
<tr>
<td>Main Plant Location:</td>
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<td></td>
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<td>Miles from Project:</td>
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<td>Secondary Plant Location:</td>
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END OF SECTION 033000.23
SECTION 033300 - ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place architectural concrete including form facings, reinforcement accessories, concrete materials, concrete mixture design, placement procedures, and finishes.
   1. Exterior bench and site wall

B. Related Requirements:
   1. Section 079200 "Joint Sealants" for elastomeric joint sealants in contraction and other joints in cast-in-place architectural concrete.
   2. Section 321313 "Concrete Paving" for concrete pavement and flatwork finishes.

1.3 DEFINITIONS

A. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.

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


D. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place architectural concrete to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.

2. Review concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural concrete.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Formwork Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.

D. Placement Schedule: Submit concrete placement schedule before start of placement operations. Include locations of all joints including construction joints.

E. Samples: For each of the following materials:

   1. Form-facing panel.
   2. Form ties.
   3. Form liners.
   5. Chamfers and rustications.

F. Samples for Verification: Architectural concrete Samples, cast vertically, approximately 18 by 18 by 2 inches (450 by 450 by 50 mm), of finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data:
B. Material Certificates: For each of the following:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Repair materials.

C. Material Test Reports: For the following, by a qualified testing agency:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "NRMCA Quality Control Manual - Section 3, Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

C. Source Limitations for Cast-in-Place Architectural Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Field Sample Panels: After approval of verification sample and before casting architectural concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, cast vertically, approximately 48 by 48 by 6 inches (1200 by 1200 by 150 mm) minimum, to demonstrate the expected range of finish, color, and texture variations.
1. Locate panels as indicated or, if not indicated, as directed by Architect.
2. Demonstrate methods of curing, aggregate exposure, sealers, and coatings, as applicable.
3. In presence of Architect, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
4. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove field sample panels when directed.

G. Mockups: Before casting architectural concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Build mockups of typical exterior wall of cast-in-place architectural concrete as shown on Drawings.
3. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
4. In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
5. Obtain Architect's approval of mockups before casting architectural concrete.
6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. General: Comply with Section 033000 "Cast-in-Place Concrete" for formwork and other form-facing material requirements.

B. Form-Facing Panels for As-Cast Finishes: Steel, glass-fiber-reinforced plastic, or other approved nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.
F. Rustication Strips: Metal, rigid plastic, or dressed wood with sides beveled and back kerfed; nonstaining; in longest practicable lengths.

G. Chamfer Strips: Metal, rigid plastic, elastomeric rubber, or dressed wood, 3/4 by 3/4 inch (19 by 19 mm), minimum; nonstaining; in longest practicable lengths.

H. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 1/4 inch (6 mm) thick.

I. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or Type S, Grade NS, that adheres to form joint substrates.

J. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood.

K. Form-Release Agent: Commercially formulated, colorless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.


L. Surface Retarder: Chemical liquid set retarder, for application on form-facing materials, capable of temporarily delaying final hardening of newly placed concrete surface to depth of reveal specified.

M. Form Ties: Factory-fabricated, ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.2 STEEL REINFORCEMENT AND ACCESSORIES

A. General: Comply with Section 033000 "Cast-in-Place Concrete" for steel reinforcement and other requirements for reinforcement accessories.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufacture according to CRSI's "Manual of Standard Practice."

1. Where legs of wire bar supports contact forms, use gray, all-plastic bar supports.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, Type II or Type III, white. Supplement with the following:
a. Fly Ash: ASTM C 618, Class C or Class F.

b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or Grade 120.


B. Normal-Weight Aggregates: ASTM C 33, Class 5S coarse aggregate or better, graded. Provide aggregates from single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm)
2. Gradation: Uniformly graded.
3. Color: White
   a. Fine aggregate: Grey and black

C. Normal-Weight Fine Aggregate: ASTM C 33 or ASTM C 144, manufactured or natural sand, from same source for entire Project.

1. Color: Grey and white

D. Water: Potable, complying with ASTM C 94/C 94M except free of wash water from mixer washout operations.

2.4 ADMIXTURES


B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Colors: As required to Match Architect's sample

2.5 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) when dry.
B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
   1. For integrally colored concrete, curing compound shall be approved by color pigment manufacturer.
   2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

2.6 REPAIR MATERIALS

A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

B. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of cast-in-place architectural concrete proportioned on basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed design mixtures based on laboratory trial mixtures.

B. Proportion concrete mixtures as follows:
   1. Compressive Strength (28 Days): 5000 psi (34.5 MPa)
   2. Maximum Water-Cementitious Materials Ratio: 0.46.
   3. Slump Limit: 4 inches (100 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture <Insert dimension(s)>, plus or minus 1 inch (25 mm).
   4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.
   5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

C. Cementitious Materials: For cast-in-place architectural concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

E. Admixtures: Use admixtures according to manufacturer's written instructions.

F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXING

A. Ready-Mixed Architectural Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
   1. Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.
   2. 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.

PART 3 - EXECUTION

3.1 FORMWORK

A. General: Comply with Section 033000 "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.

B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.

C. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   1. Class A, 1/8 inch (3.2 mm)

D. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.
   1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
   2. Do not use rust-stained steel form-facing material.
F. 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.

G. Chamfer or radius exterior corners and edges of cast-in-place architectural concrete as indicated on the drawings.

H. Coat contact surfaces of wood rustications and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Coat contact surfaces of forms with surface retarder, according to manufacturer's written instructions, before placing reinforcement.

N. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting. Prevent form liners from sagging and stretching in hot weather. Seal joints of form liners and form liner accessories to prevent mortar leaks. Coat form liner with form-release agent.

3.2 REINFORCEMENT AND INSERTS

A. General: Comply with Section 033000 "Cast-in-Place Concrete" for fabricating and installing steel reinforcement. Securely fasten steel reinforcement and wire ties against shifting during concrete placement.

B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.3 REMOVING AND REUSING FORMS

A. 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 if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
1. Schedule form removal to maintain surface appearance that matches approved mockups.
2. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.

B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of 28-day design compressive strength. 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. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. 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 cast-in-place architectural concrete surfaces.

3.4 JOINTS

A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete 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.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete. Align construction joint within rustications attached to form-facing material.
3. Unless otherwise indicated, 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. Unless otherwise indicated, locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use bonding agent or epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. Do not permit vibrators to contact forms.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
   4. Do not use chemical accelerators unless otherwise specified and approved in design mixtures.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. 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. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

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3.6 FINISHES, GENERAL

A. Architectural Concrete Finish: Match Architect’s design reference sample, identified and described as indicated, to satisfaction of Architect.

B. 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.

1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

C. Maintain uniformity of special finishes over construction joints unless otherwise indicated.

3.7 AS-CAST FORMED FINISHES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Do not repair and patch tie holes and defects unless specifically directed by the Architect.

B. Rubbed Finish: Apply the following to smooth-form-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

C. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

3.8 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Begin curing cast-in-place architectural concrete immediately after removing forms from or applying as-cast formed finishes to concrete. Cure according to ACI 308.1, by one or a combination of the following methods that will not mottle, discolor, or stain concrete:

1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete continuously moist for no fewer 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 no fewer than seven days. Immediately repair any holes or tears during curing period; use cover material and waterproof tape.

3. Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Reccoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

A. General: Comply with field quality-control requirements in Section 033000 "Cast-in-Place Concrete."

3.10 REPAIRS, PROTECTION, AND CLEANING

A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.

1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.

B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.

C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.

D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.

E. Wash and rinse surfaces according to concrete finish applicator's written instructions. Protect other Work from staining or damage due to cleaning operations.

1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

END OF SECTION 033300
SECTION 033600 – SPECIAL CONCRETE FLOOR FINISHES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following.
   1. Ground, exposed aggregate concrete floor finishes including sealer and hardener.

B. Related Sections:
   1. Section 033000 Cast-In-Place Concrete for mix specification and surface retarder.

1.2 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces
   2. ASTM G23-81, Ultraviolet Light & Water Spray
   3. ASTM C805, Impact Strength

B. American Concrete Institute
   1. ACI 302. 1R-89, Guide for Concrete Floor and Slab Construction

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01600- Product Requirements.
   1. Provide submittal information within 35 calendar days after the contractor has received the owner’s notice to proceed.

B. Product data:
   1. Submit special concrete finishes manufacturer's specifications and test data.
   2. Submit special concrete finishes describing product to be provided, giving manufacturer’s name and product name for the specified material proposed to be provided under this section.
   3. Submit special concrete finishes manufacturer’s recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
4. Submit special concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.
5. Submit special concrete finishes manufacturer’s Material Safety Data Sheet (MSDS) and other safety requirements.
6. Follow all special concrete finishes published manufacturer’s installation instructions.

C. Test Reports:
1. Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, manufacturer's representative, and installers whose work interfaces with or affects concrete finish.
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 application, including manufacturer's written instructions.
4. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
5. Review protection requirements for floor finish after application.
6. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Use an experienced installer and an adequate number of skilled workers thoroughly trained and experienced in the necessary craft.
2. The special concrete finish manufacturer shall certify the applicator.
3. The applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section.

B. Manufacturer’s Certification:
1. Provide letter of certification from concrete finish manufacturer stating that installer is certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer.

C. Mock-ups:
1. Refer to specification section 033000 for concrete floor mockup sizes.
   a. Ground finish: Provide mockups on site in an area that can be
      maintained and protected until the acceptance of the completed
      work in the building.

D. Protection:
   1. Protect concrete mockup slabs and installed work from weather, dirt,
      water, oil and chemical spills, and other conditions that may affect the
      finished appearance of the sample.
      a. Protection of mockup shall be maintained in place before and after
         polishing, until the acceptance of the completed building surfaces.
   2. Protection of installed work
      a. Protection of mockup shall be maintained in place before and after
         polishing, until the acceptance of the completed building surfaces.
      b. Diaper all hydraulic powered equipment to prevent staining of the
         concrete.
      c. Do not allow vehicles to be parked on the interior slab areas to receive
         polished finish without adequate protection.
      d. Do not use pipe cutting machines on the inside floor slab.
      e. Do not place steel on interior slab to avoid rust staining.
      f. Do not allow acids or acidic detergents to come into contact with slab.
      g. Require all trades to protect the slab at all times.

1.5 DELIVERY, STORAGE AND HANDLING

   A. Deliver materials in original containers, with seal’s unbroken, bearing
      manufacturer labels indicating brand name and directions for storage.

   B. Dispense special concrete finish material from factory numbered and sealed
      containers. Maintain record of container numbers.

1.6 PROJECT CONDITIONS

   A. Environmental limitations:
      1. Comply with manufacturers written instructions for substrate temperature
         and moisture content, ambient temperature and humidity, ventilation, and
         other conditions affecting topping performance.
         a. Refer to specification section 033000 “Cast-in-Place Concrete” for floor
            flatness and levelness requirements.

   B. Close areas to traffic during floor application and after application, for time
      period recommended in writing by manufacturer.
PART 2 – PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

A. Hardening / Sealing Agent
   1. Provide the product named below:
      a. Retro-Plate 99; Advanced Floor Products, Inc

B. Grinding media
   1. Polishing pads of varying grit adequate to match Architect’s sample for color, polish and sheen. Architect’s sample represents an approximate 200-Grit sheen.

C. Sealer
   1. Matte penetrating finish sealer to prevent dusting and seal pores to protect against staining and discoloration from dirt, water and oils.

2.2 RELATED MATERIALS

A. Neutralizing Agent:
   1. Tri-sodium Phosphate

B. Water:
   1. Potable

PART 3- EXECUTION

3.1 SURFACE CONDITIONS:

A. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that base slab meet finish and surface profile requirements in Division 3 Section “Cast-In-Place Concrete,” and Project Conditions above. Confirm aggregate is adequately exposed.

C. Prior to application, verify that floor surfaces are free of construction latents.
D. Protection:

1. Protect adjacent surfaces from chemicals, splatter, spray or other damage from floor grinding and sealing processes.

3.2 GRINDING AND SEALING

A. Apply hardener in accordance with manufacturer’s recommendations.

B. Grind floor using sweeping motion in multiple passes, such that the process can be monitored as it progresses and overgrinding will be avoided. Begin grinding with coarsest media and progress to a maximum 200-grit pad.

C. Sealing, Hardening and Polishing of Concrete Surface
   1. Concrete must be in place a minimum of 45 days or as directed by the manufacturer before application can begin.
   2. Follow manufacturer’s written instructions and procedures.
   3. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.
   4. Polish to required sheen level to match approved mock-up.

3.3 WORKMANSHIP AND CLEANING:

A. The premises shall be kept clean and free of debris at all times.

B. Remove spatter from adjoining surfaces, as necessary.

C. Repair damages to surface caused by cleaning operations.

D. Remove debris from jobsite
   1. Dispose of materials in separate, closed containers in accordance with local regulations.

3.4 PROTECTION:

A. Protect finished work until fully cured in accordance with manufacturer’s recommendations.

END OF SECTION 033600
1. GENERAL

1. SUMMARY

A. Section Includes: Dimension stone indicated and as specified.

B. Related Sections:
   1. Division 3 Section “Cast-in-Place Concrete” for installing inserts in concrete for anchoring dimension stone cladding.
   2. Division 7 Section “Joint Sealants” for sealing joints in dimension stone cladding system with elastomeric sealants.

2. PERFORMANCE REQUIREMENTS

A. General: Design stone anchors and anchoring systems according to ASTM C 1242.

B. Structural Performance: Provide dimension stone cladding system capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Wind Loads: Determine loads based on a uniform pressure of 25 psf. except 30 psf. ft. at corners acting inward or outward.

C. Seismic Performance: Provide dimension stone cladding system capable of withstanding the effects of earthquake motions determined according to City of Chicago Code.

D. Thermal Movements: Provide dimension stone cladding system that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing displacement of stone, opening of joints, overstressing of components, failure of joint sealants and connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Horizontal Building Movement (Interstory Drift): Allow for maximum horizontal building movement equal to quotient resulting from dividing floor-to-floor height at any floor by 400.

F. Safety Factors for Stone: Design dimension stone cladding system to withstand loads indicated without exceeding allowable working stress of stone determined by dividing stone’s average ultimate strength, as established by testing, by the following safety factors:
   1. Safety Factor for Granite: 3.
G. Design stone anchors to withstand loads indicated without exceeding allowable working stresses established by the following:

1. For Cold-Formed Stainless Steel: ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
2. For Cast-in-Place and Postinstalled Fasteners in Concrete: One-fourth of tested capacity when installed in concrete with compressive strength indicated.
3. For Post-Installed Fasteners in Masonry: One-sixth of tested capacity when installed in masonry units indicated.

H. Provision for Deflection of Building Structure: Allow for the following:

1. Deflection due to Weight of Dimension Stone Cladding System: Allow for 1/4-inch (6-mm) vertical deflection in 20-foot (6-m) span of structural members supporting dimension stone cladding system.
2. Live Load Deflection: Allow for 1/4-inch (6-mm) vertical deflection, in 20-foot (6-m) span of structural members supporting dimension stone cladding system, due to live loads imposed on building’s structural frame after stone installation.

I. Control of Corrosion and Staining: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Use materials that do not stain exposed surfaces of stone and joint materials.

3. SUBMITTALS

A. Product Data: Submit complete printed data for each stone accessory, and other manufactured products indicated.

B. Shop Drawings: Show details of fabrication and installation of dimension stone cladding system, including dimensions and profiles of stone units.

1. Show locations and details of joints both within dimension stone cladding system and between dimension stone cladding system and other construction.
2. Provide shop drawings sealed and signed by a State of Illinois Licensed Structural Engineer.

C. Stone Samples: Sets for each color, grade, finish, and variety of stone required; not less than 12 inches (300 mm) square. Include two or more Samples in each set showing the full range of variations in appearance characteristics expected in the completed Work.

D. Colored Pointing Mortar Samples: For each color required, showing the full range of exposed color and texture expected in the completed Work.

E. Material Test Reports: Submit Material Test Reports from a qualified independent testing agency indicating and interpreting test results of the following for compliance with requirements indicated:

1. Stone Test Reports: Provide test data indicating compliance with required physical properties including those specified by reference to ASTM standards. Include test data for flexural strength based on testing according to ASTM C 880,
performed on specimens representative of minimum thickness and finish of installed stone, in both wet and dry conditions. Base reports on testing done within previous five years.

2. Anchorage Test Reports: Provide Test Reports for each anchor type, based on testing according to ASTM C 1354, performed on specimens representative of minimum thickness and finish of installed stone.

4. QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed dimension stone cladding systems similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.

1. Obtain each variety of stone from a single quarry, whether specified in this Section or in another Section of the Specifications.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Materials: Obtain each type of stone accessory, sealant, and other material from a single manufacturer for each product.

E. Mockups: Before installing dimension stone cladding systems, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Locate mockups where indicated or, if not indicated, as directed by Architect.

2. Build mockups of typical exterior wall with dimension stone cladding, approximately 15 feet (4.5 m) long by 10 feet (3 m) high.
   a. Show typical components and methods of installation.

3. Notify Architect seven days in advance of dates and times when mockups will be constructed.


5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

6. Approved mockups may become part of the completed Work if undisturbed at time of Preliminary Acceptance.
5. DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.

   1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.

   2. Store stone on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

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 in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

6. PROJECT CONDITIONS

A. Cold-Weather Construction: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace dimension stone cladding damaged by frost or freezing conditions. When ambient temperature is within limits indicated, use the following procedures:

   1. At 40 deg F (4.4 deg C) and below, produce mortar temperatures between 40 and 120 deg F (4.4 and 49 deg C) by heating mixing water and, at temperatures of 32 deg F (0 deg C) and below, sand. In heating mortar materials, maintain mixing temperatures within 10 deg F (6 deg C); do not heat water to above 160 deg F (71 deg C). Maintain temperature of mortar on boards above freezing. Do not apply mortar to stone units or substrates below 32 deg F (0 deg C).

   2. At 25 to 20 deg F (minus 4 to minus 7 deg C), heat both sides of walls under construction. Use windbreaks or enclosures when wind velocity exceeds 15 mph (25 km/h).

   3. At 20 deg F (minus 7 deg C) and below, provide enclosure and auxiliary heat to maintain air temperature above 32 deg F (0 deg C) within enclosure. Heat stone so it is above 40 deg F (4.4 deg C) at time of installation.

B. Cold-Weather Protection: When mean daily temperature is within limits indicated, provide the following protection:

   1. 40 to 25 Deg F (Plus 4.4 to Minus 4 Deg C): Cover dimension stone cladding with a weather-resistant membrane for 48 hours after construction.

   2. 25 to 20 Deg F (Minus 4 to Minus 7 Deg C): Cover dimension stone cladding with insulating blankets or provide enclosure and heat to maintain air temperature above 32 deg F (0 deg C) within enclosure for 48 hours after construction. Use windbreaks or enclosures when wind velocity exceeds 15 mph (25 km/h).
3. **20 Deg F (Minus 7 Deg C) and below:** Provide enclosure and heat to maintain air temperature above 32 deg F (0 deg C) within enclosure for 48 hours after construction.

C. **Hot-Weather Requirements:** Comply with hot-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602.

### 2. PRODUCTS

#### 1. GRANITE

A. **Material Standard:** Comply with ASTM C 615.

B. **Varieties and Sources:** Subject to compliance with requirements, provide the following:

1. **Product:** Subject to compliance with requirements, provide ‘Raven Noir’ Granite, ‘Pacific’ finish, provided by Cold Spring, Cold Spring MN.

C. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

D. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

E. **Thickness:** As indicated on Drawings unless otherwise recommended by dimension stone cladding manufacturer. Manufacturer to provided Architect with written confirmation of any reduction in stone thickness prior to any fabrication.

#### 2. MORTAR MATERIALS

A. **Portland Cement:** ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. **Low-Alkali Cement:** Portland cement for use with limestone shall contain not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. **Hydrated Lime:** ASTM C 207, Type S.

C. **Portland Cement-Lime Mix:** Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

1. For pigmented mortar, use a colored Portland cement-lime mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of Portland cement by weight.

D. **Aggregate:** ASTM C 144; except for joints narrower than 1/4 inch (6 mm) and pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
E. Mortar Pigments: Natural and synthetic iron oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar and containing no carbon black.

F. Water: Potable.

G. Products: Subject to compliance with requirements, provide one of the following:
   1. Mortar Pigments:
      b. True Tone Mortar Colors; Davis Colors.
      c. Centurion Pigments; Lafarge Corporation.
      d. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

3. ANCHORS

A. Manufacturers:: Subject to compliance with requirements, provide products as manufactured by Halfen Anchoring Systems or one of the following.
   1. Stone anchors as manufactured by Heckman Building Products
   2. Stone anchors as manufactured by Dur-O Wall

B. Fabricate anchors, including shelf angles, from stainless steel, ASTM A 666, Type 304, temper as required to support loads imposed without exceeding allowable design stresses.

4. STONE ACCESSORIES

A. Setting Buttons: Lead or resilient plastic buttons, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of joint sealants or causing third-side adhesion between sealant and setting button.

B. Setting Shims: Strips of resilient plastic or vulcanized neoprene, 50 to 70 Shore A durometer, nonstaining to stone, sized to suit joint thicknesses and depths of stone supports without intruding into required depths of joint sealant or causing third-side adhesion between sealant and setting shims.

C. Concealed Sheet Metal Flashing: Fabricate from stainless steel in thicknesses indicated, but not less than 0.0156 inch (0.4 mm) thick.
   1. At Contractor’s option, fabricate flashing from lead for installation in locations where flashing rests on continuous members.

D. Weep and Vent Tubes: Rectangular, cellular, polypropylene or clear butyrate extrusion, 3/8 by 1-1/2 inches (9 by 38 mm) and of length required to extend from exterior face of stone to cavity behind.
5. **STONE FABRICATION**
   A. **General:** Fabricate stone units in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.
      1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
   B. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.
   C. Cut stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.
      1. **Minimum Thickness:** Provide stone units of not less than the following thickness, unless otherwise indicated:
         a. Granite: Minimum 2 inches.
      2. Dress joints (bed and vertical) straight and at right angle to face, unless otherwise indicated.
      3. Quirk-miter corners, unless otherwise indicated; provide for cramp anchorage in top and bottom bed joints of corner pieces.
      4. Cut stone to produce joints of uniform width and in locations indicated.
         a. Joint Width: 3/8 inch (10 mm).
      5. Clean backs of stone to remove rust stains, iron particles, and stone dust.
   D. **Contiguous Work:** Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
   E. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.
   F. Finish exposed faces and edges of stone, except sawed reveals, to comply with requirements indicated for finish and to match approved samples and mockups.
5. **MORTAR MIXES**
   A. **General:** Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
      1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use calcium chloride.
2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer, unless otherwise indicated. Discard mortar when it has reached initial set.

B. Portland Cement-Lime Setting Mortar: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:

1. Set granite with Type S mortar.

C. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:

1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.

2. Point granite with Type N or S mortar.

3. EXECUTION

1. EXAMINATION

A. Examine framing and surfaces to receive dimension stone cladding and conditions under which dimension stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of dimension stone cladding.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

2. PREPARATION

A. Advise installers of other work about specific requirements for placement of inserts, flashing reglets, and similar items to be used by dimension stone cladding Installer for anchoring, supporting, and flashing of dimension stone cladding system. Furnish installers of other work with Drawings or templates showing locations of these items.

B. Protect dimension stone cladding during erection as follows:

1. Cover tops of dimension stone cladding installation with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches (600 mm) down both sides and hold securely in place.

2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging stone.

3. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

4. Protect sills, ledges, and projections from mortar and sealant droppings.
C. Clean stone surfaces that are dirty or stained by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3. INSTALLING BACKUP STRUCTURE

A. Installing Miscellaneous Steel Framing: Comply with AISC 303 and install to accommodate construction tolerances specified.
   1. Maintain erection of backup structure within tolerances in AISC 303.
   2. Install by bolting to structural and cold-formed steel framing members.
   3. Clean welds, bolted connections, and abraded areas immediately after erection.
      a. Repair galvanizing to comply with ASTM A 780/A 780M.
      b. Apply paint to exposed areas using same material as used for shop painting.

4. SETTING, GENERAL

A. Execute stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.
   1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.

B. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.

C. Set stone to comply with requirements indicated on Drawings and Shop Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure dimension stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.

D. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
   1. Keep expansion joints free of mortar and other rigid materials.

E. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water to divert water to building exterior.

F. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.
   1. Place weep holes and vents in joints where moisture may accumulate, including base of cavity walls, above shelf angles, and flashing. Locate weep holes and vents at intervals not exceeding 24 inches (600 mm) and for those serving as vents only, at intervals not exceeding 60 inches (1500 mm) horizontally and 20 feet (6 m) vertically.
5. SETTING MECHANICALLY ANCHORED DIMENSION STONE CLADDING
   A. Set dimension stone cladding with mechanical anchors without mortar unless otherwise indicated.
   B. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.
   C. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
   D. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

6. SETTING WITH MORTAR
   A. Set dimension stone cladding with mortar and mechanical anchors unless otherwise indicated.
   B. Set stone in full bed of mortar with head joints slushed full, unless otherwise indicated.
      1. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding. Hold buttons back from face of stone a distance at least equal to width of joint.
      2. Do not set heavy units or projecting courses until mortar in courses below has hardened enough to resist being squeezed out of joint.
      3. Support and brace projecting stones until wall above is in place and mortar has set.
      4. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes with mortar.
   C. Embed ends of sills in mortar; leave remainder of joint open until final pointing.
   D. Rake out joints for pointing with mortar to depths of not less than 1/2 inch (12 mm). Rake joints to uniform depths with square bottoms and clean sides.
   E. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply first layer of pointing mortar in layers not more than 3/8 inch (9 mm) until a uniform depth is formed; compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
   F. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch (9 mm). Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
G. Tool joints with a round jointer having a diameter 1/8 inch (3 mm) larger than width of joint, when pointing mortar is thumbprint hard.

H. Set dimension stone cladding with unfilled head joints for installing joint sealants where indicated.

7. JOINT-SEALANT INSTALLATION
   A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

8. INSTALLATION TOLERANCES
   A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/8 inch in 10 feet (3 mm in 3 m).
   B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), or 1/4 inch (6 mm) maximum.
   C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/4" (6mm) maximum.
   D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch (6 mm).
   E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch (3 mm) or a quarter of nominal joint width, whichever is less. For joints within 60 inches (1500 mm) of each other, do not vary more than 1/8 inch (3 mm) or a quarter of nominal joint width, whichever is less from one to the other.
   F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units.

9. ADJUSTING AND CLEANING
   A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and dimension stone cladding that does not match approved samples and mockups. Damaged stone may be repaired if Architect approves methods and results.
   B. Replace in a manner that results in dimension stone cladding’s matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
   C. In-Progress Cleaning: Clean dimension stone cladding as work progresses. Remove mortar fins and smears before tooling joints.
D. Clean dimension stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION
SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Retain sections relevant to project below

B. Section Includes:

1. Structural steel.
2. Bolts, washers, and other steel accessories
3. Shear studs.
4. Welded steel connections.
5. Grout.

C. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 03 Section "Cast-in-Place Concrete" for post-installed concrete anchors.
3. Division 05 Section "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
4. Division 05 Section "Buckling-Restrained Braced Frames"
5. Division 05 Section "Steel Decking" for field installation of shear studs through deck.
6. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other metal items not defined as structural steel.
7. Division 05 Section "Metal Stairs."
8. Division 05 Section "Metal Grating".
9. Division 05 Section "Decorative Metal".
10. Division 07 Section "Applied Fireproofing".
11. Division 09 Section "Intumescent Painting"
12. Division 09 Section "Exterior Painting" and Division 09 Section "Interior Painting" for surface-preparation and priming requirements.
1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by American Institute of Steel Construction (AISC) 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Heavy Sections: Rolled and built-up sections as follows and subjected to special notch toughness, fabrication, welding and inspection requirements as defined in this specification:

1. Shapes included in ASTM A6 with flanges thicker than 1-1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

1.4 ACTION SUBMITTALS

A. General:

1. Review of submittals if of a general nature only, and responsibility for conformance with the intent of the Contract Documents shall remain with the Contractor. Review does not imply nor state that fabricator has correctly interpreted the Contract Drawings.
2. All submissions shall be in accordance with the submission schedule developed and agreed between the Architect and Contractor at the commencement of the project. Submission shall include dates of order and delivery of materials to the shop and the site.
3. Shop drawing schedule shall allow adequate time for reviews. Submittal shall include all related pieces in an assembled or area. The Contractor shall allow adequate time in shop drawing preparation stage for the dimensioning process and coordination with the Architectural Drawings and those of other disciplines. Submit a schedule for steel shop and erection drawings. [Assume a maximum of one hundred drawings will be reviewed in any 10 working day period.]

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

C. Shop Drawings: Show fabrication of structural-steel components, including anchor rod setting plans, details of layout and connections, fabrication of all members, and element and erection plans. Direct copies of the Contract Documents are not acceptable as a submission from the Contractor.

1. Submit shop drawings to Architect for review and obtain Architect's acceptance prior to start of fabrication. Where shop drawings are resubmitted, the Contractor shall cloud and identify all changes made due to additions, deletions, and corrections to the shop drawing. Shop drawings resubmitted without each change being clouded and identified will be returned for resubmission.
2. Only shop drawings marked "No Exceptions Taken" or "Make Corrections Noted, Resubmittal Not Required" may be used by the Contractor in the work. Shop drawings marked "Rejected" or "Revise and Resubmit, Not Accepted for Reasons Given" shall be corrected and completed as required and resubmitted and approved before they are used in the work.
3. Include layout, member size, and weights, materials used, and beam marks as well as orientation and relation of members to appropriate grid lines and setting elevations for column bases. Reference shop drawings to specific location and detail number on the Structural Drawings.
4. Include details of cuts, connections, splices, camber, holes, openings, doubler plates, stiffeners and other pertinent data, including bolt hole sizes, connection materials, and welded joint designations.
5. Include embedment drawings.
6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. [Identify WPS applicable to each shop weld.]
7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical high-strength bolted connections.
8. Indicate surface preparation and finishes.
9. Submit plans of all levels locating the edge of slab at perimeter and at interior openings.
10. Where items such as anchor bolts and inserts are scheduled to be set into concrete or masonry provide setting drawings, templates, instructions and directions for their installation. Coordinate delivery with other work to avoid delay of job progress.

D. Connection Design:

1. The Contractor is responsible for the design of connections when they are not fully defined on the Contract Documents.
2. The Engineer shall be licensed in the state in which the project is located. At the commencement of the project submit a letter signed and sealed by the Engineer that will supervise the steel connection design attesting to this responsibility.
3. At the end of the steel shop drawing submission phase submit a letter, signed and sealed by the Engineer supervising the steel connection design, attesting to the completion of the work.
4. Submit calculations of all connections. Calculations and details shall be clearly keyed to the appropriate members on the construction documents. Calculations shall bear the seal of the Engineer supervising design of the steel connections.
5. When connection calculations are resubmitted, the Contractor shall cloud and identify all changes made due to additions, deletions, and corrections to the calculation. Calculations will be returned as "Not Reviewed" if changes are not identified.
6. Contractor shall not proceed with steel erection until these requirements are fulfilled.
7. The Contractor shall not submit any piece drawing for review until all connections used on that drawing have been reviewed by the Engineer. Drawings submitted with connections that have not previously been submitted for review will be rejected as incomplete.

E. Erection Procedures:

1. Submit procedures, methods, sequences of erection, temporary shoring and guy ing, and equipment proposed for erecting structural steel. Erection procedures are submitted for record only and therefore will not be returned to the Contractor.

F. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," and AISC 341 Appendix W for each welded joint whether prequalified or qualified by testing, including items listed below. All submitted Procedures shall be reviewed by the Testing Agency prior to use on the project for conformance with the requirements of AWS D1.1. The Procedures will be submitted to the Engineer for record only.

1. All weld joints shall be qualified for this project by test even if they are pre-qualified. This qualification will be with the same electrodes, processes and procedures that will be used on this project.
2. Power source (constant current or constant voltage).
3. Electrode and flux manufacturer and trade name.
4. Tolerances or the acceptable range of values, applicable to the various welding parameters.
5. Where backgouging is required provide back gouging criteria (e.g. smoothness, grinding, gouge shape, inspection by the welder, etc.).
6. For multi-pass welds define sequence and layering of passes.
7. Welding Procedure Qualification Record (WPQR) Tests: [For WPSs that are not pre-qualified per AWS D1.1, submit] [Submit] the supporting WPQR tests results conducted in accordance with AWS D1.1 along with the corresponding WPS.
8. When the required effective throat thickness of flare groove welds is larger than allowed by Table J2.2 of AISC "Steel Construction Manual", submit data establishing by qualification the consistent production of such larger effective throat thickness. Qualification of effective throat thickness shall be as required by the AISC specification.
9. For complete penetration butt or groove welds, include test records for the following only at locations specified on the drawings: toughness, (Charpy tests for weld metal), heat affected zone.
10. In addition to the WPS submit fabrication and erection procedures where needed to control shrinkage, fabrication tolerances, or to insure proper inspection.
G. Weld Shrinkage and Distortion Procedures: Submit weld shrinkage and distortion procedures for all welded connections where distortion due to weld shrinkage may cause damage to the steel material. The welding sequence and procedures are to minimize the effect of weld shrinkage, residual stresses, and to maintain erection tolerances. These procedures shall be reviewed by Testing Agency, and then used by Testing Agency to verify conformance. As a minimum, procedures shall be submitted for the following connections:

1. Welding of continuity plates and doubler plates into the WF columns.
2. Field welding and bolting of special-moment-frame beam-to-column connection (include beam flange welds, rib welds, connection plate bolting and weld).
3. Welding ASTM A913 columns to base plates.

H. Fastener Installation Procedures: Submit written procedures for the pre-installation testing, installation snugging, pre-tensioning, and post-installation inspection of fasteners. The procedures shall meet all requirements of the Research Council on Structural Connections (RCSC) "Specification for Structural Joints Using ASTM A325 or A490 Bolts" and the Contract Documents.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified [Installer] [fabricator] [professional engineer] [testing agency].

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties, regardless of thickness or use. Reports shall comply with ASTM A6.

1. Submit a mill report for each heat of steel used, and certified fastener reports for all fasteners, including nuts, washers and direct tension indicators prior to the start of fabrication. For unsatisfactory mill test report, retest steel.
2. Include Charpy test results for heavy sections and for materials where Charpy values are specified. Testing required per AISC Section A3.1c for sections with over 2" flanges with net tension and have CJP welds.
3. Mill test reports shall include ladle analysis and tensile elongation and bend tests.
4. Mill reports shall be traceable to individual pieces of steel used.
5. In addition to other requirements mill reports shall address the following elements: copper, columbium, chromium, nickel, molybdenum, silicone, and vanadium.
6. Provide mill reports for all welding consumables used on this project.
E. Contractor Certificate of Compliance for Materials: Submit a Certificate of Compliance letter stating that the Contractor has reviewed the submitted manufacturer's test reports and certifications, and that the materials being furnished for the project are in conformance with the applicable standards and project documents. The Certificate of Compliance letter shall be submitted along with the manufacturer's test reports and certifications for structural steel, fasteners, welding filler metals, and shear studs.

F. Product Test Reports and Certifications: Submit manufacturer's test reports and certifications as listed below. Test Reports and Certifications are submitted for record only and therefore will not be returned to the Contractor. A copy of the test reports and certifications shall be sent to the owner's Quality Assurance Agency. The Contractor Certificate of Compliance letter shall accompany the Manufacturer's Certifications.

1. Bolts, nuts, and washers including mechanical properties and chemical analysis. Certifications for high strength bolts shall conform to certification requirements contained in ASTM A325, A490, F1852, F959, F2280.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors. Shear studs, as supplied, shall meet the requirements of AWS D1.1, Sections 7.2 and 7.3.
5. Shop primers.
7. Welding electrodes, fluxes and shielded gas products. Certifications shall satisfy the applicable AWS A5 and project requirements.
8. Spray-on fireproofing. Submit certificate issued by paint manufacturer ensuring compatibility between the primer and the spray-on fireproofing.

G. Source quality-control reports.

H. Field quality control [and special inspection] reports

I. Submit fabricators identification mark system to Testing Agency prior to fabrication.

J. As-Built Drawings: At the end of the work included in this Section submit a complete set of reproducible drawings incorporating all changes, additions and deletions to the Construction Drawings due to revisions, change orders, field conditions, or any other reason.

1.6 QUALITY CONTROL AND QUALITY ASSURANCE

A. Comply with AISC Chapter N minimum quality control and quality assurance requirements.

B. Testing Agency: Shop and field testing and inspection of steelwork specified in this document or requested by the Owner will be performed by an independent agency engaged by the Owner.
1. The Testing Agency shall be furnished with the following:
   a. One complete set of fabrication and erection drawings.
   b. Material bills, cutting lists, order sheets and mill test reports.
   c. Information regarding time, place of rolling and shipment of materials to shop.
   d. If requested, representative sample pieces for testing.
   e. Full and ample means and assistance for testing materials.
   f. Access and facilities, including scaffolding, temporary work platforms, etc., for testing and inspection at all places where materials or components are stored, fabricated or erected in the mill, shop or field.
   g. Complete set of welding procedures.
   h. Welder qualifications.
   i. AISC fabricator certification documents, QA/QC manual and most recent AISC audit.
   j. Reports for all Contractor tests and inspections.

2. In addition to the work specified elsewhere in the Contract Documents, the Testing Agency shall review the following for compliance with project specifications:
   a. Fastener Installation Procedures.
   b. WPSs and WPQRs.
   c. Manufacturer's Test Reports and Certifications.
   d. Welder qualification.

C. Comply with applicable provisions of the current edition of the following specifications and documents, except where more stringent requirements are shown or specified:

1. AISC 303 "Code of Standard Practice for Structural Steel Buildings and Bridges".
2. AISC 360, "Specification for Structural Steel Buildings".
3. AISC "Steel Construction Manual".
4. AISC 358, "Pre-qualified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications".
6. American Welding Society (AWS) D1.1 [and D1.8].
7. <Chicago Building Code, As applicable>.

D. All work shall be performed by qualified operators experienced in their field of work and as otherwise required by these specifications.
E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1 for each process, position and joint configuration. Each operator shall have been qualified as prescribed by AWS and shall be approved by the [City Name] building department. Qualification performed more than six months prior to the start of the welding by the welder is acceptable, provided written documentation is submitted showing that the welder has continued to use the applicable welding process on an ongoing basis since the test was conducted, with no lapse in service exceeding six months.

1. Welder Certificates shall be submitted to Testing Agency prior to welding.
2. Require welders to retake the qualification test if, as determined by the Architect or Testing Agency, there is a reasonable doubt as to the proficiency of the welder. If the welder does not requalify, he shall not perform any welding on the project.
3. In addition to AWS D1.1 requirements on welder Qualification, qualify welders making welds with restricted access (such as welding the bottom flanges of girders to column flanges through cope or access holes in the girder webs) by using a mock-up assembly identical to the actual conditions of producing weldments in the field, using the approved WPS.
4. Welder qualification shall include passing the bend test [and Charpy tests when Charpy values are specified for the electrode].
5. Welders and welding operators performing work on Demand Critical Welds, beam bottom flange to column welds, or welds that must be made by welding through a beam access hole shall pass the supplemental welder qualification testing, as required by AWS D1.8.
   a. Supplemental Qualification test shall be in accordance with AWS D1.8. The qualification test specimens shall be made with the same electrodes, processes and welding procedures that will be used on this project and also using the highest weld deposition rate allowed by the WPS.
   b. Documentation showing that a welder has passed a similar qualification test within the last 12 months will be acceptable if in the opinion of the Testing Agency the test meets the criteria.
   c. Testing Agency will perform and/or witness the tests on the qualification test specimen.
   d. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

F. Contractor's Quality Control Plan: Quality Control includes the functions performed by the Contractor to ensure that the material and workmanship of structural steel construction meets the project specifications and applicable standards. The Contractor shall submit a Quality Control Plan that addresses all inspection issues, including fabrication/erection testing and inspection per AWS D1.1 [and AISC 341 Appendix Q]. The verification testing and inspection carried out by the Testing Agency does not relieve the contractor of the responsibility for conducting their own quality control/inspection program to ensure the requirements of the Contract Documents have been met. The Contractor's Quality Control Plan will be reviewed by the Testing Agency.
G. Quality Control Inspector Qualifications: Along with Quality Control Plan, Contractor shall submit written qualifications for all inspectors to be assigned Quality Control functions for structural steel work, including general inspection, bolting inspection, welding inspection, and non-destructive testing. Qualifications for welding inspectors shall show evidence of ability to monitor all WPS variables, check weld sizes, and visually detect weld defects.

H. Unidentifiable Materials: Materials delivered with certificates are classified as identifiable; those without certificates are classified as unidentifiable.

1. Testing of Unidentifiable Material: By Contractor's testing agency; paid for by Contractor.
   a. General: Test material not identifiable by heat number and mill test or other acceptable manufacturer's identification per ASTM A370 as follows.
   b. Shear Studs: Each lot of 100 studs; tensile tests on 3 finished studs per AWS.
   c. Structural Shapes and Plates: From coupons taken from material; one tensile test and one bend test per 5 tons of each shape.
   d. High Strength Bolts: Each lot of 100 bolts; tensile tests on 2 bolts in full size and one tensile test on a 1/2" diameter machined specimen.
   e. Other Materials: Test as directed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not handle structural steelwork until paint has thoroughly dried. Care shall be exercised to avoid abrasions and other damage.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration. Material shall be kept free from dirt, grease, and other foreign matter.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed, to the acceptance of the Architect, and at no additional cost to the Owner. Materials showing evidence of damage will be rejected and shall be immediately removed from the site.

C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

D. Requirements for storage and handling of electrodes shall be per AWS D1.1. Additional requirements include:

1. Long term storage of weld consumables shall be indoors, where moisture or dew does not collect, and in undamaged manufacturer's shipping bags, boxes, and containers.
2. Open Flux Cored Arc Welding (FCAW) electrodes shall be completely covered during hours of non-use (i.e., weekends, nights of nonuse, days of nonuse, etc.). Where rain or dew could be expected to collect (i.e., open floors of erection site, open shop bays, etc.), electrodes shall also be covered.

1.8 COORDINATION

A. Surveys: Contractor shall conduct field surveys and field verification as required to incorporate existing conditions from previous works, such as foundations and existing buildings, to the work before shop drawings are produced.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions for installation.

C. Notify the Owner's Representative in sufficient time prior to shop or field fabrication or erection to permit testing and inspection without delaying work.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL MATERIALS

A. W-Shapes: ASTM A992 as noted on Contract Drawings

B. Channels, Angles[, M][, S]-Shapes: ASTM A36 as noted on Contract Drawings

C. Plate and Bar: ASTM A36 as noted on Contract Drawings
2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy-hex steel structural bolts unless noted otherwise; ASTM A563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish. [ASTM F1852 Twist-Off Type Torque Control Bolts are a suitable alternative to ASTM A325 bolts, although use of such bolts shall not negate the requirement that Direct Tension Indicators be used for inspection].

   1. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with plain finish. Use where noted 'slip-critical' or 'fully pre-tensioned' on Structural Drawings.

B. High-Strength Bolts, Nuts, and Washers: ASTM A490, Type 1, heavy-hex steel structural bolts, where noted on drawings; ASTM A563, [Grade DH] [Grade DH3 (Class 10S to Class 10S3), heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers with plain finish. [ASTM F2280 Twist-Off Type Torque Control Bolts are a suitable alternative to ASTM A490 bolts, although use of such bolts shall not negate the requirement that Direct Tension Indicators be used for inspection].

   1. Direct-Tension Indicators: ASTM F959, [Type 490] [Type 490-3], compressible-washer type with plain finish. Use where noted 'slip-critical' or 'fully pre-tensioned' on Structural Drawings.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, [Type 1] [Type 3], [heavy-hex] [round] head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

   1. Finish: Plain.

D. Unfinished Bolts and Nuts (Machine Bolts) and Threaded Rods: ASTM A307, Grade A, low carbon steel bolts and nuts; ASTM F436, Type 1, hardened carbon-steel washers.

E. Shear Studs: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B and conform to requirements of AWS D1.1 Section 7.

F. Unheaded Anchor Rods: ASTM F1554, Grade 36.

   4. Washers: ASTM F436, Type 1, hardened carbon steel.
   5. Finish: Plain.

G. Headed Anchor Rods: ASTM F1554, Grade 36 [ASTM A449], straight.

3. Washers: ASTM F436, Type 1, hardened carbon steel.

H. Threaded Rods: ASTM A 36/A 36M.
   2. Washers: [ASTM F436, Type 1, hardened] [ASTM A36] carbon steel.
   3. Finish: Plain.

2.3 PRIMER
   A. Comply with Division 09 Section "Paintings and Coatings".
   B. Primer Paint shall comply with all applicable SSPC requirements and shall be compatible with finish paints and spray-on fireproofing specified elsewhere.
   C. Galvanizing Repair Paint: ASTM A780.
   D. Primer:
      1. Typical Interior Primer: SSPC-Paint 25, Type II. Primer shall comply with the requirements called out in the "Green Seal Standard for Anti-Corrosive Paints" (GC-03).
      2. Typical Exterior Primer: SSPC-Paint 20, Type II, Organic.

2.4 GROUT
   A. Grout shall have a minimum 2400 psi compressive strength in 48 hours and 6000 psi compressive strength at 28 days.
   B. Metallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
   C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 CONNECTION DESIGN
   A. Contractor shall design all steel connections not fully defined in the Contract Documents. Design shall be performed by a qualified professional engineer.
   B. Type of Connections
      1. All connections shall be one of the following:
         a. High-strength bolts assemblies.
b. Unfinished bolts assemblies.
c. Welds.

2. When the type of connection is shown on the Drawings use that type of connection unless otherwise approved in writing by the Engineer of Record.

3. Use a connection other than unfinished bolts where required by code and in the following locations:
   a. All beam and column connections and splices unless otherwise noted on Drawings.
   b. All connections indicated as such.
   c. Connections that are a part of the lateral force resisting system.
   d. Connections for supports of running machinery or of other live loads which produce impact.
   e. Connections carrying cooling tower loads.
   f. Beams supporting columns or posts.
   g. Connections for cantilevers.
   h. Full and partial moment connections.

C. Design Criteria.

1. Design connections for the loads and according to the requirements in the Contract Documents and the applicable building regulations.
2. Bolts shall be at least ¾ inches in diameter.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303 and AISC 360.

1. Camber structural-steel members where indicated. Fabricate beams and girders with natural camber upward, unless noted otherwise on the drawings. Camber stated in the drawings is the required camber after erection.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly. Members shall be fabricated for delivery in a sequence that will expedite erection and minimize field handling of structural steel.
5. Splice members only where indicated on Structural Drawings or where accepted by the Architect.
6. All hollow members exposed to weather shall be sealed with continuous welds, incorporating structural welds where shown or required, or provide weep holes where water may accumulate.
7. Grind burrs, sharp arrises and ragged edges that would prevent solid seating of the connected parts.
8. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
B. Tolerances:

1. Except as noted as follows, maintain fabrication tolerances of structural steel within the tolerances specified on the drawings and AISC's "Code of Standard Practice for Steel Buildings and Bridges."

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. An unguided torch may be used provided the cut is within 1/8 inch of the required line.

1. Plane thermally cut edges [to be welded] to comply with requirements in AWS D1.1.

D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

1. Use standard holes unless otherwise indicated as oversized, short-slotted, or long-slotted on the Drawings. Holes shall be drilled or punched at right angles to the surface of the metal. Making or enlarging holes by burning is prohibited.
2. Flame cut holes for fasteners are not acceptable.
3. Holes in column baseplates shall be no more than 1/2-inch larger than the nominal bolt size. Holes in column baseplates shall be within the limits of table 14-2 of AISC "Steel Construction Manual"
4. For the following conditions holes shall be drilled (not punched), even where punching is allowed by referenced standards: a) material having a thickness in excess of 7/8 inch or the hole diameter; b) column base plates; c) holes less than 6-inches from an edge that requires a CJP weld; d) where holes are subjected to welding shrinkage stresses.

E. Bending Steel Plate:

1. Bend plates perpendicular to the rolling direction.
2. Grind flame cut plate edges transverse to the bend line.
3. Grind out nicks in plate edges transverse to the bend line.
4. Round sharp corners on plate edges transverse to the bend line.

F. Heat Straightening: Will be permissible by the use of properly controlled heat, skilled personnel, proper equipment and in accordance with documents prepared by the fabricator and accepted. Reject materials that contain kinks or sharp angles. Material straightened prior to fabrication shall be rejected where it shows signs of distress or defects.

G. Planing and Milling: Accurately finish ends of columns and other members transmitting bearing loads. Mill bearing surfaces to true planes. Mill ends of columns perpendicular to centerline axis connection mid-depth points at ends of member. Cut and fit column and bearing stiffeners in manner to provide bearing over entire cross section

1. Column Base Plates
a. From 2" Through 4" Thickness: Straighten by pressing.

H. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning" and [SSPC-SP 2, "Hand Tool Cleaning] [SSPC-SP 3, "Power Tool Cleaning]."

I. Shear Studs: Prepare steel surfaces as recommended by manufacturer of shear studs. Use automatic end welding of headed-stud shear studs according to AWS D1.1/D1.1M and manufacturer's written instructions.

J. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

   1. Provide holes, slots and openings together with necessary reinforcing as shown on the Drawings required for securing work of other trades to the work specified here. Where openings are shown on the Drawings no change shall be permitted without prior approval. Openings shall be done in the shop.
   2. Cut, drill, or punch holes perpendicular to steel surfaces.[ Do not thermally cut bolt holes or enlarge holes by burning.]
   3. Baseplate Holes: Cut, drill, [mechanically thermal cut,] or punch holes perpendicular to steel surfaces.
   4. Weld threaded nuts to framing and other specialty items indicated to receive other work.

K. The Contractor shall cooperate fully with requests form inspection and testing personnel for access to the connections and joints to be inspected and tested. This includes beam and column turning in shop, weld backing removal when nondestructive examination indicates rejectable conditions, and access to platforms or scaffolding as required to perform the work safely.

2.7 SHOP CONNECTIONS

A. General Bolting:

   1. Product containers must be marked with lot numbers and traceability information so that correspondence with mill reports can be established. Manufacturer's symbol and grade markings shall appear on all bolts, nuts, through-hardened washers and direct tension indicators.
   2. Bolts shall be of a length that will extend to a point at least flush with the surface of the nuts, though not more than a length equal to the height of the nut, beyond the nuts unless otherwise noted.
   3. Washers shall be used on all bolts. Use beveled washers where bolts bear on sloping surface.

B. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified. Contact surfaces of bolted parts shall as a minimum comply with the Class A requirements.
1. Joint Type shall be as noted on drawings.
2. Direct tension indicator (load indicating washers or "Tension-Set" bolts) method shall be used at slip-critical connections. "Turn-of-Nut" methods are not an acceptable alternative.
3. When connection has bolts and welds, fully tighten bolts prior to welding with the exception that in moment connections the flange welds shall be completed prior to final tightening of high strength bolts.
4. When already tensioned bolts have had their tension relaxed, replace the bolt and tension indicator and re-tighten.

C. Unfinished Bolts (Machine Bolts): Machine bolts shall be brought to a snug tight condition. Mutilate bolt threads for unfinished bolts to prevent the nuts from backing off.

D. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Shop welds shall be inspected in the shop before the work is painted or shipped.
2. Weld sizes where shown shall be assumed to be effective weld sizes.
3. All groove or butt welds shall be full penetration unless noted otherwise on the Drawings.
4. Where structural steel members are to remain exposed in the finished work, welds exposed to view shall be uniformly made and ground smooth.
5. Weld tabs shall be in accordance with AWS D1.1. In addition, weld tabs shall extend beyond the edge of the joint a distance equal to the plate thickness but not less than 1-inch except at access holes in beam/girder webs and at continuity plate clips. Weld tabs shall be oriented parallel to the joint preparation and to the weld direction. Weld dams are not allowed.
6. Remove weld tabs and backup plates and grind surfaces smooth as required for inspection or testing. Where tabs or backup bars interfere with architectural treatment or are exposed to view in the final structure, remove and grind smooth. Backup bars and run-off tabs at Heavy Structural Sections shall be removed.
7. Splices of members in tension, all members of moment frames and all members of braced frames that are made from heavy steel sections shall be made in conformance with Section J1.5 of AISC 360.
8. Weld variables shall be consistent with the recommendations of the electrode manufacturer.
9. Do not weld into column flange-to-web intersection as defined the AISC "k" and "k1" distances except for the doubler plate to column welds. Continuity plate welds shall stay clear of this area as noted on the drawings.
10. Sequence the work as necessary to accommodate testing.
11. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
12. Welding Procedures:
a. Weld only in accordance with the Welding Procedure Specifications. WPS shall be readily available to all welders, inspectors, and supervisors during the production process.
b. Consider toughness and notch sensitivity of steel in formation of the welding procedures to prevent brittle and premature fracture during fabrication and erection. Toughness requirements are to match those of the parent metal.
c. Weld in a manner to minimize accumulation and concentration of through-thickness strains due to weld shrinkage. Sequence welds in a manner to reduce residual stresses (caused by welding) to a minimum value. Welding procedures shall incorporate measures necessary to eliminate cracking.
d. Do not mix different electrodes in the same weld joint unless the interactions have been shown not to cause problems.
e. Stringer passes only, no weaving or wash passes. Manipulation of the electrode for vertical welds (oscillation) shall be kept to a maximum movement of 4 to 5 electrode diameters.
f. Welding shall not begin until joint elements are bolted or tacked in intimate contact and adjusted to dimensions shown in the Drawings, with proper allowance for any weld shrinkage.
g. All tack welds shall be of the same quality as final welds. Preheat of tack welds is only necessary at the immediate area where the tack is placed. Preheat temperature is the same as for welding. Tack welds must be placed where they will be consumed in the weld, or be ground out to a depth of 1/8" but not rewelded unless the gouge is greater than 1/8". If rewelding is necessary, it shall then be considered a new weld with all relevant weld inspections.

13. Refer to the Structural Drawings for additional requirements.

2.8 SHOP PRIMING

A. Shop prime all steel surfaces exposed to whether or not completely concealed by interior finishes unless noted otherwise and excepting the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded and areas within 4 inches on each side of field welds.
3. Top surfaces of beams to receive metal deck.
4. Surfaces to be high-strength bolted except surfaces painted with Type B Primer. Areas with high-strength bolts exposed to the weather shall receive a primer coat compatible with slip-critical type connections.
5. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
7. Machined surfaces.
8. Welded shear studs.
B. Steel members not otherwise painted shall be painted when subjected to condensation from piping, are in shower or steam rooms, are exposed to chemical fumes or are exposed to other conditions of potentially aggressive corrosion

C. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the applicable SSPC specification requirements for each primer. As a minimum, all surfaces shall be prepared according to the following specifications and standards:

1. SSPC-SP1 "Solvent Cleaning"
2. SSPC-SP 2, "Hand Tool Cleaning"

D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 2 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

E. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 2 mils. Surface preparation and application shall be in accordance with SSPC-PS 12.01 "One-Coast Zinc-Rich Painting System".

F. All steel exposed to the weather in the final structure shall be galvanized or painted.

G. The following surfaces shall be temporarily protected by a thin coating of varnish or lacquer:

1. Unpainted area around field welds.
2. Steel around high-strength bolts.
3. Machined surfaces.

H. Use special care if steel is fabricated, cleaned, and painted in damp weather to remove moisture from mill scale cracks.
2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123 and to bolts, nuts, and washers according to ASTM A153. Galvanize all items noted on Drawings to be galvanized and fasteners that connect galvanized components, except that ASTM A490 bolts shall not be hot-dip galvanized. [Where ASTM A490 bolts connect galvanized components, use A490 Type 3 bolts.]

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize [lintels] [and] [shelf angles] attached to structural-steel frame and located in exterior walls.
3. Roughen faying surfaces of slip-critical high-strength bolted connections to achieve Class C surface accordance with the RCSC Specifications.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Testing Agency to perform shop tests and inspections as defined by AWS, AISC and these specifications. Testing Agency shall summarize their finding in inspection and testing reports. Reports shall identify any findings that are not in compliance with requirements of the project specifications.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. See Part 1 of this specification for additional testing and inspection requirements. As a minimum the inspector will make all tests and inspections as required by the . Testing Agency will make all the tests and inspections indicated in the Contract Documents.

C. Contractor shall correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

1. Owner's Representative reserves right, at any time before final acceptance, to reject material not complying with requirements.
2. Any tests that may be necessary to reconfirm any noncompliance of original work, and as may be necessary to show compliance of corrected work, shall be at Contractor's expense.

D. Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the Inspector can refer back to the person making the connection.

E. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
1. High Strength Bolted Connections: High strength bolts specified as Snug-Tight (ST) need not be inspected for bolt tension.

2. High Strength Bolted Connections: For bolts specified as Pre-Tensioned or Slip-Critical, the special inspector shall observe the preinstallation testing and calibration procedures when such procedures are required by the installation method or by project plans or specifications; determine that all plies of connected materials have been drawn together and properly snugged and monitor the installation of bolts to verify that the selected procedure for installation is properly used to tighten bolts.

   a. Periodic monitoring: Monitoring of bolt installation for pretensioning is permitted to be performed on a periodic basis (10% or a minimum of 2 bolts per connection) when using the turn-of-nut method with matchmarking techniques, the direct tension indicator method or the alternate design fastener (twist-off bolt) method.

3. Direct Tension Indicators: Observe all Direct Tension Indicators to see if proper tightness was achieved.

4. Standard Bolted Connections: Testing Agency shall inspect the installation of A307 bolts to verify that 10% of all bolts or a minimum of 2 bolts per connection are installed properly and tightened to a Snug-Tight (ST) condition.

F. Welded Connections:

1. Testing Agency shall be present during all welding operations. In addition to visual inspection, all shop-welded connections will be tested and inspected according to AWS D1.1 and this specification using the following inspection procedures:

   a. Liquid Penetrant Inspection (PT): ASTM E165.
   b. Magnetic Particle Inspection (MT): ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   d. Radiographic Inspection (RT): ASTM E94.

2. Visual Inspection of Welding: Testing Agency shall visually inspect all shop and field welding of structural steel accordance with the governing building code and AWS D1.1. Visual inspection of welds shall include but not be limited to the following:

   a. Verify: Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder making the weld, welder qualification and identification, fit-up meets tolerances of WPS and mark joint prior to welding, welding consumables are per the Contract Documents and the WPS, amperage and voltage at the arc with hand-held meters, meters on welding equipment are functioning and accurate.
   b. Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.
c. Multi-pass shop and field welds shall be continuously inspected.
d. Visually inspect welds of heavy structural sections, or plates of 1-1/2 inch minimum thickness, at least 72 hours after completion of welding for the presence of cracks.
e. Visually inspect areas where backing bars and welds tabs are removed for conformance with the surface roughness criteria of the specifications.
f. Verify that the effective throat thickness of flare groove welds is consistently obtained when flush to bar or section. This verification shall be based on test sections where necessary.

3. Nondestructive Testing Requirements: Testing Agency shall perform non-destructive testing of shop and field welding in accordance with the project specifications, governing building code, and AWS D1.1. Extent of non-destructive testing shall be as follows:

a. Complete Joint Penetration (CJP) welds: UT 100% CJP welds greater than 5/16-inch. MT 25% all CJP welds.
b. Partial Penetration Joint (PPJ) welds: UT 100% of PJP welds greater than 5/16-inch. UT 100% PJP in column splices.
c. Fillet Welds: Fillet welds of gusset plates to beams, columns and base plates - MT 10% of the following fillet welds and reduce to 5% if no significant cracks are found in the first 50 tested: a) gusset plate fillet welds to beam and columns; b) base plate fillet welds.
d. Column Web Material at Continuity Plate: MT the WF column webs 3-inches above and below the weld terminations at the first 50 continuity plates and doubler plates installed. Test shall be conducted when weld has cooled to ambient temperature. If no web cracks are found, then no more testing required. This test shall also be conducted for all locations where the Contractor has welded into the "no weld" zone shown on the Drawings for continuity plates.
e. Access holes at splices in Heavy Structural Sections - MT or PT 100%.

G. In addition to visual inspection, shop-welded shear studs will be tested and inspected according to requirements in AWS D1.1 and the governing building code for stud welding and as follows:

1. The type and capacity of the welding equipment shall be in accordance with the manufacturer's recommendations and shall be checked and approved.
2. At the beginning of each day's work, a minimum of 2 test stud welds shall be made, with the equipment to be used, to metal which is the same as the actual work piece. The test studs shall be subjected to a 90-degree bend test by striking them with a heavy hammer. After the above test, the weld section shall not exhibit any tearing or cracking.
3. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
4. Tests will be conducted on additional shear studs if weld fracture occurs on shear studs already tested, according to requirements in AWS D1.1.
H. Inspection Records

1. The inspector will maintain a daily record of the work that has been inspected and its disposition. One copy of each report will be submitted to the Owner on a weekly basis. Test reports will be made on the form suggested in the AWS D1.1 "Structural Welding Code".

2. Make systematic record of all shop welds, including:
   a. Date of inspection.
   b. Location and type of weld.
   c. Identification marks of welders.
   d. List of defective welds.
   e. Manner of correction of defects.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Discrepancies: In the event of discrepancy, immediately notify the Owner's Representative in writing. Do not proceed with construction in the region of the discrepancy until all such discrepancies have been resolved.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. The Contract Drawings indicate the completed structure. The Contractor is fully responsible for all temporary measures necessary for erection, except where specific sequences and requirements are specified on the Drawings.

B. Furnish templates for exact locations of items to be embedded in concrete and any setting instructions required for installation
3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360. Check plumbness after erection of each tier.

B. Dimensions shown on drawings are based on an assumed design temperature of 70 degree F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.

C. Where erection requires performing work of fabrication on site, comply with the applicable standards of Part 2 of this Specification.

D. Care shall be taken to protect work already installed from damages resulting from structural steel erection.

E. Items installed before concrete is placed shall be properly braced to prevent distortion by pressure of concrete. Watch and maintain bracing during concrete operations.

   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. If used, do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

G. Maintain erection tolerances of structural steel within AISC 303.

H. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

I. Splice members only where indicated.

J. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
K. Expansion Bolts:

1. Install in accordance with the manufacturer's recommendations.
2. Use washers on all bolts.
3. Use care to avoid cutting or damaging reinforcing bars.
4. When exposed to view in the final structure, bolts shall be of a length that will extend entirely through but not more than 1/4-inch beyond the nuts unless otherwise shown on the Drawings.

L. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts. Where a hole is required to be enlarged by more than 3/32-inch ream to and use next larger bolt size.

M. Shear Studs: Prepare steel surfaces as recommended by manufacturer of shear studs. Use automatic end welding of headed-stud shear studs according to AWS D1.1 and manufacturer's written instructions.

N. Temporary Shoring and Bracing:

1. The Contract Drawings indicate the completed structure. The Contractor is fully responsible for all temporary measures necessary for erection, except where specific sequences and requirements are specified on the Drawings. See the Drawings for erection sequence notes and minimum requirements.
2. Contractor is responsible for identifying need for temporary construction and for the design, installation and use of all temporary bracing and supports necessary to stabilize the framing until complete.
3. Provide temporary works as necessary to erect the structure and achieve proper alignment as erection proceeds. In addition, provide temporary bracing and shoring to brace the incomplete structure against loads such as wind and seismic forces comparable in intensity to the design loads for the completed structure.
4. Make all necessary provisions for temporary bracing and for completion of erection where structural members are temporarily left out for erection at a later time.

3.4 FIELD CONNECTIONS

A. Field connection requirements shall be as a minimum equal to those specified in Part 2 of this document.

B. Erection bolts for welded connection shall be tightened securely and left in place, unless noted otherwise.

C. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened Pretensioned Slip critical.
D. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or weld tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
4. Weld in manner to prevent warping or distortion of finished product. Use jigs which will not restrain piece from moving during welding or cooling after welding. Sequence weld passes at a joint to prevent excessive heat build-up or cause shrinkage cracks to form.
5. Auxiliary Member Connections and Temporary Welds shall be per AWS provided that preheating may be omitted on ASTM A36 steel for single pass fillet welds with low hydrogen electrodes under the following conditions: Air temperature is 60° F. or over, steel is dry, and welds to structural base material are more than 1" away from corners or ends of plates.
6. Preheat and post-heat procedures for welded joints shall be utilized to prevent rapid cooling of welds, particularly in cold weather. Procedures are Contractor's responsibility.

E. Shear Studs: The shear studs shall be automatically end welded in accordance with AWS D1.1 and the manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and the plate.

1. There should be no porosity or evidence of lack of fusion between the welded end of the stud and the plate.
2. Shear studs through metal deck shall be welded through the deck within 1 day of laying the deck.

F. Bearing Pads: Install bearing pads in accordance with manufacturer's recommendations.

3.5 FIELD QUALITY CONTROL

A. Field quality control shall, as a minimum, conform to the requirements specified under Source Quality Control in Part 2.
B. Erection Tolerances: Unless otherwise noted, level and plumb individual members of the structure within a tolerance of 1:500, but not to exceed 1/2" for full height of columns. Make exterior columns and columns adjacent to elevator beams accurate within tolerance of 1:1000, but not to exceed 1/2" for full column height. Make level and plumb based on the mean operating temperature of the structure, allowing for the difference in temperature at time of erection and the mean temperature of the structure when completed and in service. Base measurements relating to tolerances on the theoretical centerline of the columns.


C. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

D. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

E. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

1. The Inspector shall observe all Direct Tension Indicators to see if proper tightness is achieved.

F. Welded Connections: Field welds will be visually inspected according to AWS D1.1, the governing building code, and Part 2 of this document, by the Testing Agency.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.

G. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

H. Defective Work:
   
1. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents. Work deemed defective will be removed from the site at the Contractor's expense.
   
2. Any special tests not specifically covered by this specification that are proposed by the Contractor as a result of failure to comply with this Section shall be at the Contractor's expense. The Contractor shall be responsible for any consequential costs or delays.
   
3. The results of those tests will be accepted, at the discretion of the Architect, as proof of adequate materials or workmanship.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 "Exterior Painting" and "Interior Painting" Section.

D. Touchup Priming: Cleaning and touchup priming are specified in Division 09 "High-Performance Coatings."

E. Repair of Openings: For all members exposed to view in the final structure, close all lifting holes, access openings, etc. in such a manner that no visual evidence of the opening remains.

END OF SECTION 051200
SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Cellular roof deck.
3. Acoustical roof deck.
5. Noncomposite form deck.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
5. Section 099123 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.
B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.
   2. Acoustical roof deck.

D. Evaluation Reports: For steel deck, from ICC-ES.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.


C. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.


1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
   1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
4. New Millennium Building Systems, LLC.
5. Nucor Corp.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 40 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 40, [G60] [G90] zinc coating.
3. Deck Profile: As indicated.
4. Cellular Deck Profile: As indicated, with bottom plate.
5. Profile Depth: As indicated.
6. Design Uncoated-Steel Thickness: As indicated.
7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
8. Span Condition: Triple span or more.
9. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACOUSTICAL ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings Insert manufacturer's name; product name or designation or comparable product by one of the following:
1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
4. New Millennium Building Systems, LLC.
5. Nucor Corp.

C. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 40 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
   a. Color: [Manufacturer's standard] [Gray] [White] [Gray top surface with white underside].

2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 40, [G60] [G90] zinc coating.

3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 40, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

4. Deck Profile: As indicated.
5. Profile Depth: As indicated.
6. Design Uncoated-Steel Thickness: As indicated.
7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
8. Span Condition: Triple span or more.
9. Side Laps: Overlapped or interlocking seam at Contractor's option.
10. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs.
11. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
   a. Installation of sound-absorbing insulation is specified in Section <Insert Section number> "<Insert Section title>.

12. Acoustical Performance: NRC 0.65, tested according to ASTM C 423.

2.4 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
4. New Millennium Building Systems, LLC.
5. Nucor Corp.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard [gray] [or] [white] baked-on, rust-inhibitive primer.
2. Profile Depth: As indicated.
3. Span Condition: Triple span or more.

2.5 NONCOMPOSITE FORM DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
3. New Millennium Building Systems, LLC.
4. Nucor Corp.
5. Verco Decking, Inc., a Nucor company.

B. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Uncoated Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum.
2. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, with top and underside surface shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
4. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.
2.6 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile [indicated] [recommended by SDI Publication No. 31 for overhang and slab depth].

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and [level] [sloped] recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

L. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
   1. Weld Diameter: [5/8 inch] [3/4 inch], nominal.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:
   1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space not more than 12 inches apart with at least one [weld] [fastener] at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 053100
SECTION 054000 - COLD FORMED METAL FRAMING

1. GENERAL

1. SUMMARY

A. Section Includes: Cold Formed Metal Framing indicated and as specified, including engineering.

2. SUBMITTALS

A. Product Data: Submit manufacturer's product information and installation instructions.

B. Shop Drawings: Submit Shop Drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data.

1. Include placing drawings for framing members showing size and gauge designations, number, type, location and spacing. Indicate supplemental bracing, splines, accessories, and details as may be required for proper installation.

2. Submit shop drawings for the system framing and connections with the supporting construction stamped and signed by a State of Illinois Licensed Structural Engineer.
   a. Calculations shall be submitted with the first shop drawing submittal, and shall be cross-referenced with all shop drawing submittals.
   b. Shop drawings will not be reviewed without the submittal of coordinated calculations.

3. QUALITY ASSURANCE

A. Component Design: Compute structural properties of members in accordance with AISI "Specification for the Design of Cold-Formed Steel Structural Members."

1. Design the systems for the loads indicated and required by code.

2. Design exterior wall systems to sustain load of 30 psf acting inward and outward (except 40 psf at corners, overhanging eaves and soffits, and projecting elements) with a maximum deflection of L/600.
   a. Maintain width of studs shown at exterior wall framing. Provide gauge and spacing required for design loads, but not greater than 16" o.c.

B. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3 "Structural Welding Code-Sheet Steel".

C. Mockups: Build mockups to set quality standards for fabrication and installation.

1. Build mockup of cold formed metal framing to support exterior wall mockup as shown on Drawings. Mockup framing shall replicate project conditions at each
location including base of wall, corners, soffits, window openings, terminations, and head of wall.

a. Exterior enclosure mockup includes elements and systems specified in other specification sections. Contractor shall coordinate mockup such that the entire mockup is completed and approved prior to final approval of any system or component.

D. Locate mock-up on site in a protected area where it can be kept in place until after the building is completed. Obtain architects approval before disposing of mock-up.

4. DELIVERY AND STORAGE

A. Protect metal framing units from rusting and damage. Deliver to the Project Site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off the ground in a dry ventilated space or protect with suitable waterproof coverings.

2. PRODUCTS

1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. AllSteel Products, Inc.
2. California Expanded Metal Products Company.
3. Clark Steel Framing.
4. Dietrich Metal Framing
5. Formetal Co. Inc. (The).
6. MarinoWare; a division of Ware Industries.
7. SCAFCO Corporation.
8. Steeler, Inc.
9. The Steel Network
10. United Metal Products, Inc.

2. METAL FRAMING

A. System Components:

1. Provide manufacturer’s standard minimum 18 gauge steel studs, steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for the applications indicated, as needed to provide a complete metal framing system.

B. Materials and Finishes: ASTM A1003/A 1003M, structural grade required by design, Type H. G60 metallic coating.
C. Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with corrosion-resistant plated finish.

D. Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.

E. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

3. FABRICATION

A. Basic Requirements: Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion in any members in the assembly.

B. Cutting: Cut ends of member square to fit against abutting members.

C. Fastenings: Attach components by welding, bolting, or screw fasteners.
   1. Wire tying of framing components is not permitted.

3. EXECUTION

1. INSPECTION AND PREPARATION

A. Pre-Installation Conference: Prior to the start of installation of metal framing systems, meet at the Project Site with the installers of other Work, including door and window frames, and Mechanical and Electrical Work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing Work.

2. INSTALLATION

A. Basic Requirements:
   1. Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations.
   2. Install continuous runner tracks sized to match studs. Align tracks accurately to the layout at base and tops of studs. Secure tracks as recommended by the stud manufacturer for the type of construction involved, except do not exceed 24” o.c. spacing. Provide fasteners at corners and ends of tracks.
   3. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
   4. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
   5. Install supplementary framing, blocking and bracing in the metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar Work requiring attachment to the wall or partition. Where type of supplementary support is not
otherwise indicated, comply with the stud manufacturer’s recommendations and industry standards in each case, considering the weight of loading resulting from the item supported.

6. Coordinate framing locations with exterior cladding system requirements.

7. Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.

8. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer’s instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of the wall. Secure stud system all around to wall opening frame in the manner indicated.

9. Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 4'-6" o.c.

10. Frame both sides of expansion joints with separate studs. Do not bridge the joint with components of stud system.

B. Field Painting: Touch up shop-applied protective coatings damaged during handling and installation. Use galvanizing repair paint.

3. FIELD QUALITY CONTROL

A. Quality Control Testing During Construction:

1. The Owner’s testing service may inspect welds

2. If, in the opinion of the Owner's testing service, based on reports of the testing service and inspection, additional testing will be required until satisfactory results are obtained at no additional cost to Owner. In such event, retesting will be paid by the Contractor.

B. Contractor’s Responsibilities

1. Notify 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.

3. Furnish casual labor and facilities to provide access to Work to be tested to facilitate inspections and tests.

END OF SECTION 054000
SECTION 055000 - METAL FABRICATIONS

1. GENERAL

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.

2. SUMMARY

A. Section Includes:
   1. Steel framing and supports for countertops.
   2. Steel framing and supports for mechanical and electrical equipment.
   3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   4. Metal ladders.
   5. Miscellaneous steel trim
   6. Metal bollards.
   7. Loose bearing and leveling plates for applications where they are not specified in other Sections.
   8. Metal railing at bleachers

B. Products furnished, but not installed, under this Section:
   1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into other construction.
   2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:
   1. Section 033000 "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 051200 "Structural Steel Framing."

3. PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F ambient; 180 deg F, material surfaces.

4. ACTION SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections.
      a. Show anchorage, fasteners and accessory items.
      b. Include details of interface with adjacent construction, materials and surfaces.

C. Samples for Verification: For each type and finish of exposed metal fabrication.

D. 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.

5. INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Mill Certificates: Signed by manufacturers of stainless-steel 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.

6. 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."

7. PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.
8. **COORDINATION**

   A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers’ written recommendations to ensure that shop primers and topcoats are compatible with one another.

   B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or other work. Deliver such items to Project site in time for installation.

2. **PRODUCTS**

1. **METALS, GENERAL**

   A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2. **FERROUS METALS**

   A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

   B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

   C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304

   D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304

   E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

   F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

   G. Steel Tubing: ASTM A 500, cold-formed steel tubing.

   H. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

   I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

      1. Size of Channels: 1-5/8 by 1-5/8 inches
      2. Material: Galvanized steel, ASTM A 653, commercial steel, Type B structural steel, Grade 33, with G90 coating; 0.108-inch
3. Material: Cold-rolled steel, ASTM A 1008, commercial steel, Type B structural steel, Grade 33; 0.0966-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel

J. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

3. NONFERROUS METALS

D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
E. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).

4. FASTENERS

A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5. Select fasteners for type, grade, and class required.

1. Provide type 304 stainless steel fasteners at the following conditions:
   a. Exterior work and work in exterior wall assemblies.
   b. For fastening aluminum.
   c. For fastening stainless steel.
   d. For fastening nickel silver.

2. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1)

D. 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.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

G. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).

H. Wood Screws: Flat head, ASME B18.6.1.


K. Anchors, General: Anchors capable of sustaining, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

L. 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.

M. 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 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

N. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

5. MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
B. Low-Emitting Materials: Paints and coatings shall 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."

C. Shop Primers: Provide primers that comply with Division 9 Painting sections.

D. 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.

E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

H. Nonshrink, Metallic Grout for heavy-duty loading applications: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
   1. Do not use in wet or exterior locations.

I. Nonshrink, Nonmetallic Grout for interior and exterior locations: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. 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 (20 MPa).

6. FABRICATION, GENERAL

A. Galvanizing: All ferrous metal fabrications located at the exterior are to be shop galvanized.

B. 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.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.
F. 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.

G. 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.

H. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

I. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

J. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1. Where units are indicated to be cast into concrete, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

7. MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated recommended by partition manufacturer with attached bearing plates, anchors, and braces as indicated recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.
E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

8. METAL LADDERS

A. General:
   1. Comply with ANSI A14.3 unless otherwise indicated.

B. Steel Ladders:
   1. Space siderails 16 inches (406 mm) 18 inches (457 mm) apart unless otherwise indicated.
   2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.
   3. Rungs: 3/4-inch- (19-mm-) square 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, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive, by coating with abrasive material metallically bonded to rung, or by using a type of manufactured rung filled with aluminum-oxide grout.
   6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch (19 mm) in least dimension.
   7. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
   8. Galvanize exterior ladders, including brackets, clips, anchors and fasteners.

C. Aluminum Ships Ladders:
   1. Space siderails 24 inches (406 mm) nominally apart unless otherwise indicated.
   2. Siderails: Continuous, 5-inch by 2-inch by 3/16 inch aluminum channels, with eased edges.
   3. Rungs: 5 3/16-inch nominal width, to match side rails, extruded aluminum with 1-1/8" angled returns to match ladder angle, with textured tread for slip resistance.
      a. Mounting brackets: 1 1/4” by 1 1/4-inch by 1/4-inch by 4-inch long angles welded to treads, and bolted and welded to side rails.
   4. Fit rungs in siderails at angle to be horizontal in installed condition.
   5. Support each ladder at top and bottom with aluminum angle brackets mounted to channel stringers and attached to floor structure and roof structure.

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 construction.

C. Galvanize exterior miscellaneous steel trim.

10. FIXED METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe wall-thickness steel shapes, as indicated.
   1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.
   2. Where bollards are indicated to receive controls for door operators, provide necessary cutouts for controls and holes for wire.
   3. Where bollards are indicated to receive light fixtures, provide necessary cutouts for fixtures and holes for wire.

B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard.

C. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch (6.4-mm) wall-thickness steel tubing with an OD approximately 1/16 inch (1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 3/4 inch (19 mm) steel machine bolt.

D. Galvanize metal bollards and prepare for field paint.

11. LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates in exterior walls.

12. 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.

13. FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.
C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

14. STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
   1. Do not quench or apply-post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete or receive sprayed-on fireproofing or unless otherwise indicated.
   1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

3. EXECUTION

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 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 or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

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 concrete or steel pipe columns. Secure girders with anchor bolts embedded in 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, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
   1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3. INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete in formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19
mm) larger than OD of bollard. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

4. INSTALLING NOSINGS, TREADS, AND THRESHOLDS
   A. Center nosings on tread widths unless otherwise indicated.
   B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
   C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 079200 "Joint Sealants" to provide a watertight installation.

5. INSTALLING BEARING AND LEVELING PLATES
   B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
      1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
      2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

6. 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 (0.05-mm) dry film thickness.
   B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Painting sections.
   C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000
SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Rooftop curbs.
2. Wood cants and nailers.
3. Plywood backing panels.

B. Related Requirements:
1. Section 061600 "Sheathing."

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
5. WCLIB: West Coast Lumber Inspection Bureau.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with
requirements. Indicate type of preservative used and net amount of preservative retained.

2. 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.

5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Expansion anchors.
4. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 REGULATORY REQUIREMENTS

A. Location limitations: Do not use wood materials in fire-rated construction. All blocking, furring, and framing in fire-rated construction shall be steel.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship"

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

C. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. 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.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
D. Application: Treat all rough carpentry at exterior wall assemblies, roof areas, and high-moisture areas unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated 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, and 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. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. Application: Treat all rough carpentry unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Nailers.
2. Rooftop curbs.
3. Cants.
5. Furring strips

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Northern species; NLGA.
7. Eastern softwoods; NeLMA.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and of any of the following species and grades:
   1. Mixed southern pine; No. 2 3 grade; SPIB.
   2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
   3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

   1. Plywood shall 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.”

2.6 FASTENERS

A. General: Provide fasteners as required for the work, of size and type indicated that 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.

B. Nails, Brads, and Staples: ASTM F 1667.


D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4), at exterior work, exterior wall assemblies, and high-moisture areas.

2.7 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing wood to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall 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."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. 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.

C. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
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.

F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally at 16 inches on center.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches o.c.

3.4 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
END OF SECTION 061000
SECTION 061600 - SHEATHING

1. GENERAL

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.

2. SUMMARY

A. Section Includes:

1. Wall and soffit sheathing.
2. Miscellaneous sheathing

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 072100 "Thermal Insulation" for rigid board insulating sheathing for exterior wall cladding.
3. Section 072726 "Fluid-applied Membrane Air Barriers" for water-resistant barrier applied over wall sheathing.

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 plywood complies 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 plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
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.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
4. INFORMATIONAL SUBMITTALS
   A. Evaluation Reports: Fire test-response characteristics for the following products:
      1. Preservative-treated plywood.
      2. Fire-retardant-treated plywood.
      3. Foam-plastic sheathing.

5. QUALITY ASSURANCE
   A. Testing Agency Qualifications: For testing agency providing classification marking for
      fire-retardant-treated material, an inspection agency acceptable to authorities having
      jurisdiction that periodically performs inspections to verify that the material bearing the
      classification marking is representative of the material tested.

6. DELIVERY, STORAGE, AND HANDLING
   A. Stack panels flat with spacers beneath and between each bundle to provide air
      circulation. Protect sheathing from weather by covering with waterproof sheeting,
      securely anchored. Provide for air circulation around stacks and under coverings.

2. PRODUCTS
   1. PERFORMANCE REQUIREMENTS
      A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings,
         provide materials and construction identical to those of assemblies tested for fire
         resistance per ASTM E 119 by a testing and inspecting agency acceptable to
         authorities having jurisdiction.

         1. Fire-Resistance Ratings: Indicated by design designations from UL’s "Fire
            Resistance Directory."

   2. WOOD PANEL PRODUCTS
      A. Plywood: DOC PS 2
      B. Thickness: As needed to comply with requirements specified.
      C. Factory mark panels to indicate compliance with applicable standard.

   3. PRESERVATIVE-TREATED PLYWOOD
      A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b for
         exterior construction not in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

4. **FIRE-RETARDANT TREATED PLYWOOD**

   A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

   B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and 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. Use treatment that does not promote corrosion of metal fasteners.
      2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
      3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.

   C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

   D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

   E. Application: Treat all plywood unless otherwise indicated.

5. **EXTERIOR WALL AND SOFFIT SHEATHING**

   A. Glass-Mat Exterior Gypsum Wall Sheathing: ASTM C 1177/1177M.

      1. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
      2. Size: 48 by 96 inches (1219 by 2438 mm)
6. FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For sheathing in exterior assemblies, provide fasteners of Type 304 stainless steel.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with of Type 304 stainless steel.

1. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

7. SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

B. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

3. EXECUTION

1. INSTALLATION, GENERAL

A. 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. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
3. 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."

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and soffit sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

2. GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.

2. Install boards with a 3/4-inch (19-mm) gap where non-load-bearing construction abuts structural elements.

3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant.
Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3. CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer’s written instructions for type of application indicated.

END OF SECTION 061600
SECTION 061800 - GLUED-LAMINATED CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes framing using structural glued-laminated timber.

1.3 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include data on lumber, adhesives, fabrication, and protection.
   2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
   3. For connectors. Include installation instructions.

B. Shop Drawings:
   1. Show layout of structural glued-laminated timber system and full dimensions of each member.
   2. Indicate species and laminating combination.

1.5 INFORMATIONAL SUBMITTALS

A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.
B. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.

C. Research/Evaluation Reports: For [structural glued-laminated timber] [and] [timber connectors], from ICC-ES.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: [An AITC- or APA-EWS-licensed firm] [certified for chain of custody by an FSC-accredited certification body].

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design structural glued-laminated timber and connectors.

B. Structural Performance: Structural glued-laminated timber and connectors shall withstand the effects of structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117 or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

2.2 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.

2. Provide structural glued-laminated timber made from single species.

3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.

4. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.
B. Species and Grades for Structural Glued-Laminated Timber: Any species in grades needed to comply with "Performance Requirements" Article.

C. Species and Grades for Structural Glued-Laminated Timber: Any species that complies with beam stress classifications indicated.

D. Species and Grades for [Beams] [and] [Purlins]:
   1. Species and Beam Stress Classification: Any species, 24F-1.7E.
   2. Lay-up: Either balanced or unbalanced.

E. Appearance Grade: Architectural, complying with AITC 110.
   1. For Premium and Architectural appearance grades, fill voids as required by AITC 110. [For Premium appearance grade, use clear wood inserts, of matching grain and color, for filling voids and knot holes more than 1/4 inch wide.]

2.3 PRESERVATIVE TREATMENT

A. Preservative Treatment: Where preservative-treated structural glued-laminated timber is indicated, comply with AWPA U1, Use Category 1.
   1. Use preservative solution without substances that might interfere with application of indicated finishes.

2.4 TIMBER CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable product by one of the following:

C. Materials: Unless otherwise indicated, fabricate from the following materials:
   1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.
   2. Round steel bars complying with ASTM A 575, Grade M 1020.
   3. Hot-rolled steel sheet complying with ASTM A 1011/A 1011M, Structural Steel, Type SS, Grade 33.
   4. Stainless-steel plate and flat bars complying with ASTM A 666, Type 304.
   5. Stainless-steel bars and shapes complying with ASTM A 276, Type 304.
   6. Stainless-steel sheet complying with ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.
2.5 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.6 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

1. Dress exposed surfaces as needed to remove planing and surfacing marks.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. Where preservative-treated members are indicated, fabricate (cut, drill, surface, and sand) before treatment to greatest extent possible. Where fabrication must be done after treatment, apply a field-treatment preservative to comply with AWPA M4.

1. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
2. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

D. End-Cut Sealing: Immediately after end cutting each member to final length and after preservative treatment, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

E. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit except for preservative-treated wood where treatment included a water repellent.

2.7 FACTORY FINISHING

A. Wiped Stain Finish: Manufacturer's standard, dry-appearance, penetrating acrylic stain and sealer; oven dried and resistant to mildew and fungus.

1. Color: As selected by Architect from manufacturer's full range.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.

B. Framing Built into Masonry: Provide 1/2-inch clearance at tops, sides, and ends of members built into masonry; bevel cut ends 3 inches; and do not embed more than 4 inches unless otherwise indicated.

C. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

D. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.

1. Predrill for fasteners using timber connectors as templates.
2. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
3. Coat cross cuts with end sealer.

E. Install timber connectors as indicated.

1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

3.3 ADJUSTING

A. Repair damaged surfaces after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.
3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION 061800
SECTION 064000 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior woodwork items indicated not specified elsewhere and as specified.

1.2 SUBMITTALS

A. Product Data: Submit complete printed data on all specified manufactured items.

B. Shop Drawings: Submit Shop Drawings for shop fabricated items, showing location of each item, dimensioned plans and elevations, large scale details, anchors and other components. Indicate compliance with specified Standards and other specified requirements for materials and workmanship.

C. Samples:

1. Submit samples of laminate of colors and patterns selections by Architect.
2. Submit solid wood for transparent finish, a set of 3 samples, minimum one foot long, each required configuration, each specie, showing extremes in color and grain.
3. Submit solid wood for opaque finish, 3 samples, minimum foot long, each configuration.
4. Submit panel products or veneer for transparent finish, 3 samples, 12" square, showing extremes in color, grain and characteristics.
5. Submit composite wood bench products as indicated
   a. Provide 12 inch long sample of IPE composite wood bench material.
   b. Provide 3 samples of each type of IPE Clip hidden deck fasteners.
6. Submit samples, approximately 6" square full thickness corner sections of Epoxy tops having finish proposed for the project.
7. Solid-surfacing materials, 6 inches square.

1.3 QUALITY ASSURANCE

A. Fabricator/Installer: A firm which has successfully produced work similar to the quality specified and in the quantity shown for a period of not less than 5 years.

B. Reference Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" (herein referred to as Standards) for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements except as otherwise specified.
1.4 DELIVERY, STORAGE AND HANDLING

A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Store woodwork materials and completed woodwork only in a dry, ventilated place, protected from the weather.

C. Protect woodwork from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

D. Do not deliver woodwork until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas which meet the requirements specified for installation areas.

1.5 JOB CONDITIONS

A. Environmental Requirements: Do not start Work until room or space is at normal use temperature and humidity and wood has tempered to the room or space.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before on Shop Drawings.

1.6 COORDINATION

A. Coordinate and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastic Laminate: Comply with the requirements of "Publication No. LD3" by the National Electrical Manufacturer's Association (NEMA), General-Purpose type (HGS), 0.048", except post formed type (HPG) for surfaces shown formed, 0.039"). Colors, patterns and texture selected by the Architect and as indicated on the Material Finish Schedule on Drawings.
1. Backer Sheet: NEMA LD3, 0.028" VGS.

B. Solid Finish Wood (Transparent Finish): AWI Premium Grade Teak, selected for compatibility of color and grain from piece to piece.

1. Obtain from forests certified by an FSC-accredited certification body to comply with FSC 1.2 “Principles and Criteria.”

C. Solid Finish Wood (Opaque Finish): Paint grade poplar or birch.

1. Obtain from forests certified by an FSC-accredited certification body to comply with FSC 1.2 “Principles and Criteria.”

D. Panel Product:

1. Obtain new wood from forests certified by an FSC-accredited certification body to comply with FSC 1.2 “Principles and Criteria.”
2. Opaque Finish: Sound (paint) grade poplar or birch veneered veneer to fiberboard core, as specified or particle board core, as specified.

E. Particle Board: ANSI A 208.1 composed of wood chips, medium (40-50 PSF) density, Grade M-2-Exterior Glue (no urea formaldehyde), sanded faces, fire retardant treated where indicated, and where used as backing core of wall paneling (UL stamp for Class 1. rating).

F. Hardboard: ANSI A 135.4, pressed wood fibers with resin binders, tempered grade, 1/4" thick unless shown otherwise, smooth two sides where exposed. Hardboard to contain no urea formaldehyde.

G. Fiberboard: ANSI A208.2 composed of wood reduced to fine fibers mixed with binders and formed into panels by heat and pressure, 37 to 50 lb./cu.ft. density, grade MD-exterior glue (no urea formaldehyde).

H. Thermoset Decorative Overlay Board: Particleboard specified above, or medium-density fiberboard specified above with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

I. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2. Colors and patterns selected by the Architect and as indicated on the Material Finish Schedule on Drawings

J. Open Adjustable Shelf Supports and Brackets:

1. Adjustable Shelf Supports: Heavy-duty slotted steel, BHMA A156.9, B04102.
   a. Knape & Vogt No. 87.
   b. Reeve No. RV-700.
   c. Equal.
   b. Reeve NO. RV-767.
   c. Provide shelf rests.

3. Finish: Satin Chrome or Zinc.

K. Cabinet Hardware (except where Drawings indicate otherwise):

1. Adjustable Pilaster Shelf Supports and Brackets: Flush mounted pilaster type slotted steel standards, comply with BHMA B84073. Provide matching shelf rests, BHMA B84093.
   b. Sugatsune No. SP-1820 and SPB-20.
   c. Multiple holes, 5 mm diameter with pins matching shelf supports acceptable.

2. Side Pair Drawer Slides: BHMA B05053, 100 lb. rated (per pair) ball-bearing nylon rollers, 1/2" wide units, commercial grade, full extension.
   a. Accurate No. 7432 Series.
   b. Hettich Grant No. 5632.
   c. Knape & Vogt No. 1429.

3. Magnetic Cabinet Catches: BHMA, B43142, B43152 or B43162 (type as applicable) aluminum case, commercial grade.

4. Heavy-Duty Magnetic Catches: BHMA B43172, aluminum case, commercial grade, 11.0 lbs. minimum test pull (door 16" wide and wider).

5. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees minimum of opening, self-closing.

6. Pulls: Rod type, 5/16" diameter, 7/8" finger clearance, 4" screw centers.
   a. Stanley No. 4483.
   b. Hafele No. 116.39.464
   c. Equal

   a. Provide on all doors and drawers.

8. Finish for Exposed Cabinet Hardware: Except as otherwise indicated, provide the following finish for exposed hardware comply with BHMA A156.18. For items not available in required finish, provide finish selected by Architect from those available. If more than one finish is indicated, match finish of hardware items on each "set" of casework as indicated.
a. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

L. Miscellaneous Accessories:

1. Nails: Select the material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
2. Anchors:
   a. Select the material, type, size and finish required by each substrate for secure anchorage. Provide nonferrous metal plated or galvanized anchors.
   b. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.
3. Closet Poles: Chrome plated tubing cut to lengths required, with standard wrought steel flanges (one with open top).
4. Center Brackets: Combination shelf and closet pole support, wrought steel with enamel finish, BHMA B84052.
5. Grommets: 1¼” diameter molded plastic with matching caps having slops for wire passage unless otherwise shown.
6. Other Accessories: As indicated on the drawings.
7. Hooks: Hewi 513 or equal.

2.2 FABRICATION

A. Shop-fabricate to the greatest extent possible, disassemble only as necessary for delivery and installation.

B. Install hardware at the shop prior to delivery. Remove hardware for finish application and reinstall after finishing.

C. Fabricate shop built items with scribes to fit to existing construction.

D. Adjustable Shelving: Minimum 3/4” panel product shelves, (for paint) with hardwood edges, except where thermoset overlay (melamine) indicated.

E. Casework:
   1. Conform to AWI Premium Grade and as follows:
   2. Face Construction: "Flush overlay" type, except as otherwise indicated.
   3. Thickness and Style: As shown, or if not shown, provide 3/4” thick doors, drawer fronts and fixed panels, except where required to be thicker by Standards; and provide flush units.
   4. Edges of Plastic Laminate Door, Drawers and Face Frame: 3 mil PVC, exposed surfaces.

8. Wood Casework Matching: Run and match grain vertically for drawer fronts, doors and fixed panels.
   a. Fabricate Work of each continuous casework unit from book matched, flitch-matched architectural plywood panel sets.

9. Wood Casework Finish: AWI for complete factory application of finish system TR-4; conversion varnish, partially filled effect, satin sheen, stain selected by Architect. Provide specified finish inside and outside.

F. Solid-Surfacing Counters and Sills Construction:
   2. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
   3. As shown, or if details not shown, comply with Standards and provide 4" high back-splash and end-splash, top-mounted square butt joint, eased edges.
   4. Openings:
      a. Cut openings for equipment to be installed. Comply with equipment manufacturer's requirements, but provide internal corners of 1/8" minimum radius. Smooth saw cut and ease edges.
   5. Counter Top Supports: Where counter top span exceeds 48", provide mid span support as shown, or if not shown provide painted triangular metal gusset support or Unistrut

2.3 ARCHITECTURAL WOOD CABINETS, GENERAL

A. 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] [and] [certificates] from [AWI] [WI] certification program indicating that woodwork[, including installation,] complies with requirements of grades specified.
   2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.4 WOOD CABINETS FOR OPAQUE FINISH

A. Grade: [Premium] [Custom] [Economy].
B. Regional Materials: Wood cabinets for opaque finish shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

C. Regional Materials: Wood cabinets for opaque finish shall be manufactured within 500 miles (800 km) of Project site.

D. Certified Wood: Wood cabinets for opaque finish shall be produced from wood certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

E. Type of Construction: [Frameless] [Face frame].

F. Cabinet and Door and Drawer Front Interface Style: [Flush overlay] [Reveal overlay] [Lipped] [Flush inset].

G. Reveal Dimension: [1/2 inch (13 mm)] [As indicated] <Insert dimension>.

H. Species for Exposed Lumber Surfaces: Any closed-grain hardwood.

I. Panel Product for Exposed Surfaces: Medium-density [fiberboard] [overlay].

J. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: [Match materials indicated for exposed surfaces] [Thermoset decorative panels].
   a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.

2. Drawer Sides and Backs: [Solid-hardwood lumber] [Thermoset decorative panels with PVC or polyester edge banding].

3. Drawer Bottoms: [Hardwood plywood] [Thermoset decorative panels].

K. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

L. 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] [or] [glued dovetail joints].

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: [Softwood or hardwood lumber] [Fire-retardant-treated softwood lumber], kiln dried to less than 15 percent moisture content.
2.6 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

3.2 INSTALLATION

A. Basic Requirements:

1. Install plumb, level, true and straight with no distortions. Shim as required using concealed shims.
2. Cut to fit, unless specified to be shop-fabricated or shop-cut to exact size. Where woodwork abuts other finished Work, scribe and cut for accurate fit.

B. Closet Shelving:

1. Provide shelf and pole supports at maximum 32" o.c.
2. Secure with toggle bolt into cells of masonry units.
3. Secure wood screws into wood blocking built into stud framing for the purpose.
4. Provide end brackets for shelf and rod.

C. Adjustable Shelving:

1. Secure plumb and true at maximum 32" o.c. and maximum 6" from ends of shelves.
2. Secure with toggle bolts into cells of masonry units.
3. Secure with wood screws built into stud framing for the purpose.

D. Casework - Shop Fabricated Items:
1. Install plumb, level, true and straight with no distortions. Shim as required using concealed shims.
2. Where work abuts other finished work, scribe and cut for accurate fit. Before making cutouts, drill pilot holes at corners.
3. Attach work securely in place with uniform joints providing for thermal and building movements. Secure to anchors or blocking built in or directly attached to substrates.
4. Provide tops fabricated in largest sizes practical. Assemble in field with splines for alignment and drawn tight to hairline contact with tight-joint fasteners.

E. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

   1. Align adjacent solid-surfacing-material countertops and sills and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
   2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c.
   4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

F. Preparing for Finish: Clean woodwork (not shop finished) and fill nail holes in preparation for finishes specified for job-applied finish. Where woodwork is to receive a transparent finish, use matching wood filler, sand smooth.

3.3 CLEANING AND PROTECTION

A. Repair or remove and replace defective work upon completion of installation.

END OF SECTION 064000
SECTION 06 61 16 - SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid-surface-material wall surfacing, window sills, countertops and wall base.

1.2 RELATED SECTIONS

A. Section 079200 - “Joint Sealants” for sealants between solid surface and adjoining construction.
B. Section 101423 – “Interior Signage”, for solid surface signs to be attached to wall surfaces.

1.3 ACTION SUBMITTALS

A. Product Data: For solid surfacing materials.

B. Shop Drawings: Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures. Provide details showing supporting substrates and interfaces with adjacent work.

C. Samples for Verification: For the following products:
   1. Solid surfacing material for each color and application, 6 inches square.

1.3 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of solid surfacing fabrications by field measurements.

PART 2 - PRODUCTS

2.1 SOLID SURFACING MATERIALS

A. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

   1. Manufacturers: Basis of Design is Corian by E. I. du Pont de Nemours and Company, Color: Glacier Ice. Provide basis of design product or equal product by one of the following:
2. Type: Provide Standard Type.
3. Colors and Patterns: As indicated on the drawings.
4. Solid Surface Material shall be manufactured with no added urea formaldehyde.

2.2 SOLID-SURFACE-MATERIAL FABRICATIONS

A. Wall Surfacing: 1/2-inch- thick, solid surface material.
B. Window Sills: 1/2-inch- thick, solid surface material.
C. Countertops: 1/2-inch- thick, solid surface material, built up at edges to provide indicated edge profile.
D. Wall base: 1/2-inch- thick, solid surface material.

C. Fabrication:
   1. Seams: Fabricate seams so as to be invisible unless otherwise indicated.
   2. Finish: Smooth
   3. Comply with solid-surface-material manufacturer's written instructions for mounting, adhesives and sealers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall surfacing and window sills to comply with manufacturer's written instructions for mounting, adhesives and sealers.
B. Install wall surfacing and window sills level and plumb to a tolerance of 1/8 inch in 8 feet.
C. Align adjacent surfaces and, using adhesive in color to match, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface to provide invisible seams.
D. Seal joints between solid surface and adjacent surfaces. Sealant color to match solid surface color.

END OF SECTION 066116
SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
5. Vapor retarders.

B. Related Sections:

1. Section 061600 "Sheathing" for foam-plastic board sheathing over wood or steel framing.
2. Section 075419 Polyvinyl-Chloride (PVC) Roofing for insulation specified as part of roofing construction.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1.6 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. 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 before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Owens Corning.
   d. Pactiv Building Products.

2. Type: Type IV, 25 psi (173 kPa).

B. Unfaced Wall Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Pactiv Building Products.

C. Geotextile-Faced Wall Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type IV, 25-psi (173-kPa) minimum
compressive strength; fabricated with tongue-and-groove edges and with one side having grooved drainage channels faced with nonwoven geotextile filter fabric.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Owens Corning.
   b. Approved equal

D. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 MINERAL-WOOL BOARD INSULATION

A. Rigid Board insulation designed as substrate to support lightweight cladding, rated for use in exterior cavity of rainscreen construction, and confirming with requirements for ASTM C612 Type IV B.

B. Unfaced, Mineral-Wool Board Insulation:
   1. With maximum flame-spread index of zero and and smoke-developed index of zero, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   2. Nominal density of 8 lb/cu. ft. (128 kg/cu. m), Type III, thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (30.2 K x m/W at 24 deg C).
   3. Size: 48 inches x 72 inches
   4. R-value/inch at 75⁰ F: 4.0 hr ft²
   5. Thickness: 2 ½ inches for R-10
   6 Moisture resistance:
      a. Moisture sorption: 0.28 % maximum to ASTM C1104/C1104M.
      c. Water absorption: 1.2 % to ASTM C209.
   7. Dimensional stability: 0.38 % maximum linear shrinkage at 1200 ºF to ASTM C356.
   8. Corrosive resistance:
   10. Compressive strength: To ASTM C165.
      a. 1220 psf at 10 %.
      b. 1880 psf at 25 %.

C. Basis of design Product: Comfortboard 110 by Roxul. Subject to compliance with requirements, provide basis of design product or products by one of the following:

   1. Fibrex Insulations Inc.
   2. Isolatek International.
   3. Thermafiber.

D. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
2.3 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
5. Owens Corning.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, 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.

D. Reinforced-Foil-Faced, Glass-Fiber Blanket Insulation: 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.

2.4 MINERAL-WOOL BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fibrex Insulations Inc.
2. Owens Corning.
3. Roxul Inc.
4. Thermafiber.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
   a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
   b. Gemco; Spindle Type.

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 indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Gemco; 90-Degree Insulation Hangers.
   b. Approved equal

2. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 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 indicated.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
   a. AGM Industries, Inc.; TACTOO Adhesive.
   b. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.
3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

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. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

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.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. Mineral Wool Board Insulation: Install in accordance with manufacturer’s written instructions. Fit courses of insulation between furring, clips and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Provide

3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
C. Glass-Fiber or Mineral-Wool 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 toward interior of construction.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation.

3.6 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. 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 indicated.

2. Apply insulation standoffs to each spindle to create cavity width indicated 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 below indicated thickness.

4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.7 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100
SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Fluid-applied vapor-retarding membrane air barrier.

B. Related Requirements:
   1. Section 061643 "Gypsum Sheathing" for wall sheathings.

1.2 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Material: A primary element that provides a continuous barrier to the movement of air.

C. Air Barrier Accessory: A transitional component of the air barrier assembly that provides continuity between materials and/or elements.

D. Air Barrier Element: A fabricated item that is connected to the air barrier with accessories to become part of the Air Barrier Assembly.

E. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS:

A. Preinstallation Conference: 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.

1.4 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control
joints, construction material changes, 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., when tested according to ASTM E 283, ASTM E 783, or ASTM E 2357

1.5 ACTION SUBMITTALS

A. Product Data: Include manufacturer’s written instructions for evaluating, preparing, and
treating substrate; technical data; and tested physical and performance properties of
air barrier.

B. LEED Submittals: Comply with material submittal requirements of Division 1 Section
01352 “LEED Requirements.”

1. Submit manufacturer’s product data for each of the following materials per
Division 1 Section “LEED Requirements.”

   a. Adhesive and sealant MSDS for each product applied on-site in the interior.
   b. Painting and coating MSDS for each product applied on-site in the interior.

C. Shop Drawings: Show locations and extent of air barrier. Include details for substrate
joints and cracks, counterflashing strip, penetrations, inside and outside corners,
terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier.
2. Include details of mockups.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and
supervisors employed by the Installer, who work on Project.

B. Product Certificates: For air barriers, certifying compatibility of air barrier and
accessory materials with Project materials that connect to or that come in contact with
the barrier; signed by product manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a
qualified testing agency, for air barriers.

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 licensed by ABAA according to ABAA’s Quality Assurance
      Program and shall employ ABAA-certified installers and supervisors on Project.
B. Mockups: Before beginning installation of air barrier, build mockup to set quality standards for materials and execution.
   1. Build integrated mockups of exterior wall assembly, 150 square feet in area, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
      a. Include junction with roofing membrane, building corner condition, building foundation wall interface and window opening interface.
      b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
   2. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
   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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site.
   1. Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
   2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer.
1. Protect substrates from environmental conditions that affect performance of air barrier.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 LEED REQUIREMENTS
A. Products to comply with the requirements of Section 01352 “LEED Requirements”.

2.2 FLUID-APPLIED VAPOR-RETARDING MEMBRANE AIR BARRIER
A. Fluid-Applied, Vapor-retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane
1. Products: Subject to compliance with requirements, provide one of the following
   a. Elastomeric, Modified Bituminous Membrane:
      1) Carlisle Coatings & Waterproofing Inc
      2) Henry Company;
      3) Tremco Incorporated, an RPM company;
   b. Synthetic Polymer Membrane:
      1) Grace, W. R., & Co. - Conn.;
      2) Henry Company;

2. Physical and Performance Properties
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178
   b. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M
   c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C

2.3 ACCESSORY MATERIALS
A. General: Accessory materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
B. Primer: Liquid primer recommended for substrate by manufacturer of air barrier material.
C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, crosslaminated polyethylene film with release liner backing.

D. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

E. Joint Reinforcing Strip: Air barrier manufacturer's standard glass-fiber-mesh tape for use with air barrier to reinforce openings, inside and outside corners and joints.

F. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

G. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

I. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

J. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 7 Section "Joint Sealants."

K. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test 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.
3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

E. Remove excess mortar from masonry ties, shelf angles and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.
B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
   1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply adhesive-coated transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
   1. Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, counterflash strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 AIR BARRIER MEMBRANE INSTALLATION

A. General: Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
   1. Apply primer to substrates at required rate and allow to dry.
2. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
3. Prime glass-fiber-surfac ed gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Membrane Air Barriers: Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
1. Vapor-Retarding Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil dry film thickness, applied in one or more equal coats.

C. Apply strip and transition strip a minimum of 1 inch onto cured air membrane or strip and transition strip over cured air membrane overlapping 3 inches onto each surface according to air barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies, air barrier and sealants have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: As determined by Owner's testing agency from among the following tests:

1. Qualitative Air-Leakage Testing: Air barrier assemblies will be tested 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, or ASTM E 1186, chamber depressurization using detection liquids.
2. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness
2. Remove and replace deficient air barrier components and retest as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.7 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 60 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION
SECTION 073116.19 – FLAT LOCK METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Individual metal panels.
   2. Underlayment.
   3. Sheet metal backing strips for shingle attachment
   4. Accessory metal flashing and trim.

B. Related Requirements:
   1. Section 011410 “Preconstruction Mockups” for integrated exterior mockup.
   2. Section 061600 "Sheathing" for sheathing
   3. Section 072100 “Thermal Insulation” for insulation supporting shingles

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 for each manufactured product and accessory.

B. Shop Drawings: For metal panels. Include wall elevations; sections; details of metal panels, flashing, trim, and accessories; and attachments to other work.
   1. Provide detailed layout drawings for each elevation indicating conformance to required modulation and orientation of panels as indicated on Contract Documents.
   2. Provide details at parapets, window and door openings and other terminations that show dimensions of start and stop panels that are coordinated panel modulation.
C. Samples for Initial Selection: For each type of metal panel and accessory indicated with factory-applied color finishes.

D. Samples for Verification: Full-size components of each type of metal panel and exposed finish indicated, including visible accessories.
   1. Finish samples shall be provided in sets of three panels or trim elements, with each set exhibiting the full range of color variation that will be acceptable on the project.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For metal panels, for tests performed by a qualified testing agency.

B. Sample Warranty: For manufacturer's special warranties.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Metal Panels: 100 sq. ft. (9.3 sq. m) of exposed area, representing full range of colors.
      a. 50% of Replacement panels shall be configured to allow installation by adhering to intact damaged panels.
      b. 50% of replacement panels shall be standard configuration to allow replacement of panels that have been removed.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects.
   1. Build mockups of metal panels, including related roofing materials.
      a. Quantity: 3 mockups of indicated size to represent full range of colors
      b. Size: 48 inches (1200 mm) long by 96 inches (2400 mm) wide each.
   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 DELIVERY, STORAGE, AND HANDLING

A. Do not store metal-panel materials in contact with other materials that might cause staining, denting, or other surface damage. Store metal-panel materials away from uncured concrete and masonry.

B. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing to be performed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace metal panels and accessories that fail in materials within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including wind uplift.

b. Water penetration and hail perforation.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Materials-Only Warranty Period: 25 years from date of Substantial Completion.

B. Special Project Warranty: Installer's Warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, in which Installer agrees to repair or replace components of panel system that fail in materials or workmanship within the following warranty period:

1. Warranty Period: Five years from date of Substantial Completion.

C. Special Warranty on Light Interference Color Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-produced finishes within specified warranty period.

1. Light Interference Color Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, flaking, checking or peeling of surface.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Metal panels shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Fire-Test Exposure Rating: Class A as acceptable to authorities having jurisdiction.

C. Wind-Uplift Resistance: Provide metal-panel assemblies that comply with the following wind-uplift requirements:
   1. Class: 90 when tested according to UL 580.
   2. Uplift Resistance: 165 lbf/sq. ft. (7.9 kPa) when tested according to UL 1897.

D. Impact Resistance: Class 4 when tested according to UL 2218.

2.2 METAL PANELS

A. Stainless steel: Factory-formed, custom-sized interlocking individual flat-lock panels.
   1. Basis-of-Design Product: Millennium Forms Flat Lock Panel. Provide basis-of-design product or equal product by one of the following:
      a. Zahner.

2. Source Limitations: Obtain aluminum panels from single source from single manufacturer.

3. Individual Panels: Diamond panel units.
   a. Material: Formed aluminum, 0.032 inch thickness or as needed to comply with performance requirements.
   b. Reinforcement: Manufacturer's standard insert material in units to increase rigidity.
   c. Exposure: 9 by 9 inches visible
   d. Finish: Bright annealed
   e. Color: Iridescent color range selected from manufacturers full Light Interference Color color spectrum.
      1) Color range will be selected from manufacturer’s violet-red-orange-gold range.
      2) The selected color range will narrow the manufacturer’s standard color range based on Architect’s selections to be made during the submittal process.
3) The Basis-of-Design color range is Millennium Forms flat lock panel, Burgundy color range, narrowed to 50% of full range by quantity to focus on red-yellow-gold tones and exclude purple-blue tones.

2.3 ACCESSORIES

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other accessory items as required for a complete wall shingle system and as recommended by manufacturer unless otherwise indicated.

B. Sheet Metal Flashing and Trim: Shingle manufacturer's flashing and trim components matching panel material, color, and finish unless otherwise indicated or recommended in writing by metal-panel manufacturer. Fabricate to sizes and configurations shown or required. Unless otherwise indicated, fabricate sheet metal flashing and trim to comply with recommendations that apply to design, dimensions, metal, and other characteristics of the item in SMACNA's "Architectural Sheet Metal Manual."

C. Metal Battens: Hat channels formed from zinc-coated (galvanized) steel sheet; ASTM A 653/A 653M, G90 (Z275) coating designation, not less than [0.025-inch (0.64-mm)] <Insert dimension> nominal thickness, and complying with requirements in Section 054000 "Cold-Formed Metal Framing."

D. Metal Sheet furring: Flat strips formed from zinc-coated (galvanized) steel sheet; ASTM A 653/A 653M, G90 (Z275) coating designation, not less than [0.025-inch (0.64-mm)] <Insert dimension> nominal thickness, and complying with requirements in Section 054000 "Cold-Formed Metal Framing."

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187D 1187M.

F. Sealant: ASTM C 920, one-part elastomeric polymer joint sealant as recommended by metal-panel manufacturer for installation indicated; of Type, Grade, Class, and Use classifications required to seal joints in metal panels and remain watertight. Where sealant is exposed, provide in color matching panel.

G. Sheet Metal Fasteners: Stainless steel screws, nails, and anchors designed to withstand design loads as recommended in writing by metal-panel manufacturer.

1. Exposed Fasteners: Avoid exposed fasteners wherever possible. Where it is not possible to avoid exposed fasteners, provide fastener heads matching color of metal panels using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC washers under heads of exposed fasteners bearing on weather side of panels.

2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.


2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical and painted 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 unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking, that tops of fasteners are flush with surface, and that installation is within flatness tolerances.

2. Verify that substrate is sound, dry to the maximum moisture content recommended by metal-panel manufacturer, smooth, clean, sloped for drainage, and completely anchored and that provision has been made for flashings and penetrations through metal panels.

3. Verify that vent stacks and other penetrations through metal panels have been installed and are securely fastened.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 METAL-PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions applicable to products and applications indicated; install level, plumb, and true to line.

B. Maintain uniform exposure and coursing of metal panels throughout roof.

C. Apply sealant between panels, flashing, trim, and exposed fasteners to achieve a weathertight system.

D. Install panels at 45 degree angle as indicated on drawings. Interlock and overlap panels and align joints of tile-form courses above and below.

1. Conform to modulation indicated on Contract Documents.
E. Metal Protection: Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by manufacturer of metal panels or of the metals in contact.

1. Do not use graphite pencils to mark metal surfaces.

3.3 ACCESSORY INSTALLATION

A. General: Install accessories according to manufacturers' written instructions unless more stringent requirements are indicated.

B. Metal Flashings and Trim: Install metal flashings and trim according to recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" unless more stringent requirements are indicated.

C. Battens: Install battens according to metal-panel manufacturer's written instructions and as needed to comply with performance requirements.

1. Metal Battens: Install 1-1/2-inch (38-mm) metal battens horizontally over installed underlayment with ends separated by 1/2 inch (13 mm), at spacing required by metal-panel manufacturer, and securely fasten to roof deck with sheet metal fasteners.

D. Metal Protection: Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by manufacturer of metal panels or of the metals in contact.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 ADJUSTING

A. Remove and replace damaged or deformed metal panels and metal panels that do not comply with specified requirements. Replace panels with damaged or deteriorated finishes and other components of the Work that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions.
C. On completion of installation, clean exposed surfaces of metal panels and touch up minor nicks and abrasions in finish, according to manufacturer's written instructions. Remove excess sealants.

3.6 INSTALLER'S WARRANTY

A. WHEREAS <Insert name> of <Insert address>, herein called the "Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner>.
2. Address: <Insert address>.
3. Building Name/Type: <Insert information>.
4. Address: <Insert address>.
5. Area of Work: <Insert information>.
6. Acceptance Date: <Insert date>.
7. Warranty Period: <Insert time>.
8. Expiration Date: <Insert date>.

B. AND WHEREAS 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 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 165 mph (m/s);
   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 the 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 <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.
2. Name: <Insert name>.
3. Title: <Insert title>.

END OF SECTION 073116
SECTION 074213.19 - INSULATED METAL WALL PANELS

1. GENERAL

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.

2. SUMMARY

A. Section Includes:
   1. Foamed-insulation-core metal wall panels, installed horizontally.
   2. Vertical supports (sub-framing) to support horizontal panels where required between structural wall framing.
   3. Accessories including miscellaneous framing, fasteners, flashings and perimeter trim.

3. PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal 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.
   9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.
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 type of panel and accessory.
   B. Shop Drawings:
      1. Include fabrication and installation layouts of metal panels, relative to building framing; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
      2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
   C. 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.
   D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.
      1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

5. INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.
   B. Product Test Reports: For each product, tests performed by a qualified testing agency.
   C. Sample Warranties: For special warranties.

6. CLOSEOUT SUBMITTALS
   A. Maintenance Data: For metal panels to include in maintenance manuals.

7. QUALITY ASSURANCE
   A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
8. **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. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. 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.
   
   D. Retain strippable protective covering on metal panels during installation.
   
9. **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 instructions and warranty requirements.
   
10. **COORDINATION**
   
   A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
   
11. **WARRANTY**
   
   A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
      
   1. Failures include, but are not limited to, the following:
      
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
      
   2. Warranty Period: Five years from date of Substantial Completion.

   B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
      
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

2. PRODUCTS

1. PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:

1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/360 of the span.

B. Air Infiltration: Air leakage of not more than 0.02 cfm/sq. ft. (0.1 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:


C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:


D. 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.

E. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

2. FOAMED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Panel Performance:
   a. Flatwise Tensile Strength: 30 psi (207 kPa) when tested according to ASTM C 297/C 297M.
   b. Humid Aging: Volume increase not greater than 6.0 percent and no delamination or metal corrosion when tested for seven days at 140 deg F (60 deg C) and 100 percent relative humidity according to ASTM D 2126.
   c. Heat Aging: Volume increase not greater than 3.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at 200 deg F (93 deg C) according to ASTM D 2126.
   d. Cold Aging: Volume decrease not more than 1.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at minus 20 deg F (29 deg C) according to ASTM D 2126.
   e. Fatigue: No evidence of delamination, core cracking, or permanent bowing when tested to a 20-lbf/sq. ft. (958-kPa) positive and negative wind load and with deflection of L/180 for 2 million cycles.
   f. Autoclave: No delamination when exposed to 2-psi (13.8-kPa) pressure at a temperature of 212 deg F (100 deg C) for 2-1/2 hours.

2. Insulation Core: Polyisocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
   a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
   b. Density: 2.0 to 2.6 lb/cu. ft. (32 to 42 kg/cu. m) when tested according to ASTM D 1622.
   c. Compressive Strength: Minimum 20 psi (140 kPa) when tested according to ASTM D 1621.
   d. Shear Strength: 17 psi (117 kPa) when tested according to ASTM C 273/C 273M.

B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1. Subject to compliance with requirements, provide products by one of the following:
   a. CENTRIA Architectural Systems;
   b. IPS - Insulated Panel Systems, an NCI company;
2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Nominal Thickness: 0.040 inch (1.02 mm)
1) Color: As selected by Architect from manufacturer's full range
c. Interior Finish: Siliconized polyester
1) Color: As selected by Architect from manufacturer's full range

3. Panel Coverage: 36 inches (1016 mm) nominal.
4. Panel Thickness: 3.0 inches (76 mm)
5. Thermal-Resistance Value (R-Value): 25 according to ASTM C 1363.
6. Fasteners and washers: To match panels

3. MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide sections as required and indicated on drawings for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, Mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim, formed from same material as metal panels, as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

4. FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
   a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

5. FINISHES
   A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
   B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in 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.
   C. Aluminum Panels and Accessories:
      1. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

3. EXECUTION
   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.

2. PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer’s written recommendations.

3. METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Panels are to be installed parallel to structural cold-formed framing to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

   1. Install cross-framing (sub-framing) perpendicular to structural cold-formed framing.
   2. Shim or otherwise plumb substrates receiving metal panels.
   3. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
   4. Install screw fasteners in predrilled holes.
   5. Locate and space fastenings in uniform vertical and horizontal alignment.
   6. Install flashing and trim as metal panel work proceeds.
   7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
   8. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

B. Fasteners:

   1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.
1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

4. INSULATED METAL WALL PANEL INSTALLATION

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.

2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.

4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.

5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.

6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.

B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.

1. Install clips to supports with self-tapping fasteners.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

D. 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. 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 achieve 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 (610 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).

5. FIELD QUALITY CONTROL
   A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   B. Water-Spray Test: After installation, test area of assembly as selected by Architect for water penetration according to AAMA 501.2.
   C. Metal wall panels will be considered defective if they do not pass test and inspections.
   D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
   E. Prepare test and inspection reports.

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 074213.19
SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

1. GENERAL

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.

2. SUMMARY

A. Section Includes: PVC roofing system assembly including but not limited to:

1. Adhered PVC membrane roofing system.
2. SBS modified bitumen vapor retarder
3. Roof insulation.
4. Summary

B. Section includes the installation of acoustical roof deck rib insulation strips furnished under Section 053100 "Steel Decking."

C. Related Sections:

1. Section 061000 "Rough Carpentry for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
4. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

3. DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

4. PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and 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. Membrane roofing and base flashings shall remain watertight.
B. 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.

C. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

D. Energy Performance: Solar Reflectance Index (SRI): Meeting the requirements of Chapter 18-11 of the Chicago Building Code: Not less than 78 for a minimum of 75 percent of the roof surface when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

5. ACTION SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Roof insulation.
3. Walkway pads or rolls.
4. Metal termination bars.
5. Battens.

6. INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.
C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Field quality-control reports.

E. Warranties: Sample of special warranties.

7. CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

8. QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including roof insulation, cover board asf fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

G. Manufacturer's Certification: For Roof membrane Thickness.

9. DELIVERY, STORAGE, AND HANDLING
   A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
   B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
      1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
   C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
   D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

10. PROJECT CONDITIONS
   A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
11. WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes entire assembly including membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, walkway pads and other components of membrane roofing system.
2. Warranty Period: 25 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

2. PRODUCTS

1. PVC MEMBRANE ROOFING

A. PVC Sheet: ASTM D 4434, Type II, Grade I, glass fiber reinforced, felt backed.

1. Products: Subject to compliance with requirements, provide the following:
   a. Sarnafil Inc.; Sarnafil G410 fiberglass-mesh reinforced, felt backed membrane
   b. Approved equal. Equal product will be judged by comparison of physical properties.

2. Backing weight: 9 oz / yd

3. Physical Properties (per ASTM D751, except as noted)
   a. Overall thickness: 80 mils (2.0 mm) minimum, 40 mil minimum thickness above reinforcing mesh.
   b. Breaking Strength, min: 110 lbf/in80
   c. Elongation at Breaking point, min: 250% (Machine Direction), 220% (Cross-Machine Direction)
   d. Seam Strength, min 75% of original: Pass
   e. Retention of Properties after Heat Aging (D3045)
      1) Tensile Strength, min 90% of original (ASTM D751): Pass
      2) Elongation, min 90% of original (ASTM D751): Pass
   f. Tearing resistance per D1004: 22 lbf min
   g. Low Temperature Bend, -40°F (ASTM D2136): Pass
h. **Accelerated Weathering Tests, Hours (Fluorescent Light UV exposure, ASTM G154)**
   1) Cracking (7x magnification): None
   2) Discoloration (Observation): Negligible
   3) Crazing (7x Magnification): None
i. Linear Dimensional Change, % (ASTM D1204): -0.01
j. Weight Change after immersion in water, % (ASTM D570): 1.7
k. Static Puncture Resistance 33 lbf min (ASTM D5602): Pass
l. Dynamic puncture resistance 7.3 ft/lbf min (ASTM D5635): Pass
4. Exposed Face Color: White

2. **AUXILIARY MEMBRANE ROOFING MATERIALS**

   A. **General:** Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

   B. **Sheet Flashing:** Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.

   C. **Bonding Adhesive:** Manufacturer's standard

   D. **Metal Termination Bars:** Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

   E. **Metal Battens:** Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch (25 mm wide by 1.3 mm) thick, prepunched.

   F. **Fasteners:** Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

   G. **Miscellaneous Accessories:** Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

3. **THERMAL BARRIER**

   A. **Substrate Board for Thermal Barrier between metal deck and foam insulation:** ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch (13 mm) thick.

   1. Georgia Pacific Dens Deck or equal.
B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

4. VAPOR RETARDER
A. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt impregnated.

5. ROOF INSULATION
A. General: Preformed roof insulation boards manufactured or approved by PVC membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

6. INSULATION ACCESSORIES
A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphalt, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

D. Bead-Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

E. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

F. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 5/8 inch (16 mm) thick, factory primed.
1. Georgia Pacific Dens Deck or equal.

7. ASPHALT MATERIALS
   A. Roofing Asphalt: ASTM D 312, Type III or Type IV
   B. Asphalt Primer: ASTM D 41.

8. WALKWAYS
   A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway rolls approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

3. EXECUTION

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 curbs are set and braced and that roof drain bodies are securely clamped in place.
      2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
      3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
      4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
      5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
      6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

2. PREPARATION
   A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

D. Install acoustical roof deck rib insulation strips, specified in Section 053100 "Steel Decking," according to acoustical roof deck manufacturer's written instructions, immediately before installation of overlying construction and to remain dry.

3. SUBSTRATE BOARD
   A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
      1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
      2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

4. VAPOR-RETARDER INSTALLATION
   A. Built-up Vapor Retarder: Install two glass-fiber felt plies lapping each felt 19 inches (483 mm) over preceding felt. Embed each felt in a solid mopping of hot roofing asphalt. Glaze-coat completed surface with hot roofing asphalt. Apply hot roofing asphalt within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
   B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

5. INSULATION INSTALLATION
   A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
   B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
   C. Install tapered insulation under area of roofing to conform to slopes indicated.
   D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with...
joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.
2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
3. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
4. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

I. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
4. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
5. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
J. Loosely Laid Insulation: Loosely lay insulation units over substrate.

K. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.

1. Fasten cover boards according to requirements in FM Approvals’ "RoofNav" for specified Windstorm Resistance Classification.

6. ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

1. Install sheet according to ASTM D 5036.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.
7. BASE FLASHING INSTALLATION
   A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
   B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
   C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
   D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
   E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

8. WALKWAY INSTALLATION
   A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

9. FIELD QUALITY CONTROL
   A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   B. Manufacturer's Field Inspection:
      1. Provide periodic Field Inspections of project progress by Manufacturer's technical field representative as follows:
         a. After completion of roof substrate and prior to commencement of roofing installation
         b. At commencement of roofing installation
         c. One visit every ten days during roofing installation
         d. One visit during testing.
         e. At closeout.
      2. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

D. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

10. PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

11. ROOFING INSTALLER'S WARRANTY

A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner>.
2. Address: <Insert address>.
3. Building Name/Type: <Insert information>.
4. Address: <Insert address>.
5. Area of Work: <Insert information>.
6. Acceptance Date: <Insert date>.
7. Warranty Period: <Insert time>.
8. Expiration Date: <Insert 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 (m/sec);
   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 <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.
2. Name: <Insert name>.
3. Title: <Insert title>.

END OF SECTION 075419
1.1 SUMMARY

A. Section Includes: Flashing and sheet metal indicated on drawings and specified.

B. Related requirements:
   1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Section 075419 Polyvinyl-Chloride (PVC) Roofing for requirements relative to roofing system.
   3. Section 073116 “Flat Lock Metal Wall Panels” for sheet metal flashing material to match shingle material.
   4. Section 077100 “Roof Specialties” for Roof edge flashings, reglets and counterflashings.
   5. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.2 SUBMITTALS

A. Product Data
   1. Submit sheet metal manufacturer's product specifications, installation instructions and general recommendations for standard factory fabricated items.
   2. Submit data and color chart for prefinished sheet metal.

B. Samples:
   1. Submit 6" square samples of specified sheet metals in specified gauges finished as specified.
   2. Submit 12" wide (long) mock-up of the following:
      a. Flexible expansion joint covers.

C. Shop Drawings:
   1. Submit Shop Drawings showing fabrication, jointing and securing of sheet metal. Show expansion joint details and connections to adjoining Work and at obstructions and penetrations.

1.3 QUALITY ASSURANCE

A. Fabricator/Installer: A company experienced in the type of Work required and acceptable to the Roofing Installer.
B. Reference Standards: Except as otherwise specifically shown or specified, comply with applicable recommendations and details of the "Architectural Sheet Metal Manual" by SMACNA

1.4 PROJECT CONDITIONS

A. Coordinate Work with adjacent Work, including installation of roofing to avoid leaving roofing terminations unprotected.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Exposed Flashings and trim: LIC Stainless Steel Sheet: Alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
   1. Surface: Smooth, flat finish.
      a. Color range to match range of exterior wall shingles

B. Concealed Flashings and trim: Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Stainless-Steel Sheet: ASTM A 167, Type 304, soft annealed, with No. 2D finish, except where harder temper is required for forming or performance; minimum 0.0187 inch (0.5 mm) thick, unless otherwise indicated.

D. Scupper boxes: Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.
   1. Nonpatinated Exposed Finish: Mill.
2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F (111 deg C); and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Atlas Roofing Corporation; Summit.
   b. Engineered Coated Products; Nova-Seal II.
   c. SDP Advanced Polymer Products Inc; Palisade.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
   b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT
   c. Henry Company; Blueskin PE200 HT.

2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.

D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Solder for Stainless Steel: ASTM B 32, Grade Sn60, used with an acid flux of type recommended by stainless-steel sheet manufacturer, use a noncorrosive rosin flux over tinned surfaces.

B. Stainless-Steel Welding Rods: Type recommended by stainless-steel sheet manufacturer for type of metal sheets furnished.

C. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
1. Fasteners for Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.

D. Solder:
   1. For Copper: ASTM B 32, with maximum lead content of 0.2 percent.
   2. For Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.

E. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur compounded for 15-mil (0.4-mm) dry film thickness per coat.

F. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

H. Elastomeric Sealant: Polyurethane based, one-part elastomeric sealant complying with ASTM C920, Type S, Grade NS, Class 25.

I. Epoxy Seam Sealer for Aluminum: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

J. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

K. Metal Accessories: Furnish sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

L. Roofing Cement: Of type compatible with specified roofing system.

M. Flexible Expansion Joint Covers: Furnish units consisting of exposed 60 mil neoprene sheet bellows; security anchored at both edges to sheet metal nailing flanges 3″-4″ wide by special bifurcations formed in the metal, either plain or angle-formed to fit curbs as required; insulated from below with adhesively-applied closed cell; flexible, rubber/plastic insulation not less than 3/8″ thick, coordinated with width of elastic sheet.
   1. Furnish sheet metal flanges matching counterflashing.
   2. Furnish shop fabricated corners and intersections.

2.4 FABRICATION

A. Fabricate sheet metal work to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Work free of oil canning, buckling, and tool marks and that is true to line and levels with exposed edges folded back to form hems.
C. Fabricate nonmoving seams in sheet metal other than aluminum with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   1. Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

D. Space joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection.

E. Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

F. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

G. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
   1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

H. Fabricate extruded-aluminum running units with formed or extruded-aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers of same material as downspouts and anchors.
   1. Provide shop fabricated downspouts in profiles indicated. Shop fabricate elbows and joints with fully welded watertight seams to provide one-piece downspout.
   2. Fabricate downspout from the following materials:
      a. Stainless Steel: 0.032 inch (0.80 mm) thick.
   3. Provide hangers in accordance with NRCA and SMACNA recommendations.

B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft. (0.55 mm thick).

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes and exterior flange trim. Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft. (0.55 mm thick).
D. Splash Pans: Fabricate to dimensions and shape required and from the following materials:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Except for perimeter copings, shall be fabricated from exterior wall shingles as indicated. Fabricate copings in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external and interior legs. Miter corners, [fasten and seal] [solder or weld] watertight. Shop fabricate interior and exterior corners.
   1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
   2. Fabricate from the Following Materials:
      a. Aluminum: 0.050 inch (1.27 mm) thick.

B. Flashings: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.040 inch (1.02 mm) thick.
   2. Light Interference Colored (LIC) Stainless Steel: 0.019 inch (0.48 mm) thick.

C. Counterflashings: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.040 inch (1.02 mm) thick.
   2. Light Interference Colored (LIC) Stainless Steel: 0.019 inch (0.48 mm) thick.

2.7 STAINLESS STEEL FINISHES

A. General: Light Interference Colored (LIC) stainless steel sheet, to match exterior wall shingle color range.

2.8 ALUMINUM FINISHES

A. General: Comply with Aluminum Association’s (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers’ written instructions.
   1. Mica Color: Match Architect’s sample. Color selection to be determined after brick selection and color is finalized.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Unless otherwise indicated, install sheet metal work to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place. Conceal fasteners were possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal: Work free of oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal work to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretrin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pretinned surface would show in finished Work.
   1. Do not solder aluminum and coil-coated galvanized steel sheet.
   2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   1. Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

E. Separate dissimilar metals from each other by painting each metal surface in area of contact with a heavy application of bituminous coating, or by other permanent separation as recommended by manufacturers of dissimilar metals.

F. Install Sheet metal Work with provisions for thermal expansion of running items of more than 15'-0" continuous length. Maintain a water-tight installation at expansion seams. Locate expansion seams as shown or, if not shown, at the following maximum spacings for each general flashing use:
   1. Gutters: Midway between drains (at high points in slopes), but in no case more than 30'-0" apart.
   2. Copings, Gravel Stop/Fascias, Counter Flashing and Trim: At 10'-0" intervals.
G. Expansion Joints:
   1. Concealed Splice-Type Expansion Joints: Furnish 4” wide splice plates of same metal and configuration of item to be joined. Set plates under units to be joined. Set units in full bed of non-skinning butyl mastic sealant allowing 1/4” gap between abutting ends of units for 40o to 70oF. temperature range.
      a. Use for gravel stops/fascia.

H. Fabricate and install Sheet Metal Work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, waves and avoidable tool marks, considering temper and reflectivity of metal. Furnish uniform, neat seams with minimum exposure of solder, welds and sealant. Except as otherwise shown, fold back sheet metal to form hem on concealed side of exposed edges.

I. Conceal fasteners and expansion provisions where possible in exposed Work, and locate so as to minimize possibility of leakage. Cover and seal Work as required for a watertight installation.
   1. Furnish continuous cleat-type anchorages for gravel stop/fascias, copings, and trim.

J. Installation of Stainless Steel Items:
   1. Separate stainless steel from dissimilar metals, including regular steel and iron, and from cementitious materials.
   2. Tin the edges of stainless steel to be soldered, for a width of 1-1/2”, using solder for stainless steel and acid flux. Remove every trace of acid flux residue from metal promptly after tinning or soldering. Comply with manufacturer's recommended methods for cleaning and neutralization.
   3. Furnish flat-lock seams, soldered, unless otherwise indicated, except at expansion joints. Remove residue of flux promptly and thoroughly.
   4. Clean exposed surfaces of non-coated stainless steel of every substance, which is visible or might cause corrosion of metal surfaces. Exercise extreme care to remove fluxes and ferrous metal particles, including welding spatter and grinding dust.

K. Installation of Nonferrous Items:
   1. In addition to bituminous coatings at locations where metal contacts dissimilar metals, apply a heavy tinning of solder at locations where flashing makes a spot-contact with dissimilar metals.
   2. Furnish flat-lock soldered seams, unless otherwise indicated, with minimum of 1/2" wide hooked flanges, except at expansion joints.
   3. Clean exposed metal surfaces of substances which would interfere with uniform oxidation and weathering.

L. Installation of Aluminum Items:
   1. Where aluminum flashing is shown with contact to non-ferrous or ferrous metal, wood or cementitious materials, apply 15-mil bituminous coating or heavy trowel coating of roofing cement on substrate or as back-coating on flashing.
   2. Furnish form flat-lock seams with epoxy seam sealer or other permanent sealer recommended by aluminum manufacturer except at expansion joints.
   3. Clean exposed aluminum surfaces of every substance, which is visible or might cause corrosion of metal or deterioration of finish.
M. Flexible Expansion Joint Covers:
   1. Use factory prefabricated corners, intersections and transitions.
   2. Install in exact accordance with manufacturer's instructions. Use cover plates and mastics manufactured for the purpose.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Furnish final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 076200
SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Roof-edge flashings.
   2. Reglets and counterflashings.

B. Related Sections:
   1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
   3. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
   4. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.
   5. Section 079500 "Expansion Control" for manufactured sheet metal expansion-joint covers.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. FM Approvals' Listing: Manufacture and install roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90 Identify materials with FM Approvals' markings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. 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.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
   1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   3. Details of termination points and assemblies, including fixed points.
   4. Details of special conditions.

C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

D. Samples for Verification: For roof-edge flashings and reglets and counterflashings made from 12-inch (300-mm) lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

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 roof edge as shown on the Drawings including gravel stop, fascia, trim, supporting construction cleats, seams, attachments, underlayment, and accessories.
      a. Exterior enclosure mockup includes elements and systems specified in other specification sections. Contractor shall coordinate mockup such that the entire mockup is completed and approved prior to final approval of roof specialties.
b. Locate mock-up on site in a protected area where it can be kept in place until after the building is completed. Obtain architects approval before disposing of mock-up.

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.

B. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.9 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. LIC Stainless Steel Sheet: Alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
   1. Surface: Smooth, flat finish.
      a. Color range to match range of exterior wall shingles

2.2 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to base layer of material compatible with specified roofing system, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).

B. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
   1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
   2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

D. Roofing Cement: Asbestos free, compatible with specified roofing system, and of consistency required for application.

2.5 ROOF-EDGE FLASHINGS

A. One-Piece Gravel Stops: Manufactured, one-piece, metal gravel stop in section lengths not exceeding 12 feet (3.6 m), with a horizontal flange and vertical leg, fascia terminating in a drip edge, and concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.

1. Fabricate from the following exposed metal:
   a. Formed Aluminum: 0.040 inch (1.02 mm) thick

2. Corners: Factory mitered and continuously welded.
   a. Extend legs a minimum of 24 inches each side

B. Soffit trim. Manufactured, one-piece, metal trim units section lengths not exceeding 12 feet (3.6 m), with profile as indicated on the drawings. Concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.

1. Fabricate from the following exposed metal:
   a. Formed Aluminum: 0.040 inch (1.02 mm) thick

2. Corners: Factory mitered and continuously welded.
   a. Extend legs a minimum of 24 inches each side

C. Aluminum Finish: Two-coat Mica fluoropolymer

1. Color: Match Architect's sample

2.6 REGLETS AND COUNTERFLASHINGS

A. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashings pieces, from the following exposed metal:

1. Formed Aluminum: 0.050 inch (1.27 mm) thick.
2. Stainless Steel: 0.025 inch (0.64 mm) thick.
4. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
5. Concrete Type, Embedded: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
6. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

B. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches (100 mm) and in lengths not exceeding 12 feet (3.6 m) designed to snap into reglets through-wall-flashing receiver or to be fastened to wall and compress against base flashings with joints lapped, from the following exposed metal:

1. Formed Aluminum: 0.032 inch (0.81 mm) thick.

C. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

D. Aluminum Finish: Two-coat Mica fluoropolymer.

1. Color: Match Architect's sample

E. Stainless-Steel Finish: No. 2B (bright, cold rolled, unpolished)

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

B. Polyethylene Sheet: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches (50 mm).

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Separate uncoated aluminum and stainless-steel roof specialties from contact with wood, ferrous metal, or cementitious construction with a course of sheet underlayment.


1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 24 inches (450 mm) of corners or intersections unless otherwise shown on Drawings.
   a. Coordinate to stagger with perforated corrugated wall panel joints.
2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
D. Fastener Sizes: Use screws of sizes that will penetrate wood blocking or sheathing not less than 3/4 inch (19 mm).

E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer and for compatibility of specified roof system.

F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.4 ROOF-EDGE FLASHING INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches (100 mm) over top edge of base flashings.

C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches (100 mm) over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with elastomeric sealant. Fit counterflashings tightly to base flashings.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.
SECTION 077200 - ROOF ACCESSORIES

1. GENERAL

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.

2. SUMMARY

A. Section Includes:

1. Roof curbs and equipment supports
2. Roof hatches.
3. Pipe supports.
4. Preformed flashing sleeves.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
3. Section 077100 "Roof Specialties" for manufactured fasciae, copings, gravel stops, gutters and downspouts, and counterflashing.
4. Division 22 and 23 sections for plumbing and mechanical piping located at the roof and requiring flashing sleeves or supports
5. Division 23 sections for roof curbs specified with mechanical units

3. PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

4. ACTION SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
A. Shop Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

5. INFORMATIONAL SUBMITTALS
A. Warranty: Sample of special warranty.

6. CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

7. COORDINATION
A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

8. WARRANTY
A. Special Warranty on Painted Finishes: Manufacturer’s standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.
2. PRODUCTS

1. METAL MATERIALS

A. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.
   1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
   2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
   1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer Finish: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
   2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

D. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

F. Steel Tube: ASTM A 500, round tube.

G. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

2. MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.

C. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.

D. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.

E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Underlayment:
   1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
   2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
   3. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

H. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
   1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
   4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

I. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

J. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant compatible with specified roofing system and as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

K. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
   1. Confirm compatibility with specified roofing system prior to use.
L. Roofing Cement: asbestos free, compatible with specified roofing system.

3. ROOF CURBS AND EQUIPMENT SUPPORTS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.
   1. Provide integral spring-type vibration isolators where indicated for mechanical equipment.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Loads: Refer to drawings for load requirements

D. Material: Aluminum sheet, 0.090 inch (2.28 mm) thick.
   1. Finish: Two-coat fluoropolymer.
   2. Color: As selected by Architect from manufacturer's full range.

E. Construction:
   1. Insulation: Factory insulated with 1-1/2-inch- (38-mm-)thick cellulosic or glass-fiber board insulation.
   2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
   3. Factory-installed wood nailer at top of curb, continuous around curb perimeter.
   4. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
   5. Fabricate curbs to minimum height of 21 inches unless otherwise indicated.
   6. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.

4. ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashings and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Bilco Type S or equal product by one of the following:
      a. Babcock-Davis.
      b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.

B. Type and Size: Single-leaf lid, fro ship's ladder, 30 by 54 inches.

C. Loads: As indicated on drawings.

D. Hatch Material: Aluminum sheet, 0.090 inch (2.28 mm) thick.
1. Finish: Two-coat fluoropolymer
2. Color: As selected by Architect from manufacturer's full range of selections.

E. Construction:

1. Insulation: Polyisocyanurate board.
2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
4. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
5. Fabricate curbs to minimum height of 21 inches unless otherwise indicated.

F. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

G. 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. Height: 42 inches (1060 mm) above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches (31 mm) in diameter or galvanized-steel tube, 1-5/8 inches (41 mm) in diameter.
3. Flat Bar: Galvanized steel, 2 inches (50 mm) high by 3/8 inch (9 mm) thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches (533 mm) in diameter.
5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Manufacturer's standard finish
   a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches (1060 mm) above finished roof deck.
3. Material: Steel tube
4. Post: 1-5/8-inch- (41-mm-) diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.
5. PIPE SUPPORTS

A. Pipe Supports: Adjustable-height, extruded-aluminum tube, filled with urethane insulation; 2 inches (50 mm) in diameter; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated, and extruded-aluminum carrier assemblies; suitable for quantity of pipe runs and sizes.

1. Pipe Support Height: As indicated on Drawings.
2. Roller Assembly: With stainless-steel roller, sized for supported pipes.
3. Pipe Support Flashing: Manufacturer's standard insulated sleeve flashing with integral base flange; aluminum sheet, 0.063 inch (1.60 mm) thick
4. Finish: Manufacturer's standard white.

B. Light-Duty Pipe Supports: Extruded-aluminum base assembly and Type 304 stainless-steel roller assembly for pipe sizes indicated, including manufacturer's recommended load-distributing baseplate.

1. Finish: Manufacturer's standard white.

C. Duct Supports: Extruded-aluminum, urethane-insulated supports, 2 inches (50 mm) Insert dimension in diameter; with manufacturer's recommended hardware for mounting to structure or structural roof deck.

1. Finish: Manufacturer's standard white.

6. PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 16 inches (400 mm) high, with removable metal hood and slotted metal collar.

1. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick
2. Diameter: As indicated
3. Finish: Manufacturer's standard white.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick
2. Height: 16 inches (400 mm)
3. Diameter: As indicated
4. Finish: Manufacturer's standard white.
7. GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

3. EXECUTION

1. EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

2. INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.

3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.

4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Roof-Hatch Installation:
   1. Install roof hatch so top surface of hatch curb is level.
   2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
   3. Attach safety railing system to roof-hatch curb.
   4. Attach ladder-assist post according to manufacturer's written instructions.

F. Pipe Support Installation: Install pipe supports so top surfaces are in contact with and provide equally distributed support along length of supported item.

G. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.

H. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.
   1. Confirm compatibility of butyl sealant with specified roofing system prior to use.

3. REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07720
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 sprayed fire-resistant materials (SFRM).

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.
   1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: Framing plans, 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 (102 mm) square in size.

1.5 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer
B. Product Certificates: For each type of fireproofing.
C. Preconstruction Test Reports: For fireproofing.
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.
   1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility for designation of restrained and unrestrained conditions.

B. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing sprayed fire-resistant materials with appropriate markings of applicable testing and inspecting agency.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for sprayed fire-resistant material serving as direct-applied protection tested per ASTM E 119.
   2. Surface-Burning Characteristics: ASTM E 84

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, aboveground, and kept dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 40 deg F (4 deg C) 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.
1.9 COORDINATION

A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:
   1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
   2. Provide temporary enclosures for applications to prevent deterioration of fire-resistant material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
   3. Avoid unnecessary exposure of fire-resistant material to abrasion and other damage likely to occur during construction operations subsequent to its application.
   4. Do not apply fire-resistant material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistant material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistant material.
   5. Do not apply fire-resistant material to metal floor deck substrates until concrete topping has been completed.
   6. Do not begin applying fire-resistant material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
   7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistant material until application of fire protection is completed.
   8. Do not install enclosing or concealing construction until after fire-resistant material has been applied, inspected, and tested and corrections have been made to defective applications.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

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 from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 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. Asbestos: Provide products containing no asbestos.
2.2 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For applications of sprayed fire-resistive materials located above ceilings and within wall and partition construction, provide manufacturer’s standard products complying with requirements indicated for material composition and physical properties representative of installed products.

B. Available Products:
   1. Cementitious Wet Sprayed Fire-Resistive Material:
      c. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6s.
      d. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6/HY.
      e. Isolatek International Corp., Cafco Products; Cafco 300.
      f. Southwest Vermiculite Co., Inc.; 5EF.
      g. Southwest Vermiculite Co., Inc.; 5GP.

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:
   1. Dry Density: 15 lb/cu. ft. (240 kg/cu. m) for average and individual densities regardless of density indicated in referenced fire-resistance design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
   2. Thickness: Provide minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch (9 mm), per ASTM E 605:
      a. Where the referenced fire-resistance design lists a thickness of 1 inch (25 mm) or greater, the minimum allowable individual thickness of sprayed fire-resistive material is the design thickness minus 0.25 inch (6 mm).
      b. Where the referenced fire-resistance design lists a thickness of less than 1 inch (25 mm) but more than 0.375 inch (9 mm), the minimum allowable individual thickness of sprayed fire-resistive material is the greater of 0.375 inch (9 mm) or 75 percent of the design thickness.
      c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft. (240 kg/cu. m).
   3. Bond Strength: 150 lbf/sq. ft. (7/2 kPa) minimum per ASTM E 736 under the following conditions:
      a. Field test sprayed fire-resistive material that is applied to flanges of wide-flange, structural steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
      b. If surfaces of structural steel receiving sprayed fire-resistive material are primed or otherwise painted for coating materials, perform series of bond tests specified in UL’s "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736.
      c. Minimum thickness of sprayed fire-resistive material tested in laboratory shall be 0.75 inch (19 mm).
4. Compressive Strength: 5.21 lbf/sq. in. (35.9 kPa) as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch (19 mm) and minimum dry density shall be as specified, but not less than 15-lb/cu. ft. (240 kg/cu. m).
6. Deflection: No cracking, spalling, or delamination per ASTM E 759.
7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft/ (0.270 g/sq. m) in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch (19 mm), maximum dry density is 15 lb/cu. ft. (240 kg/cu. m), test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 0.
10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

2.3 EXPOSED SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For exposed applications of sprayed fire-resistive materials in mechanical/electrical equipment rooms, store rooms and other unfinished areas provide manufacturer's standard products complying with requirements indicated for material composition and for minimum physical properties of each product listed, measured by standard test methods referenced with each property.

B. Available Products:
1. Exposed Cementitious Wet Sprayed Fire-Resistive Material:
   c. Isolatek International Corp., Cafco Products; Cafco 400.
   d. Southwest Vermiculite Co., Inc.; 5MD.

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:
   1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method," but with an average density of not less than 22 lb/cu. ft. (352 kg/cu. m).
   2. Bond Strength: 434-lbf/sq. ft. (21 kPa) minimum per ASTM E 736.
   3. Compressive Strength: 51-lbf/sq. in. (351 kPa) per ASTM E 761.
   5. Deflection: No cracking, spalling, or delamination per ASTM E 759.
   6. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) per ASTM E 859.
9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 0.
10. Fungal Resistance: No observed growth on specimens per ASTM G 21.
11. For exterior applications of sprayed fire-resistive material, provide formulation approved for surfaces exposed to exterior.

2.4 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 one or both of the following requirements:

   1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

E. 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.

F. 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.
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. Verify compliance with the following:

1. 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. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Verify that concrete work on steel deck has been completed before beginning fireproofing work.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work is complete before beginning fireproofing work.

D. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. 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-resistant 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, sealers, 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. Metal Decks:
   1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
   2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

G. Extend fireproofing in full thickness over entire area of each substrate to be protected.

H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.

J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
L. Cure fireproofing according to fireproofing manufacturer's written recommendations.

M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

N. Finishes: Where indicated, apply fireproofing to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
4. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.
5. Skip-Troweled Finish with Corner Beads: Even, leveled surface produced by troweling spray-applied finish to smooth out the texture, eliminate surface markings, and square off edges.

3.4 FIELD QUALITY CONTROL

A. Testing and inspections: Owner will engage a qualified testing agency to perform construction testing on fireproofing installation

   a. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
   b. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
   c. Thickness: Test for thicknesses required to achieve the specified fire-ratings at each test location.
   d. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing and substrate finish.
   e. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

2. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.
1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

3.5 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 will be 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 078100
SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Through-penetration firestop systems for penetrations through fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items and tops of partitions.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

B. F&T-Rated Systems: Provide through-penetration firestop systems with F-ratings and T-rating, as determined per ASTM E 814, not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
   2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 200, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: Submit complete printed data for each type of through-penetration firestop system.

B. Shop Drawings: Submit drawings in the form at the end of the section for each through-penetration firestop system; show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to
authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed firestop systems similar in material, design, and extent to that indicated for this Project and familiar with the requirements and restrictions/limitations of the Firestop Contactors International Associations (FCIA) manual of practice and factory mutual research approved.

B. Source Limitations: Obtain through-penetration firestop systems for the project from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
   a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
   b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
      1) UL in "Fire Resistance Directory."

D. Preinstallation Conference: Conduct preconstruction conference at the project site.

   1. Review submittals and identify each type of penetration firestopping required.
   2. Establish locations for mock-ups specified hereinafter.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturers written instructions by natural means or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

1.8 Mock-Ups

A. With the assistance of the Owner’s Inspection Agency, establish the location of a mock-up for each penetration system identified to occur on the Project (type of construction penetrated and penetrating element).

B. Perform a mock-up of each condition in accordance with the selected U.L. system in the presence of the Owner’s Inspection Agency for the purpose of establishing installation procedures.
   1. In the event that more than one trade or Sub-Contractor is to install through-penetration, firestop system, each trade or Sub-Contractor shall execute the appropriate systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide through-penetration firestop systems by the following:
   2. DAP Inc.
   3. Firestop Systems Inc.
   4. Hilti Construction Chemicals, Inc.
   5. Instant Firestop Mfg. Inc.
   6. International Protective Coatings Corp.
   9. NUCO Industries.
   10. RectorSeal Corporation (The).
11. Specified Technologies Inc.
12. 3M Fire Protection Products.
13. Tremco.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that is needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by
cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect and test firestop systems in accordance with ASTM E-2174 and to prepare test reports.
   1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

D. Where destructive testing is done as part of the inspection/testing program, the installer shall remove and replace the system.

3.5 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Preliminary Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION 078413 (FIRESTOPPING SYSTEMS WORKSHEET FOLLOWS)
## FIRE STOPPING SYSTEMS WORKSHEET

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:  Sealants for the following applications:

1. Exterior joints in the following vertical surfaces and non-traffic horizontal surfaces:
   a. Control and expansion joints in cast-in-place concrete.
   b. Joints in dimension stone cladding.
   c. Joints between different materials listed above.
   d. Perimeter joints between materials listed above and frames of doors and windows.
   e. Control and expansion joints in ceiling and overhead surfaces.
   f. Joints in roof accessory and roof specialty systems.
   g. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:
   a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
   b. Joints between different materials listed above.
   c. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
   e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   f. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:
   a. Control and expansion joints in cast-in-place concrete slabs.
   b. Other joints as indicated.

5. Acoustic sealants
   a. Resilient sealing of building system penetrations.
   b. Resilient sealing of acoustic isolation joints.
   c. Between dissimilar building materials and substrates, (such as wall to concrete floor).
   d. Equipment room perimeters.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
1.3 SUBMITTALS

A. Product Data: Submit complete printed data for each joint-sealant product indicated.

B. Samples: Submit manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Submit manufacturer's recommended application procedures.

D. Preconstruction Field Test Reports: Submit preconstruction field test reports. Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

E. Field Adhesion Test Reports: Submit field adhesion test report log.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:
   1. Locate test joints where indicated or, if not indicated, as directed by Architect.
   2. Conduct field tests for each type of elastomeric sealant and joint substrate indicated.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected.
   4. Test Method: Test joint sealants by hand-pull method described below:
      a. Install joint sealants in 60-inch- (1500-mm-) long joints using same materials and methods for joint preparation and joint-sealant installation required for the completed Work. Allow sealants to cure fully before testing.
      b. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches (50 mm) long at sides of joint and meeting cross cut at one end. Place a mark 1 inch (25 mm) from cross-cut end of 2-inch (50-mm) piece.
      c. Use fingers to grasp 2-inch (50-mm) piece of sealant between cross-cut end and 1-inch (25-mm) mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
d. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.

5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
   2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Submit written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and
application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed, non-paintable Joint Sealants:
   a. At Exterior Enclosure: (2) Custom colors to match exterior wall components
   b. At interiors: Colors as selected by Architect from manufacturer's full range for each location.

C. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

D. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

E. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

F. Continuous-Immersion-Test-Response Characteristics: Where elastomeric sealants will be immersed continuously in water, provide products that have undergone testing according to ASTM C 1247, including initial six-week immersion period and additional immersion periods specified below, and have not failed in adhesion or cohesion when tested with substrates indicated for Project.
   1. Two additional four-week immersion periods.
   2. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 .

2.2 ELASTOMERIC SEALANT MATERIALS

A. One-Part Silicone Sealant (1-SCS): Low-Modulus Nonacid-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
   1. Products: Provide one of the following:
      a. 790; Dow Corning.
      b. Silpruf; GE Silicones.
      c. Omniseal; Sonneborn Building Products Div., Degussa.
   2. Type and Grade: S (single component) and NS (non-sag).
   4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (non-traffic).

B. One-Part Mildew-Resistant Silicone (1-MRS): Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and in-service exposure to conditions of high humidity and temperature extremes.

1. Products: Subject to compliance with requirements provide one of the following:
   a. Dow Corning 786; Dow Corning Corp.
   b. SCS 1700; General Electric Co.
   c. 863 #345 White; Pecora Corp.
   d. Tremsil 200 White; Tremco, Inc.

C. Multi-Part Nonsag Urethane for Use NT (2-PUS1): Type M, Grade NS, Class 25, and complying with the following requirements for Uses:

1. Uses NT, M, A, and, as applicable to joint substrates indicated, O.
2. Products: Subject to compliance with requirements provide one of the following:
   a. Vulkem 227; Tremco.
   b. Dualthane; W.R. Meadows.
   c. Dynatrol II; Pecora.
   d. Sonolastic NP2; Sonneborn Building Products Div. Degussa.
   e. Dymeric; Tremco.

D. Multi-Part Nonsag Urethane for Use T (2-PUS2): Type M; Grade NS; Class 25; uses T, M, G, A, and, as applicable to joint substrates indicated, O.

1. Products: Subject to compliance with requirements, provide the following:
   a. Vulkem 227; Tremco.
   b. Dynatred; Pecora.
   c. Sonolastic NP2; Sonneborn Building Products Div. Degussa.
   d. THC-901; Tremco.

2.3 LATEX JOINT SEALANTS

A. Acrylic-Latex Sealant (ALS): Manufacturer's standard, one part, nonsag, acrylic, mildew-resistant, acrylic-emulsion sealant complying with ASTM C834, formulated to be paintable and recommended for exposed applications on interior exposures involving joint movement of not more than +5%.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. AC-20; Pecora.
   b. Sonolac; Sonneborn Building Products Div.; Degussa.
   c. Tremco Acrylic Latex 834; Tremco.
2. Contractor's Option: Silicone Emulsion Sealant: Manufacturer's standard one part, non-sag, mildew-resistant, silicone-emulsion sealant complying with ASTM C834 and ASTM C920, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than +12-1/2%.
   a. Product: Subject to compliance with requirements, provide Performance Plus Silicone Sealant by Dow Corning Corp.

3. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2.4 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant (PRS): Manufacturer's standard preformed, pre-compressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a non-drying, water-repellent agent. Factory produce in pre-compressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
   1. Product: Subject to compliance with requirements, provide model VF-100 as manufactured by Construction Specialties, Inc. or product by one of the following.
      a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
      b. Willseal USA, LLC; Willseal 150.

2.5 ACOUSTIC JOINT SEALANT

A. Construction Sealants (AJS) - Non-Fire-rated
   1. Tremco Acoustical Sealant by Tremco, Cleveland, OH (Concealed locations only) (Non-paintable; for unexposed joints only)
   2. Sil Pruf, SCS 2000 by General Electric Company, Waterford, NY (Non-paintable; for unexposed joints only)
   3. Pensil 300 by Specified Technologies, Inc. Somerville, New Jersey
   4. Fire-rated Sealants Refer to specification Section 078446 Fire-resistive Joint systems.

B. Acoustic requirements: Sealant shall be permanently resilient and capable of high elongation, +/- 50%. Fire rated acoustic sealants shall also be permanently resilient and capable of a +/- 25% elongation.

2.6 JOINT SEALANT BACKING

A. Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   1. Type C: Closed-cell material with a surface skin, unless open cell is indicated or recommended by sealant manufacturer.
   2. Type O: Open-cell material.
   3. Type B: Bicellular material with a surface skin.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 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 with joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. For Acoustical Sealants: Before commencing installation, examine the substrate and surrounding conditions to insure there are no rigid connections between building elements and structure and no superfluous building materials have fallen into the void and are bridging the separation to be acoustically sealed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
   a. Concrete.
   b. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustically Sealed Penetrations
   1. Clean and prepare substrate, remove any superfluous material that has bridged the void where sealant is to be applied. Provide backing material if required, for proper application of sealant. The sealant shall be applied according to the manufacturer's guidelines so as to achieve a uniform, minimum 1/4" thick round bead and to achieve an airtight seal.
   2. No rigid material or connection shall bridge the separation when the sealant is installed. Material separations providing acoustic isolation as shown on the drawings and as specified herein, shall be inspected by the construction
supervisor, Architect, or Acoustic Consultant prior to installation. Removal of sealant may be requested by the Acoustic Consultant for sample inspection. If a sample inspection by the Acoustic Consultant reveals bridging, the Acoustic Consultant reserves the right to have any and all sealant removed for inspection.

3. Instructions According to Substrate

   a. For new concrete or new CMU [blockwork] construction, provide noise and vibration isolation of mechanical system penetrations as follows.

      1) Provide core holes for each individual pipe or duct penetration. Core hole shall be a minimum 1”, 1 ½” IS preferred, larger than scheduled pipe or duct passing through the wall and to allow penetration to be packed solidly with mineral wool or glass fibre for the full depth of the wall.
      2) Ensure penetrating duct or pipe is centered in the opening to allow for isolating material to completely surround the pipe or duct.
      3) Pack annular space to full depth of penetration with clean glass fibre or rockwool material flush to edges of wall.
      4) Seal full perimeter of annular opening with acoustic sealant to minimum ½” depth to achieve airtight seal.
      5) Each penetration must be individually sealed; multiple pipes routed through a single opening are not acceptable unless specifically detailed.

   b. For new gypsum drywall [plasterboard and dry linings] construction, provide noise and vibration isolation of mechanical system penetrations as follows.

      1) Provide core holes through solid timber blocking or steel sleeve for all duct, pipe, conduit and other penetrations through lightweight walls, ceiling and floors where noted on drawings. Where there is double wall construction, the blocking and/or sleeve must be discontinuous at the isolating airspace.
      2) Annular space shall be 1”, 1 ½” is preferred, larger than scheduled pipe or duct passing through the wall and shall be packed and sealed as described above.
      3) Each penetration must be individually sealed; multiple pipes routed through a single opening are not acceptable unless specifically detailed.

   c. To remediate existing penetration conditions and to provide vibration isolation of existing pipes and ducts through existing construction.

      1) Provide flexible connections as prescribed by the mechanical engineer.
      2) During the disconnect-reconnect process enlarge the opening in the wall through which system passes.
      3) The annular space shall be packed and sealed as described above.

   d. Where sleeved penetrations are required in concrete construction.
1) Provide sleeves of 22-gauge-minimum steel, grouted rigidly in place and airtight, for all duct, pipe, conduit, and other penetrations through walls, ceilings, and floors of mechanical equipment rooms, dimmer rooms, transformer rooms, main switchgear rooms and where noted on drawings.

2) Each penetration must be individually sealed; mass penetrations are not acceptable unless specifically detailed on the Contract Documents.

3) Inside dimension of sleeve shall be no less than 1 inch [25mm] greater than outside dimension of penetrating item on all sides.

4) Pack annular space to full depth of penetration with clean fiberglass batt or blanket material flush to ends of sleeve.

5) Seal full perimeter of both ends of sleeve with acoustic sealant to minimum ½” depth [12mm] to achieve airtight seal

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

F. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses provided for each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions
3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each type of elastomeric sealant and joint substrate.
   b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants by hand-pull method described below:
   a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches (50 mm) long at sides of joint and meeting cross cut at one end. Place a mark 1 inch (25 mm) from cross-cut end of 2-inch (50-mm) piece.
   b. Use fingers to grasp 2-inch (50-mm) piece of sealant between cross-cut end and 1-inch (25-mm) mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
   c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

4. Inspect tested joints and report on the following:
   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
   b. Whether sealants filled joint cavities and are free from voids.
   c. Whether sealant dimensions and configurations comply with specified requirements.

5. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

3.5 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
3.6 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 Preliminary Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

(SEALANT SCHEDULE Follows)
## SEALANT SCHEDULE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POLYMER</th>
<th>EXPOSURE/TRAFFIC</th>
<th>USES/APPLICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-SCS</td>
<td>Silicone</td>
<td>Exterior joints in vertical surfaces and non-traffic</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>horizontal surfaces</td>
<td>• Control and expansion joints in cast-in-place concrete.</td>
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<tr>
<td></td>
<td></td>
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<td>• Aluminum windows and between windows and other materials.</td>
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<td>• Aluminum storefront and entrances and between storefront and entrances and other materials</td>
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<td></td>
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<td></td>
<td>• Joints between materials listed above and frames of doors and windows.</td>
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<td></td>
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<td></td>
<td>• Control and expansion joints in plaster soffit and overhead surfaces.</td>
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<td>• Control and expansion joint roof specialties and accessories.</td>
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<td></td>
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<td></td>
<td>• Other joints as indicated.</td>
</tr>
<tr>
<td>2 – PUS1</td>
<td>Two-part Urethane</td>
<td>Exterior joints in horizontal traffic surfaces</td>
<td>• Control, expansion, and isolation joints in cast-in-place concrete slabs.</td>
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<td></td>
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<td>• Joints in paving.</td>
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<td>• Other joints as indicated.</td>
</tr>
<tr>
<td>2 – PUS2</td>
<td>Two-Part Urethane</td>
<td>Interior horizontal traffic joints</td>
<td>• Paving and flooring control and expansion joints</td>
</tr>
<tr>
<td>1-MRS</td>
<td>Mildew-Resistant Silicone</td>
<td>Interior wet areas</td>
<td>• Locker rooms</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Toilet rooms</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Shower areas</td>
</tr>
</tbody>
</table>
## Uses/Applications

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POLYMER</th>
<th>EXPOSURE/TRAFFIC</th>
<th>USES/APPLICATIONS</th>
</tr>
</thead>
</table>
| 1-SCS | Silicone or Two-part Urethane. | Interior moving joints in vertical surfaces and horizontal non-traffic surfaces | • Control and expansion joints on exposed interior surfaces of exterior walls.  
• Perimeter joints of exterior openings where indicated.  
• Joints between tops of non-fire rated walls and underside of floors and beams.  
• Perimeter joints between interior wall surfaces and frames. |
| 2 – PUS1 | | | |
| ALS | Acrylic Latex Sealants | Interior | • Interior non-moving exposed sealants in gypsum drywall construction |
| AJS | Acoustic joint sealants | Interior | • Interior non-moving exposed sealants in acoustic rated (non-tire-rated) construction |

END OF SECTION 079200
SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Steel doors and frames (hollow metal) indicated and as specified.

1.2 SUBMITTALS

A. Product Data: Submit complete printed data for each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.

B. Shop Drawings: Submit complete shop drawings; show the following:
   1. Elevations of each door design.
   2. Details of doors including vertical and horizontal edge details.
   3. Frame details for each frame type including dimensioned profiles.
   4. Details and locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, accessories, joints, and connections.
   7. Coordination of glazing frames and stops with glass and glazing requirements.

C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

D. Oversize Construction Certificates: Submit certification for door assemblies required to be fire-protection rated and exceeding size limitations of labeled assemblies.

E. Thermal Performance Certification: For exterior door assemblies, submit certification required under “Quality Assurance” of this specification.

1.3 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
   1. Test Pressure: Test at atmospheric pressure.
   2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
   3. Temperature-Rise Rating: Where indicated in exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

D. Thermal Performance: Provide exterior door assembly (door and frame) having a maximum U-factor of 0.700 as determined in accordance with NFRC 100 by a laboratory accredited by a naturally recognized accreditation organization such as the National Fenestration Rating Council and labeled and certified by the manufacturer or if not so labeled certified by the manufacturer to have a maximum U-factor of 0.50.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch-(100-mm-) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Benchmark Commercial Doors; a division of General Products Co., Inc.
   2. Ceco Door Products; a United Dominion Company.
   3. Curries Company.
   4. Pioneer Industries Inc.
   5. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.
   1. Use for exterior doors.

2.3 DOORS
   A. General: Provide doors of sizes, thicknesses, and designs indicated.
   B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:
      1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 Full Flush except Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush) where stile and rail doors are shown
      2. Level 4 and Physical Performance Level A (Maximum Duty), Model 1 Full Flush with 2½" wide by 1/8" thick steel offset astragal having ¼" plug welds 4" o.c. and minimum 3/16" thick hinge reinforcement for vault doors.
   C. Exterior Doors: Provide insulated doors meeting thermal performance requirements specified in “Quality Assurance” section of this specification and complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
      1. Level 3 and Physical Performance Level A (Extra heavy duty) Model 1. (Full flush).

2.4 FRAMES
   A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
   B. Interior Frames: Fabricate frames of 0.053-inch- (1.3-mm-) thick steel sheet.
   C. Exterior Frames: Fabricate frames of 0.067-inch- (1.7-mm-) thick metallic-coated steel sheet.
   D. Vault Door Frames: Fabricate frames of 0.093-inch- (2.3-mm-) thick steel sheet.
      1. Minimum 3/16" hinge reinforcement.
   E. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
   F. Plaster Guards: Provide 0.016-inch- (0.4-mm-) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
G. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick, electrolytic zinc-coated or metallic-coated steel sheet.
   1. Wall Anchors in Masonry Construction: 0.177-inch- (4.5-mm-) diameter, steel wire complying with ASTM A 510 (ASTM A 510M) may be used in place of steel sheet.

H. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.5 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- (1.3-mm-) thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.

C. Interior Door Faces: Fabricate exposed faces of door from cold-rolled steel sheet.

D. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.

E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

F. Clearances for Fire-Rated Doors: As required by NFPA 80.

G. Single-Acting, Door-Edge Profile (strike jamb).


I. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

J. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

K. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
1. Unless otherwise indicated, provide thermal-rated assemblies with a maximum U-value of 0.500 or tested and certified in accordance with NFRC 100 for a maximum U-value of 0.700.

L. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 90, and classified according to ASTM E 413.
   1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 40 or better.

M. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.

N. Frame Construction: Fabricate frames to shape shown.
   1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
   2. For exterior applications, fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
   3. Provide welded frames with temporary spreader bars.

O. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

P. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

Q. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.
   1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
   2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
   3. Coordinate stop location for the type and thickness of glazing required.

R. Astragals: As required by NFPA 80 to provide fire ratings indicated.

S. Louvers: Provide louvers for interior doors, where indicated, that 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-shaped or Y-shaped blades.
   2. Provide fire-rated fusible-link louvers in fire-rated doors.

2.6 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.
2.7 FINISH FOR CLAD DOORS

A. Exterior surface to be clad: Metallic-coated steel. Do not apply paint finish to surface to be clad.

B. Surfaces not receiving cladding shall be shop primed for field paint final finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.

2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.

3. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.

4. For in-place gypsum board partitions, install knock-down, drywall slip-on frames.

5. Install fire-rated frames according to NFPA 80.

6. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

1. Fire-Rated Doors: Install within clearances specified in NFPA 80.

2. Smoke-Control Doors: Install to comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 081113
SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes flush wood doors indicated and as specified.

1.2 SUBMITTALS

A. Product Data: Submit complete printed pads for each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Submit complete shop drawings. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

C. Samples:

1. Initial finish samples: minimum 6-inch by 6-inch samples of specified veneer finished to match existing transparent finished wood doors.
   a. Coordinate with Architect for specific location to match.
   b. If initial samples are not approved by Architect, re-submit samples until acceptable finish match is obtained.

2. After color match is approved, submit corner sections of veneered doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edgings in approved finish representing typical range of color and grain for each species of veneer and solid lumber required.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill.

2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.

3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard life or installation form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42 inch by 84 inch (1067 mm by 2134 mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch (0.25 mm in a 75 mm) span.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods Inc.
2. Eggers Industries; Architectural Door Division.
3. GRAHAM Manufacturing Corp.
4. Ideal Wood Products, Inc.
5. Marshfield.
6. Mohawk Flush Doors, Inc.
7. Oshkosh Architectural Door Co.
8. VT Industries Inc.

2.2 SOLID-CORE DOORS

A. Particleboard Cores: ANSI A208.1. Grade M-2 or LD-2 (Exterior glue, Urea-Formaldehyde free) composed of wood chips or agraboard having non-toxic emission free binder or solid stave core wood lumber fabricated from FSC accredited certification body. Provide 5 inch solid wood top and bottom rails.

1. Provide products that meet 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, including 2004 addenda.

B. Interior Veneer-Faced Doors:

1. Core: Particleboard as specified.
2. Construction: Five or seven plies with face plies, stiles and rails bonded to core, then entire unit abrasive planed before veneering.
   a. Do not use adhesives containing urea-formaldehyde.

C. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as follows:
   a. 5 inch (125 mm) top-rail blocking.
   b. 5 inch (125 mm) bottom-rail blocking.
   c. Lock blocks except midrail blocking, in doors indicated to have exit devices.
3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
4. Pairs: Furnish formed-steel edges and astragals with intumescent seals for pairs of fire-rated doors.
   a. Finish steel edges and astragals with baked enamel same color as doors.
2.3 DOORS FOR OPAQUE FINISH

A. Door Construction: Solid-Core
   1. WDMA I.S.1-A Performance Grade: Extra Heavy Duty
   2. Grade: Premium
   3. Faces: MDO.
      a. Apply MDO to standard-thickness, closed-grain, hardwood face veneers or directly to high-density hardboard crossbands.
   5. Core: Particleboard
   6. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
   7. Finishing: Factory Primed for Field paint

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors except as otherwise specified or required:
   1. Wood Species: Same species as door faces.
   2. Profile: Manufacturer's standard shape.
   3. At 20 minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated. Provide manufacturers standard stops for fire rated doors in excess of 20 minute.
   1. Coordinate stop location for the thickness of glazing required.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes, with the following uniform clearances and bevels:
   1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
1. Coordinate measurements of hardware mortises in metal frames to verify
dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for
pairs of fire-rated doors.

2.6 FACTORY FINISHING

A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for
factory finishing.
B. Interior doors: Prime doors at factory for field paint
   1. Grade: Premium

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and
   swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Manufacturer’s Written Instructions: Install doors to comply with manufacturer’s written
instructions, referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
B. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
C. Factory-Finished Doors: Restore finish before installation if fitting or machining is
required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.
B. Finished Doors: Replace doors that are damaged or do not comply with requirements.
   Doors may be repaired or refinished if work complies with requirements and shows no
evidence of repair or refinishing.

END OF SECTION
SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Access doors and frames as indicated on drawings (including MEPFP) and in Divisions 15 & 16 specifications.

B. Related Sections:
   1. Section 092713 “Glass-Fiber-Reinforced-Gypsum Fabrications” for GFRG access panels installed in gypsum board.

1.2 SUBMITTALS

A. Product Data: Submit complete printed data for each type of door and frame. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required).

B. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

C. Coordination Drawings: Reflected ceilings plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
   1. Method of attaching door frames to surrounding construction.
   2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.3 QUALITY ASSURANCE

A. Fire-Related Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 for vertical access doors.
   2. ASTM E 119 for horizontal access doors and frames.

1.4 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in “Submittals” Article.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
   1. Access Doors
      a. J.L. Industries.
      b. Karp.
      c. Larsen’s.
      d. Milcor.
      e. Nystrom.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.

C. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator’s option.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), with Class C coating and phosphate treatment to prepare surface for painting; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M for uncoated base metal.

E. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.

F. Stainless-Steel Sheet, Strip, Plate and Flat Bars: ASTM A 666, Type 304; with minimum sheet thickness indicated representing specified thickness according to ASTM A 480/A 480M.

G. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304

2.3 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
2.4 ACCESS DOORS AND FRAMES

A. Fire-Rated Access Doors and Frames with Exposed Trim:
   1. Locations: Fire resistive masonry.
   2. Fire-Resistance Rating: Match rating of separation in which located.
   3. Temperature Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
   4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal
      with a minimum thickness of 0.036 inch (0.9 mm).
   5. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with surface-mounted trim.
   6. Hinges: Concealed pin type or Continuous piano hinge.
   8. Latch: Self-latching bolt operated by Key with interior release.

B. Access Doors and Frames with Exposed Trim (Non-fire rated):
   1. Locations: Masonry.
   2. Door: Minimum 0.060-inch- (1.5-mm-) thick sheet metal, set flush with exposed
      face flange of frame.
   3. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with 1-inch- (25-mm-)
      thick, surface-mounted trim.
   4. Hinges: (Spring-loaded concealed pin type) or (Continuous piano hinge).
   5. Lock: Key-operated cylinder lock.
   6. Provide units fabricated from stainless steel where indicated.

2.5 FABRICATION

A. General: Provide access door assemblies manufactured as integral units ready for
   installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide
   materials with smooth, flat surfaces without blemishes. Do not use materials with
   exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent
   surfaces. Furnish attachment devices and fasteners of type required to secure access
   panels to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane
   when closed.
   1. For lock, furnish two keys per lock and key all locks alike.

2.6 FINISHES, GENERAL

A. Comply with NAAMM’S “Metal Finishes Manual for Architectural and Metal Products”
   for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.7 STEEL FINISH
A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications.

2. Interiors (SSPC Zone 1A): SSPC-SP 3, “Power Tool Cleaning.”

B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, “Paint Application Specification No. 1,” for shop painting.

2.8 STAINLESS-STEEL FINISH

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 PREPARATION

A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts and anchoring devices.

3.2 INSTALLATION

A. Comply with manufacturer’s instructions.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

END OF SECTION’083113
SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Aluminum entrances and storefront system as indicated and as specified.

B. Related Sections.

1. Section 088000 “Glazing” for Aluminum Entrance and Storefront glazing.

1.2 SUBMITTALS

A. Product Data: Submit copies of manufacturer’s data, recommendations and standard details, including fabrication, finishing, hardware, accessories and other components of the Work.

B. Shop Drawings: Submit Shop Drawings for the fabrication and installation and associated components of the Work signed and sealed by a licensed State of Illinois Structural Engineer stating compliance with “Quality Assurance” requirements.. Include wall elevations at 1/2” scale, and half-size detail sections of every typical composite member. Show anchors, joint system, expansion provisions and other components not included in manufacturer's standard data. Include glazing details.

C. Samples: Submit a set of two (2) samples of required aluminum finish, showing extremes of color and appearance, on minimum 4" long extrusions of the alloys to be used for the Work.

1. The right is reserved to require samples of typical fabricated sections, showing joints, exposed fastenings (if any), quality of workmanship, hardware and accessory items, before fabrication of the Work proceeds.

D. Certification: Submit written certifications, signed by window wall manufacturer, attesting that system conforms to each of the “Quality Assurance” requirements of this Specification where the manufacturer's standard system has been tested in accordance with specified tests and meets performance requirements specified. Where such testing has not been accomplished, perform required tests through a recognized testing laboratory or agency and provide certified test results.

1. Submit actual test data, signed by window wall manufacturer, that is no more than four years old and shows compliance with performance requirements.

E. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.3 QUALITY ASSURANCE
A. Standards: Comply with the requirements and recommendations in applicable specifications and standards by NAAMM, AAMA and AA, including the terminology definitions, and specifically including the "Entrance Manual" by NAAMM, except to the extent more stringent requirements are indicated. Conform to 16 CFR 1201.

B. Installer: Regularly engaged in installation of the types of Work required and acceptable to the system manufacturer.

C. Wind Loading: Fabricate exterior units to withstand the wind pressure loading of 25 psf. on the gross area of the system, acting inward and also acting outward except 30 psf. at corners when tested in accordance with ASTM E 330.

D. Deflections and Thermal Movements: Design work and internally reinforce component members to withstand wind pressures, building deflections, construction shrinkage, thermal movements and erection tolerances, within the following deflection limitations and temperature variations without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects. Fabricate, assemble and erect the work to maintain these limitations.

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus ¼ inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to 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 directly below to less than 1/8 inch (3.2 mm) and clearance between members and operable units directly below to less than 1/16 inch (1.5 mm).

3. Thermal expansion and contraction movement capability, resulting from not less than an ambient temperature range of 120ºF, which may cause a window wall material temperature range of 180oF.


E. Water and Air Leakage: Design, fabricate, assemble and erect work and system of sealed joints with other work, to be permanently free of significant leakage of both water and air. Significant leakage is defined as follows, based on a differential test pressure amounting to 20% of specified strength performance pressure required, testing a complete module of window wall work.

1. Air Infiltration (Framing): More than 0.06 cu. ft. per minute per sq. ft. (projected area of module), determined by ASTM E 283 at an inward test pressure of 6.24 PSF.

2. Air Infiltration (Doors): Provide doors with an air infiltration rate of not more than 0.50 CFM for single doors and 1.0 for pairs of doors per lineal foot of crack, when tested in accordance with ASTM E 283 at an inward test pressure differential of 1.567 PSF.

3. Water Penetration: Provide framing systems with no water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of 10.0 lbf. per sq. ft.
F. Condensation Requirements: Provide thermal-break construction, which provides a condensation resistance factor (CRF) of at least 55 per the requirements of AAMA 1502.7

G. Thermal Performance: Provide window wall system and doors having maximum U-factor of 0.57 for fixed units and 0.67 for operable units as determined in accordance with NFRC 200 by a laboratory accredited by a nationally recognized accreditation organization such as the National Fenestration Rating Council and shall be labeled and certified by the manufacturer; and assembly maximum solar heat gain coefficient (SAGC) of 0.49 for north orientation and 0.39 for all other orientations for overall glazed area as determined in accordance with NFRC 200 by a laboratory accredited by a nationally recognized accreditation organization such as the National Fenestration Rating Council and shall be labeled and certified by the manufacturer. Shading coefficient of the center of glass multiplied by 0.86 shall be an acceptable alternate for determining compliance with the SHGC required for the overall glazed area. Shading coefficient shall be determined using special data file determined in accordance with NFRC 300. Shading coefficient shall be verified and certified by the glass unit manufacturer.

1. U-Factors from 8.1 of ASHRAE IESNA Standard 90.1-1999 shall be an acceptable alternate for determining compliance with the U-factor criteria. Where credit is being taken for a low-emissivity coating, the emissivity of the coating shall be determined in accordance with NFRC 301. Emissivity shall be verified and certified by the window wall manufacturer.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by thermal movements.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   d. Water leakage through fixed glazing and framing areas.
   e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product: Basis of design: Pittco TMS 114 UFT, 2 inches by 4 and one half inches profile. Provide the basis-of-design product or equal product by one of the following manufacturers:
   1. Efco
   2. U.S. Aluminum
   3. Kawneer
   4. Tubelite

2.2 MATERIALS AND ACCESSORIES

A. Aluminum Extrusions: Provide alloy and temper as recommended by manufacturer for strength, corrosion resistance, application of required finish and control of color, but not less than 22,000-psi ultimate tensile strength. Provide main extrusions of not less than 0.125" wall thickness.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other non-corrosive metal fasteners guaranteed by the manufacturer to be compatible with the doors, frames, stops, hardware, anchors and other items being fastened. For exposed fasteners (if any), provide Phillips flat-head screws with finish matching the item fastened.
   1. Do not use exposed fasteners except where unavoidable for the assembly of units, and unavoidable for the application of hardware. Provide only concealed screws in glazing stops.

C. Steel Reinforcement and Brackets: Manufacturer's standard formed or fabricated steel units, of shapes, plates or bars; with 2.0 oz. hot-dip zinc coating complying with ASTM A 123, applied after fabrication to brackets and rust inhibitive paint applied to reinforcing elements.

D. Concealed Flashing: Dead soft stainless steel, minimum 26 gauge.

E. Inserts: For required anchorage into concrete or masonry work, furnish inserts of cast iron, malleable iron or 12 gauges steel hot-dip galvanized after fabrication.

F. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

G. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PAINT 12, compounded for 30-mil thickness per coat.

H. Sealants and Gaskets: Provide sealants and gaskets in the fabrication, assembly and installation of the Work, which are recommended by the manufacturer to remain permanently elastic, non-shrinking, non-migrating and weatherproof for the life of the building.
   1. LEED Requirement: Provide adhesives and sealants used inside the weatherproofing system meet 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. Including 2004 addenda.

I. Glazing Gaskets: For glazing glass, and for gaskets, which are factory-installed in a "captive" assembly of glazing stops, provide manufacturer's standard stripping of molded neoprene.

J. Glazing: Refer to Division 08 Section “Glazing”

2.3 HARDWARE

A. Except as indicated otherwise herein, refer to Section "Door Hardware" of these Specifications for the furnishing of hardware items. Hardware templates will be furnished to the manufacturer for the fabrication of door and frames to receive hardware. Receive the hardware and coordinate with the hardware requirements of this Section. Report discrepancies in writing to the Contractor.

B. Cut, reinforce, drill and tap frames and doors as required to receive hardware, except do not drill and tap for surface-mounted items until the time of installation at the Project Site. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

C. Install all hardware, except surface-mounted hardware, at the fabrication plant. Remove only as required for final finishing operations, and for delivery and installation of the Work at the Project Site.

2.4 FABRICATION

A. Coordination of Fabrication: Wherever possible, check the actual openings in the construction work by accurate field measurement before fabrication, and show recorded measurements on final Shop Drawings.

B. Prefabrication: Provide each door as a "packaged entrance" unit. Complete the fabrication, assembly, finishing, application of hardware and all other Work, before shipment to the Project Site, to the greatest extent possible. Disassemble only to the extent necessary for shipment and installation.

C. Basic Fabrication:
   1. Complete the cutting, fitting, forming, drilling and grinding of all metal at the shop to the extent possible. Remove arises from cut edges and ease edges and corners to a radius of approximately 1/64".
   2. Conceal fasteners, wherever possible, except as otherwise shown.
   3. Maintain continuity of line and accurate relation of planes and angles. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members.
   4. Internally reinforce the Work as necessary for performance requirements, and for support to the structure. Separate dissimilar metals with bituminous paint or preformed separators, which will prevent corrosion. Separate metal surfaces at moving joints with nonmetallic separators to prevent "freeze-up" of joints.
D. Weather Stripping: Where exterior door stiles or head rails do not close against fixed stops equipped with compression weather stripping, provide sliding weather stripping, retained in an adjustable strip in a mortise centered in the edge of the door. Provide heavy-duty, hollow, compression weather stripping in the bottom-rail, adjustable for contact with the threshold.

E. Stile-and-Rail Type Aluminum Doors:
1. Provide tubular frame members, fabricated with mechanical joints of heavy inserted reinforcing plates and concealed tie-rods or j-bolts, in accordance with manufacturer's standard fabrication methods; or fabricate with structurally welded joints, at manufacturer's option.
2. Except as otherwise shown or scheduled, provide door units 1-3/4" thick.
   a. Provide medium stile doors.
   b. Provide 10" bottom rail to conform with ANSI A117.1-2003 requirements.

F. Aluminum Framing:
1. Fabricate tubular and channel frame assemblies with either welded or mechanical joints using shear blocks with concealed fasteners wherever possible.
2. Provide non-removable doorstops extruded integrally with frame to extent possible.
   a. Provide compression weather-stripping on the door-contact face of doorstop for exterior door frames, and on other frames where indicated.
   b. Where weather stripping is not provided, install neoprene silencers on doorstops to prevent metal-to-metal contact between doors and stops.
3. Provide glazing system for frames to receive lights. Design system for replacement of glass, but for non-removal of glass from the exterior.
4. Fabricate frame assemblies for exterior walls with flashing and weeps to drain penetrating moisture to exterior. Provide anchorage and alignment brackets for concealed support of assembly from the building structure. Allow for thermal expansion of exterior units.
5. Provide all elements with thermal breaks to positively eliminate outside to inside metal contact. Provide thermal break materials certified to comply with Performance Requirements of the unit in each case (window or window wall).
   a. Interior framing need not be thermal break construction.

2.5 ALUMINUM FINISHES

A. Prepare the surfaces for finishing in accordance with recommendations of the aluminum producer and the finisher or processor.

B. Finish all components of each assembly simultaneously so as to attain complete uniformity of color. Adjust and control the direction of mechanical finishes (as specified) to achieve the best overall visual effect in the Work, as determined in consultation with the Architect.

C. Sequence the finishing and processing of materials in a predetermined bay-bay-bay plan, which will minimize color and texture differences between adjacent components.
D. Color and Texture Tolerance:
   1. The right is reserved to reject the Work because of color or texture variations, which are visually objectionable, but only where the variation exceeds the range of variations established by the manufacturer prior to the Work, by means of range samples which have been accepted by the Architect.
   2. Prepare range samples on extrusions of profiles and shapes of the actual members of the Work. Establish range samples to maintain a total range of 2 degrees on the green reflectance scale.

E. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations relative to applying and designating finishes.

F. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

G. Class I, Color Anodic Finish: AA-M12C22A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install component parts, which are observed to be defective in any way, including warped, bowed, dented, abraided and broken members, including glass and edge damage. Remove and replace members, which have been damaged during installation.

B. Deliver base plates for mullion anchorage in time to allow for installation. Provide setting drawings.

3.2 ERECTION TOLERANCES

A. Limit variations from plumb, and level to the following:
   1. 1/8" maximum deviation.

B. Limit variations from location (theoretical calculated positions in plan or elevation based on established floor lines and column lines), including variations from plumb and level, to the following:
   1. 3/8" total maximum deviation for any member at any location.
   2. 1/8" maximum change in deviation for any member at any 10' run, any direction.
C. Limit offsets in the end-to-end and edge-to-edge alignments of adjoining and consecutive members, which form planes, continuous runs and profiles to the following:

1. 1/16" maximum offset in any flush alignment, including any which are to be ½" or less out-of-flush, and including any which are separated 2" or less by a reveal or protrusion in the plane of the wall.
2. 1/8" maximum offset in alignments which are to be out-of-flush by more than ½", or separated by a reveal or protrusion of more than 2" width.

D. Provide sliding connections at top of mullions to accommodate deflections of L/360 of the floor above.

3.3 ERECTION


B. Certify welders in accordance with requirements of AWS.

C. Do not cut, trim, weld or braze components during erection in any manner which would damage the finish, decrease the strength, or result in a visual imperfection or a failure in performance of the window wall. Return component parts, which require alteration to the shop for refabrication, if possible, or for replacement by new parts, if not possible.

D. Install components level, plumb, true to line and with uniform joints and reveals. Use erection equipment, which will not mark or stain finished surfaces, and will not damage the component parts in any way.

E. Anchor component parts securely in place by bolting, welding or other permanent mechanical attachment system, which will comply with performance requirements and permit movements which are intended or necessary. Install slip-joints wherever necessary to ensure movement as intended or necessary.

F. Apply bituminous paint of approximately 30-mil dry film thickness, or other suitable permanent separator, on concealed contact surfaces of dissimilar materials, before assembly or installation.

G. Wire brush and touch-up prime welded and unshop primed steel.

H. Provide close fitting sleeves at joints to insure alignment and no open joints.

I. Provide all closures, panels, sill and stool covers and all other accessory items required for a complete installation. Form accessories of minimum .063" aluminum.

J. Install fire stopping in accordance with requirements to obtain fire rating.

3.4 PROTECTION AND CLEANING

A. Protect exposed aluminum work from damage by construction. Use lacquer coating only if totally removed without damage to finish. Use strippable covering only if totally
removed without damage to finish. Remove protection and clean surfaces and glass immediately before acceptance of building.

END OF SECTION 084113
SECTION 084126 - ALL-GLASS 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. Interior manual swinging all-glass entrance doors.
   2. Interior all-glass storefronts.

B. Related Sections:
   1. Section 055000 "Metal Fabrications" for overhead-steel support for all-glass systems.
   2. Section 087100 “Door Hardware” for hardware not specified in this section.
   3. Section 087163 “Automatic Door Operators” for door operators.
   4. Section 088000 "Glazing" for general glass requirements.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: All-glass systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Performance: All-glass systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to applicable codes.

   1. Wind Loads: N/A (Interior storefront).
   2. Deflection Limits: Deflection normal to glazing plane is limited to 1/175 of clear span or 3/4 inch (19 mm), whichever is smaller.
C. Delegated Design: Design all-glass systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

D. Thermal Movements: Allow for thermal movements resulting from the following ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.

B. Shop Drawings: Show fabrication and installation details, including the following:

1. Plans, elevations, and sections.
2. Details of fittings and glazing, including isometric drawings of all fittings.
3. Door hardware locations, mounting heights, and installation requirements.

C. Samples for Initial Selection: For each type of exposed finish indicated.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Finishes: 6-inch- (150-mm-) long sections of all fittings.
2. Glass: 6 inches (150 mm) square, showing exposed-edge finish and tint.
3. Door Hardware: For exposed door hardware of each type, in specified finish, full size.

E. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

F. Delegated-Design Submittal: For all-glass systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of all-glass systems.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer
B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for all-glass systems.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For all-glass systems to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Engineering Responsibility: Prepare data for all-glass systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Source Limitations: Obtain all-glass systems from single source from single manufacturer.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.


F. Preinstallation Conference: Conduct conference at Project site

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with all-glass systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

c. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion, except as follows:

a. Concealed Floor Closers: 25 years from date of Substantial Completion.

1.11 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of all-glass system Installer. Include monthly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper all-glass system operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Basis of Design is Blumcraft of Pittsburgh. Subject to compliance with requirements, provide basis of design or comparable product by one of the following:

1. ACI Distribution; a division of Vitro America, Inc.
2. Alpha Door & Rail, Inc.
3. Arch Aluminum & Glass Co., Inc.
4. Oldcastle Glass, Inc.
5. Virginia Glass Products Corporation; a subsidiary of Virginia Mirror Company.
6. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

2.2 MATERIALS

A. Glass: As specified in section 088000 “Glazing”

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5.

2.3 METAL COMPONENTS

A. Fitting Configuration:
   1. Manual-Swinging, All-Glass Entrance Doors: Patch fittings at head and sill on pivot side only.
   2. All-Glass Storefronts: Recessed glazing channel at top and bottom

B. Patch Fittings:
   1. Material: Bronze or Bronze-clad aluminum
   2. Finish: Dark Bronze anodized
   3. Profile: Square
   4. End Caps: Manufacturer's standard precision-fit end caps for all fittings.

C. Accessory Fittings: Match patch-fittings metal and finish for the following:
   1. Overhead doorstop.

D. Anchors and Fastenings: Concealed.

2.4 ENTRANCE DOOR HARDWARE

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of patch and rail fittings.

B. Concealed Floor Closers and Top Pivots: Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.
      a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.
   2. Hold Open: None.
   3. Opening-Force Requirements:
      a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
      b. Accessible Interior Swinging Doors: Not more than 5 lbf (22.2 N) to fully open door.

C. Concealed Overhead Stop: As specified in Section 087100 "Door Hardware."

D. Push-Pull Set: As specified in Section 087100 "Door Hardware."
E. Cylinders: As specified in Section 087100 "Door Hardware."

F. Threshold: Not more than 1/2 inch (13 mm) high.

2.5 FABRICATION

A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.

1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.

B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

2.6 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Dark Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install all-glass systems and associated components according to manufacturer's written instructions.

B. Set units level, plumb, and true to line, with uniform joints.

C. Maintain uniform clearances between adjacent components.

D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.
F. Install joint sealants as specified in Section 079200 "Joint Sealants".

3.3 ADJUSTING AND CLEANING

A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.

1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch measured to the leading door edge.

B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION 084126
SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Finish hardware as required and as specified.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s technical product data for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

B. Hardware Schedule: Submit finish hardware schedule in a vertical format separate from door and frame schedule, conforming to "Sequence and Format for the Hardware Schedule" published by the Door and Hardware Institute (DHI). Horizontal and coded schedules are not acceptable.

1. Finish Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Schedules not having the following information will be rejected:
   a. Name and manufacturer of each item.
   b. Fastenings and other pertinent information.
   c. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
   d. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
   e. Mounting locations for hardware.
   f. Door and frame sizes and materials.

2. All hardware for Aluminum doors shall be grouped and segregated from other hardware in the schedule, and may be processed separately. Only the portion of hardware schedule pertaining to Aluminum doors and frames should be forwarded to the aluminum door contractor.

3. Submit schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) that is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule. Review and acceptance by the Owner or Architect does not relieve Contractor of responsibility to fulfill requirements of Contract Documents.

C. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type of exposed hardware.
unit, finished as required, and tagged with full description for coordination with schedule.

1. Samples may be retrieved by the supplier. Units that are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

D. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

E. Keying Schedule: Submit keying schedule after meeting with Owner's agent for keying instructions.

F. Electrified Hardware Coordination: Where electric strikes, magnetic locks, low energy door operators are listed, provide power supplies by the device manufacturer and wiring diagrams for all items, whether listed in the sets or not. Provide elevations of each system showing locations for each item and description of system operation. Coordinate with electric contractor.

1.3 QUALITY ASSURANCE

A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

C. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware that has been tested and listed by UL or FM or WHI for types and sizes of doors required and complies with requirements of door and door frame labels.

1. Exit Devices: Where required on fire-rated doors (with supplementary marking on doors' UL, FM, or WHI labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL, FM, or WHI label on exit devices indicating "Fire Exit Hardware".

2. Fire exit devices and door closers shall be certified to be in compliance with UBC7.2 and UL 10C.

1.4 PRE-INSTALLATION CONFERENCE:

A. Conduct preconstruction conference at the project site in compliance with requirements of Section 012000, Progress Documentation and Meetings Procedures.
B. Contractor shall notify hardware supplier two weeks prior to beginning of hardware installation to set up pre-installation meeting with installation carpenters. Hardware supplier shall provide a qualified Architectural Hardware Consultant to personally meet with, and instruct installers on job site in proper techniques for installation and adjustment of locks, closers and exit devices, and advise on required wire types and gauges for access control/electrical locking hardware.

1. Lock, Door Closer and Exit Device Manufacturer’s representative shall be available for a post installation walk and punch list assistance on behalf of the General Contractor, Architect and Owner.
2. Review electrical roughing-in and preparatory work.
3. Review construction keying and final keying.

1.5 DELIVERY, STORAGE AND HANDLING

A. Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

C. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

D. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

PART 2 - PRODUCTS

2.1 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware item is indicated in the Schedule of Hardware sets.

B. Manufacturer’s Product Designations: A manufacturer’s symbol in the hardware sets indicates whose product designation is used in the Schedule of Hardware Sets for purposes of establishing minimum requirements. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers that comply with requirements including those specified elsewhere in this section.

C. ANSI/BHMA designations used elsewhere in this section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this section.

3. Exit Devices: ANSI/BHMA A156.3.
Project Rev: A_12/06/2017

4. Door Controls - Closers: ANSI/BHMA A156.4.
5. Auxiliary Locks: ANSI/BHMA A156.5.
10. Auxiliary Hardware: ANSI/BHMA A156.16.

2.2 MATERIALS AND FABRICATION, GENERAL

A. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement shown.

B. Manufacturer's Name Plate: Do not use manufacturer's products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Architect.

C. Manufacturer's identification will be permitted on rim of lock cylinders, and armor front.

D. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser quality than specified for the applicable hardware units by applicable ANSI A156 series standard for each type of hardware and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

E. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

F. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

2.3 HARDWARE FINISHES

A. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard
finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

B. Provide finishes that match those established by BHMA as indicated in the hardware schedule or, if none indicated, match the finish to which the item is applied.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

D. Finish Designations: Scheduled designations refer to ANSI A156.18 "Materials & Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

2.4 HINGES, BUTTS

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated in the hardware schedule, provide hinge pins as follows:
   2. Exterior Doors: Non-removable pins (NRP).
   3. Interior Doors: Non-removable pins (NRP).
   4. Tips: Flat button and matching plug, finished to match leaves.
   5. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.
   6. All hinges shall be ball bearing type.
   7. Provide safety stud and locking hole for hinges where scheduled.

D. Manufacturer, (Butts): Subject to compliance with requirements, provide products of one of the following:
   1. Butts and Hinges:
      a. Bommer Industries.
      b. Hager Hinge Co.
      c. Ives; Ingersoll-Rand Co.
      e. Stanley Hardware

E. Manufacturer, (Geared Continuous Hinges): Provide products having UL listed units equal to or better than the rating of the opening of one of the following manufacturers:
   1. ABH, Inc. 4240HD series
   2. Hager/Roton 780-224-HD series
   3. Pemko FMHD series
4. Select Products SL-24-HD series
5. Stanley 520 series
6. Zero 914DB series

2.5 LOCK CYLINDERS AND KEYING

A. General: Supplier shall meet with Owner to finalize keying requirements and obtain final instructions in writing. Comply with Owner’s instructions for master keying and except as otherwise indicated, provide individual change key for each lock which is not designed to be keyed alike with a group of related locks.

B. Standard System: Except as otherwise indicated, provide new master key system for project, utilizing Park District standard grand master system. Provide 6 master keys.
   1. Grand master: Building Manager and Building Engineer.
   2. Sub Master for the following areas and conditions:
      a. Rooms used by the public

C. All cylinder cores shall be keyed at the factory by the cylinder manufacturer where records will be established and maintained.

D. Provide construction cores and keys during the construction period. Construction control and operating keys and cores shall not be part of the Owner’s permanent key system or be furnished on the same key way as the Owner’s permanent key system. Permanent core and keys shall be furnished by the hardware supplier direct to the Contractor as specified in part 3. All cylinders shall be not less than six (6) pin interchangeable core and keyed into a new factory registered Grand Master Key System with a restricted key way.

E. Permanent keys shall be stamped with the key system symbol (VKC). Do not mark the keys with the cylinder biting. Permanent cores shall be marked with the key system symbol in such a manner that the mark is not visible when the core is installed in the cylinder (CVKC).

F. Except where otherwise specified, locksets, cylinders and cores shall be by the same manufacturer, to assure proper operations.

G. During construction, all cylinder cores shall be keyed alike. The Contractor shall receive three (3) copies of this key. Under no circumstances shall the Contractor receive any of the permanent building master keys or changes keys. The construction master key shall operate on no less than six (6) pins.

1. Quantity of Keys:
   a. 3 Great Grand Masters.
   b. 3 Grand Master Keys.
   c. 3 Master Keys.
   d. 3 Keys per lock or cylinder.
   e. 50 key blanks.
   f. 3 Control keys.
H. Provide two key control systems, including envelopes, labels, tags with self locking key clips, receipt forms, 3-way visible card index, temporary markers and standard metal cabinet, all as recommended by system manufacturer with capacity for 150 percent of the number of locks required for the project.
   1. The hardware supplier shall set up complete cross index system and place keys on markers and hooks in the cabinet as determined by the final key schedule.

I. Provide two hinges type wall mounted key cabinets for the above system to be installed as directed by the Owner.

2.6 LOCKS, LATCHES AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.
   1. Foot Bolts: Provide dust-proof strikes, except where special threshold construction provides non-recessed strike for bolt.
   2. Roller Strikes: Provide where recommended by manufacturer of the latch and lock units.
   3. Pairs of doors with overlapping astragal provide strike with a 7/8 inch lip to center (LTC).

B. Mortise Locks:
   1. Locks shall have all functions available in one size case, manufactured from heavy gauge steel, minimum thickness 3/32 inch, completely chrome plated for corrosion resistance and lubricity of parts. Cases shall be closed on all sides to protect internal parts. Locks shall have adjustable, beveled and armored fronts, secured with spanner head security screws. Standard 2-3/4 inch backset convertible from one function to another, with a full 3/4 inch throw two-piece, or approved one-piece anti-friction latch bolt and 1 inch throw dead bolt with hardened steel insert and available for a minimum door thickness of 1-3/4 inches. Internal parts shall be heavy gauge steel, zinc dichromate-plated and nickel steel hubs.
   2. All locksets with latch bolts, regardless of trim, shall be listed by UL for A and lesser labeled doors, single or pairs.
   3. Lock trim shall be solid stainless steel levers with wrought rose, through bolted through the lock case to assure correct alignment.
   4. Lockset shall conform to, and be certified as meeting, ANSI A156.13 Grade 1 requirements.
   5. Locksets shall be Corbin Russwin, 59A1 keyway. No substitutions will be allowed.

C. Exit Devices:
   1. Basis of Design is Blumcraft H100 tubular panic bar.
   2. Surface applied rim, mortise and vertical rod exit devices shall be available as a complete series, listed in UL "Accident Equipment List-Panic Hardware" and "Fire Exit Hardware". All devices shall be the modern push type. These devices shall have met Performance Test Requirements in accordance with ANSI Standard A156.3 for Grade 1 exit devices. All exit devices shall be
furnished with thru-bolts and sex nuts. Provide cylinder dogging for all devices except “Fire Exit Devices”

3. Rim exit device for single doors and pairs of doors with fixed or removable mullions shall be equipped with one of the following type of latch bolts, deadlocking, guarded or square bolt with a minimum 3/4 inch throw.

4. All rim exit devices for pairs of doors with fixed or removable mullion shall have two-piece interlocking stabilizer blocks installed above and below the latch case.

5. Exit devices shall be the type, function, and design as listed in the schedule of finish hardware sets and shall have a manufacturer’s warranty of five (5) years.

6. Subject to compliance with specifications, provide basis of design or equal product by one of the following:
   a. Dorma; Dorma Co.
   b. Precision; Precision Hardware (Stanley)
   c. Sargent; Assa Abloy Co.
   d. Yale Security; Assa Abloy Co.
   e. Von Duprin; Ingersoll-Rand Co.

2.7 PUSH/PULL UNITS

A. Basis of Design is Blumcraft Tubular pull, Hande A and Handle B.

B. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation; through-bolted for matched pairs, but not for single units. Pulls to have 2-1/2 inch clearance from face of the door to the underside of the pull.

C. Acceptable Manufacturers: Subject to compliance with requirements, provide basis of design or equal products by the following:
   1. Rockwood.
   2. Hager.
   3. Ives; Ingersoll-Rand Co.
   4. Trimco.
   5. Hiawatha.

2.8 CLOSERS AND DOOR CONTROL DEVICES

A. Closers shall be heavy duty high security overhead concealed units designed for high traffic use. Basis of Design is LCN 2210 Series.

B. Closers shall be rack and pinion construction with both rack and pinion of heat treated steel and with a cast iron or cast aluminum case. Closing the door will be controlled by 2 valves, one to control closing speed and one to control latching speed. Closers shall be regularly furnished with fully adjustable backcheck allowing approximate 70 degrees backcheck on both regular and parallel are closers. Delayed action shall be available. Valves shall be concealed against unauthorized adjustment and non-critical needle valve type. Spring power adjustment shall be standard with an adjustment size 1 to size 6. Closers shall be surface applied with rectangular metal covers, void of manufacturers' trademarks. All door closers intended to be mounted to the door shall be furnished with thru-bolts and sex nuts.
C. Closers shall be certified as meeting the ANSI A156.4 Grade 1 requirements, be listed by UL for all classes of labeled doors and shall have a manufacturer’s warranty of ten (10) years.

D. Size of units: Except as otherwise specifically indicated, comply with the manufacturers recommendations for size of door control unit depending upon size of door, exposure to weather and anticipated frequency of use.
   1. Provide heavy duty arms.
   2. Provide spring cushion stops on parallel arm closers.
   3. Provide heavy duty dead stop parallel arms on doors equipped with electric hold open/release devices.
   4. Provide all necessary plates, brackets, arms and shoes required for proper installation of closer.

E. Acceptable Manufacturers:
   1. Dorma
   2. LCN
   3. Norton
   4. SARGENT

F. Door Holder/Release: Provide electric holder/release meeting the requirements of ANSI Standard A156.15.
   2. 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.
   3. Electric boxes, conduit and wiring to be provided under Division 16.
   4. Voltage to be as required under Division 16.
   5. Acceptable manufacturers:
      a. LCN SEM7800 Series and SHE Series.
      b. SARGENT 1500 Series.
      c. Rixson 900 Series.

2.9 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer’s standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units); either machine screws of self-tapping screw.

B. Door protection plates will be stainless steel 18-8 type 302, 0.050 inch thick, beveled three sides with vertical finish grain.

2.10 STOP AND HOLDERS

A. Provide wall mounted door stops and wall mounted door stop and holders as required to protect the wall and door lever.
   1. Wall door stops: BHMA Type L52261.
   2. Door Holders, Interior Doors: BHMA Type L1191.
   3. Door Holders, Exterior doors: BHMA Type L11271.
B. Acceptable Manufacturers:
   2. Hager.
   3. Architectural Builders Hardware (ABH).
   4. Trimco.

2.11 THRESHOLDS, WEATHER SEALS AND RAIN DRIPS AND SOUND SEALS

A. Provide thresholds and weather seals on all exterior doors as scheduled.

B. Provide Sound Seals where indicated in the Opening Schedules. Pemko is Basis of design other products meeting design criteria will be considered subject to compliance with project requirements.
   1. 30 STC rating provide a single row of PEMKO S88 Gasketing for head and jamb. Door Bottom Pemko 234AV, and Pemko threshold 271A
   2. 40 STC RATING PROIDE A DOUBLE ROW OF PEMKO S88 perimeter gasketing for heads and jamb, door bottom PEMKO 234V and Pemko threshold 2005AT.

C. Subject to compliance with the specifications provide products of one of the following manufacturers:
   1. National Guard Products.
   2. Pemko.
   3. Hager.
   5. Reese.

2.12 PIVOTS

A. Offset Pivots: BHMA A156.4.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. DORMA Architectural Hardware; Member of The DORMA Group North America.
      b. IVES Hardware; an Ingersoll-Rand company.
      c. Rixson Specialty Door Controls; an ASSA ABLOY Group company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting Locations: As indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, and "ADA Accessibility Guidelines for Buildings and Facilities", except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate
removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Install door hardware units using fasteners provided by the manufacturer as specified.
   2. Exit devices: Through bolts and sex nuts.
   3. Closers Through bolts and sex nuts.
   4. Door holder/release; armature mounted with through bolts and sex nuts.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl- rubber or polyisobutylene mastic sealant. Thresholds shall be notched or coped to fit around removable mullions.

G. Removable mullion sill brackets shall be secured to the concrete floor with approved fasteners and anchors.

H. Hardware shall be installed with the fasteners and anchors provided by the manufacturer of that hardware item.

3.2 ADJUSTMENT, CLEANING AND KEYING

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Permanent cores and keys shall be delivered by the hardware supplier directly to the contractor. The contractor and representative of the hardware supplier shall jointly install the permanent cores in the presence of the Owner’s agent who shall receive the keys. Hardware supplier shall return the construction cores and construction keys to the manufacturer.

D. Tools and instructions: At the time the permanent cylinder cores delivered, the hardware supplier shall provide a complete set of specialized tools and maintenance instructions and shall instruct the Owner’s agent in the proper maintenance.

E. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to
restore proper function and finish of hardware and doors. Adjust door control
devices to compensate for final operation of heating and ventilating equipment.
1. Instruct Owner's Personnel in proper adjustment and maintenance of
hardware and hardware finishes, during the final adjustment of hardware.

F. Continued Maintenance Service: Approximately three months after the
acceptance of hardware in each area, the Installer, accompanied by the
representative of the latch and lock manufacturer, shall return to the project and re-
adjust every item of hardware to restore proper function of doors and hardware.
Consult with and instruct Owner's personnel in recommended additions to the
maintenance procedures. Replace hardware items that have deteriorated or failed
due to faulty design, materials or installation of hardware units. Prepare a written
report of current and predictable problems (of substantial nature) in the
performance of the hardware.

3.3 SCHEDULE OF FINISH HARDWARE SETS

A. Provide finish hardware for each door to comply with requirements of this Section,
hardware set numbers indicated on Door Schedule and the schedule of hardware
sets on drawings.

B. Manufacturer's function and catalog numbers used in the hardware sets are
identified by the following symbols.
1. Architectural Builders Hardware Products  A
2. Glynn Johnson  G
3. Hager Hinge Co.  HA
4. Ives; Ingersoll-Rand Co.  I
5. LCN Closers  L
6. Pemko Manufacturing Co.  P
7. Wm J. Perkenson  WP
8. Rockwood Mfg. Co  R
9. Von Duprin  V
10. Yale Security  Y

END SECTION 087100
SECTION 087163 - AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section include: Low energy door operators indicated and as specified.

1.2 SUBMITTALS

A. Product Data: Submit complete printed data. Include installation details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators and activation devices.
   1. Include wiring diagrams.

B. Samples: Submit three (3) samples of proposed aluminum finish for operator enclosure. Samples will be reviewed and approved for match of aluminum framing only.

C. Reports: Submit field quality-control test reports.

D. Operation and Maintenance Data: Submit three (3) bound copies of operation and maintenance manuals for automatic door operators including emergency operation, and maintenance instructions.

E. Maintenance Agreement: Submit three (3) signed copies of special maintenance agreement specified in this Section.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer having company certification issued by the American Association of Automatic Door Manufacturers (AAADM).

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project, and who employs an inspector certified by AAADM.

C. Source Limitations: Obtain automatic door operators through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Serviceability: Automatic door operators must be resettable and serviceable by Owner/owner vendor.
   1. Parts must be made available to owner/owner vendor by manufacturer for repair.
2. No proprietary codes that would limit access to info or parts or to resetting the unit shall be allowed

1.4 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing automatic door operators. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies.

1.5 PRE-INSTALLATION MEETING

A. Meet at the site before electrical work is started in the area with representatives of the Architect, electrical trade, General Contractor, and Owner’s agents to review each installation including location and type of activation devices and work of each trade.

1.6 MAINTENANCE SERVICE

A. Maintenance: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic door operator Installer. Include quarterly planned and preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Engage inspector certified by AAADM to perform safety inspection after each adjustment or repair and at end of maintenance period. Submit completed inspection form to Owner.

2. Perform maintenance, including emergency callback service, during normal working hours.

3. Include 24-hour-per-day, 7-day-per-week emergency callback service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Basis of Design is LCN 2860 Series overhead concealed low energy automatic door operators. Provide basis of design or equal product by one of the following:

1. Besam.

2. Horton.

3. Hunter

4. Nabco Gyro/Tech

2.2 MATERIALS
A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:
   2. Extrusions: ASTM B 221 (ASTM B 221M, Alloy 6063-T5 or T-6).

2.3 AUTOMATIC DOOR OPERATORS - GENERAL

A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

B. Electromechanical Operating System: Unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, and with manual operation including spring closing with power off.

C. Housing: Fabricated from 0.125-inch- (3.2-mm-) thick extruded or formed aluminum.

D. Exposed Cover: Fabricated from 0.125-inch- (3.2-mm-) thick extruded aluminum; continuous over full width of door opening; provision for maintenance access, and fasteners concealed when door is in closed position.
   1. Finish: Match door frame to satisfaction of Architect.

2.4 LOW-ENERGY, POWER DOOR OPERATORS

A. Standard: Comply with BHMA A156.19.

B. Performance Requirements:
   1. Not more than 15 lbf (67 N applied) 1 inch (25 mm) from latch edge of door to prevent stopped door from opening or closing.
   2. If power fails, not more than 30 lbf (133 N applied) 1 inch (25 mm) from latch edge of door to manually set door in motion.

C. Operation: Power opening and spring closing. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
   1. Control speed of cycle by motor as dynamic brake.

D. Operating System: Electromechanical.

E. Microprocessor Control Unit: Solid-state controls.

F. Features:
   1. Adjustable opening and closing speed.
   2. Adjustable closing force.
   3. Adjustable backcheck.
   4. Adjustable latch speed.
   5. Adjustable hold-open time of not less than 0 to 30 seconds.
   6. Adjustable time delay.
G. Mounting: Recessed in ceiling.

2.5 ACTIVATION DEVICES

A. Bollard: Exterior bollard with door control switch as indicated consisting of square, flat push plate; of material indicated. Provide engraved message as indicated.
   1. Finish: Stainless steel.

B. Wall Push-Plate Switch: Manufacturer's standard, wall-mounted, door control switch as indicated consisting of square, flat push plate; of material indicated. Provide engraved message as indicated.

2.6 ACCESSORIES

A. Low-Energy Automatic Door Operator Signage: Comply with BHMA A156.19.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes. Architect will select either a two-coat fluoropolymer or anodized finish.

B. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

C. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame supports, and other conditions affecting performance of automatic door operators.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.

B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install complete automatic door operator system, including activation devices, control wiring, and push plates.


C. Automatic Door Operators: Install door operator system, including control wiring.

3.3 ADJUSTING

A. Adjust automatic door operators and activation and safety devices to operate smoothly, easily, and properly, and for safe operation and weathertight closure.
   1. Adjust doors with low-energy door operators to close according to BHMA A156.19.

B. Lubricate operators, hardware, and other moving parts.

C. After completing installation of exposed, factory-finished automatic door operators, inspect exposed finishes and repair damaged finishes.

D. Readjust automatic door operators and activation and safety devices after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

E. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.4 FIELD QUALITY CONTROL

A. Testing and Inspecting: After installation has been completed, provide testing and inspecting of each automatic door operator by a party certified by AAADM to verify compliance with applicable BHMA standards.
1. Inspection Report: Submit report in writing to Architect and Contractor within 24 hours after inspection.

B. Remove and replace automatic door operators where test results indicate they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

A. Adjust automatic door operators and activation and safety devices to operate smoothly, easily, and properly, and for safe operation and weathertight closure.

1. Adjust doors with low-energy door operators to close according to BHMA A156.19.

B. Lubricate operators, hardware, and other moving parts.

C. After completing installation of exposed, factory-finished automatic door operators, inspect exposed finishes and repair damaged finishes.

D. Readjust automatic door operators and activation and safety devices after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

E. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.6 DEMONSTRATION

A. Engage manufacturer's inspector certified by AAADM to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION 087163
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Storefront framing.
   3. Glazed entrances.
   4. Doors.
   5. Interior lites.

1.2 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: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
   1. Design Wind Pressures:
      a. Exterior: As indicated on Drawings.
      b. Interior: 5 lbs/sf
   2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
   3. Glass Type Factors for Wired, Patterned, and Sandblasted Glass:
      a. Short-Duration Glass Type Factor for Patterned Glass: 1.0.
      b. Long-Duration Glass Type Factor for Patterned Glass: 0.6
      c. Short Duration Glass Type Factor for Sandblasted Glass: 0.5.
   4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
   5. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
6. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Glass Statistical Factor (Safety Factor): Glass thicknesses when shown on the Drawings are for convenience of detailing only and are to be confirmed by the Contractor and/or glass manufacturer. All glass for the size openings shown will be provided in thicknesses such that the probability of breakage at the "Wind Pressure" will not exceed 8 lights per 1000 lights (S.F. 2.5)

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. 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.
   3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.4 SUBMITTALS

A. Product Data: Submit complete printed data on each type of glazing product.

B. Samples: Submit minimum 6” square samples of each type of glazing product.

C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by Structural Engineer Registered in the State of Illinois responsible for their preparation.

D. Glazing Schedule: Submit a glazing schedule including elevations and glazing details utilizing the same designation as indicated on the drawings identifying types and thicknesses of glazing products and methods of installation.
E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated glass, insulating glass, glazing sealants, and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

F. Preconstruction adhesion and compatibility test report.

G. Warranties: Sample of special warranties.

1.5 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. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

E. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

F. Source Limitations for Glass: Obtain coated float glass laminated glass and insulating glass from single source from single manufacturer for each glass type.

1. Obtain all exterior glass, regardless of type, from a single source from a single manufacturer.

G. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.


J. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer’s name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

K. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

L. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install glazing in mockups specified in Division 8 Sections to match glazing systems required for Project, including glazing methods.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

M. 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. Review temporary protection requirements for glazing during and after installation.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.7 PROJECT CONDITIONS

A. Condition of Other Work: The Glazier must examine the framing or glazing channel surfaces, backing, removable stop design, and the conditions under which the glazing is to be performed, and notify the Contractor of any conditions detrimental to the proper and timely completion of the Work. Start of work will evidence acceptance of conditions.

B. 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 below 40 deg F.

1.8 WARRANTY

A. Manufacturer’s Special Warranty for Coated-Glass Products: Manufacturer’s standard form in which coated-glass 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 on Insulating Glass: Manufacturer’s standard form in which 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 GLASS MATERIALS

A. Include a minimum 15% pre-consumer recycled glass in the prime glass (before coating)

B. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

C. Tempered Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1. (clear), quality q3 (glazing select), kind FT (fully tempered); free of visible tong marks.

D. Patterned Glass: ASTM C 1036, Type II, Class 1 (clear), Form 3; Quality-Q6,, Pattern as selected by Architect

1. Provide Kind FT (fully tempered) as required by local building code.

2.2 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, and complying with other requirements specified.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.

B. Provide 1" insulating glass units composed of two (2) sheets of minimum 3/16" thick glass (ASTM C 1048, Type I, Quality 3) permanently and hermetically sealed together at edges with spacers and sealant to provide a dehydrated air space with -80° F dew point, passing IGCC Test CBA and having ten (10) year warranty.
   1. Provide tempered glass both sides.
   2. Provide low “E” units meeting “performance requirements” of this specification and drawing notes at all exterior wall glazed units.
   3. Where indicated, provide obscure units.

2.3 CERAMIC-COATED SPANDREL GLASS:

A. ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
   1. Glass: Clear float
   2. Ceramic Coating Color: Match Architects sample color chip

2.4 GLAZING MATERIALS:

A. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

B. Compatibility: Select tapes of proven compatibility with other materials with which they will come into contact, including glass products and glazing channel substrates, under conditions of installation and service.

C. Cellular Elastomeric Preformed Gaskets (CE-PG): Extruded or molded closed cell, integral-skinned neoprene of profile and hardness required to maintain seal; complying with ASTM C 509, Type II; black.

D. Polyvinyl Chloride Foam Glazing Tape (PVC-GT): PVC foam tape with adhesive one side and one peel paper liner; Norseal U780, Norton. Other manufacturer’s products will be considered subject to meeting the performance criteria specified herein.

E. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

F. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
G. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

2.5 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Glazing Sealants: All glazing 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 Health Services Standards Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
   4. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
      a. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, use NT.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.6 FABRICATION

A. Cut to size in the shop and key to glazing schedule

B. Permanently mark each lite of safety glazing and fire resistive glazing where seen when installed on the lower right hand corner.

C. 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.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect glass from edge damage at all times during handling, installation and operation of the building. Glass breakage during the guarantee period will be considered a form
of faulty material or workmanship (resulting from edge damage), unless known to result from vandalism or other causes not related to materials and workmanship.

B. Glazing channel dimensions must provide for necessary minimum bite on the glass, minimum edge clearance and adequate sealant thicknesses, with reasonable tolerances. The Glazier is responsible for correct glass size for each opening, within the tolerances and necessary dimensions established.

3.2 INSTALLATION

A. Basic Requirements:

1. Comply with combined recommendations of glazing product manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are shown or specified, and except where manufacturers' technical representatives direct otherwise.
2. Inspect each piece immediately before installation. Do not use pieces which have observable edge damage or face imperfections.
3. Do not attempt to cut, seam, nip or abrade glass which is tempered.
4. Clean the glazing channel, or other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to the substrate.
5. Install setting blocks of proper size at quarter points of sill rabbet.
6. Provide spacers inside and out, and of proper size and spacing, for all glass sizes larger than 50 united inches, except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8” minimum bite of spacers on glass, and use thickness equal to sealant width; except with sealant tape, use thickness slightly less than final compressed thickness of tape.
7. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
8. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
9. Install pressurized tapes and gaskets to protrude slightly out of the channel, so as to eliminate dirt and moisture pockets.

B. Glazing Systems:

1. Glaze lites in labeled assemblies in accordance with UL requirements.
2. Glaze balance of door lites and borrowed lights using setting blocks and PVC-GT or CE-PG having adhesive to stop between glass and stops both sides compressed 35 to 50%.
3. Install mirrors using Palmer mirror mastic in exact accordance with recommendations and bottom supports of aluminum or stainless steel. Do not use reglets.
4. Butt glaze corners were indicated.

3.3 CURE, PROTECTION AND CLEANING
A. Remove and replace glazing products which is broken, chipped, cracked, abraded or damaged in other ways during the construction period, including natural causes, accidents and vandalism.

B. Maintain in a reasonably clean condition during construction, so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other work.

3.4 GLAZING SCHEDULE

A. Glass Type GL-1: Low-e-coated, clear insulating glass. Basis-of Design: Viracon VE1-2M.

1. Overall Unit Thickness: 1 inch.
2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Air.
5. Indoor Lite: Fully tempered float glass
7. Visible Light Transmittance: 70 percent minimum.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
10. Solar Heat Gain Coefficient: 0.38 minimum.
11. Shading Coefficient: .44 minimum.

B. Glass Type GL-2: Kind FT (fully tempered), clear float glass

1. Thickness of glass lite: As required for glass lite size

C. Glass Type GL-3: Kind FT (fully tempered), fire-protective safety glass

1. Thickness of glass lite: As required for glass lite size

END OF SECTION 088000
SECTION 088300 - MIRRORS

1. GENERAL

1. SUMMARY
   A. Section includes the following types of silvered flat glass mirrors:
      1. Annealed monolithic glass mirrors.
   B. Related Sections:
      1. Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

2. ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.
      1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
   B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
   C. Samples: For each type of the following products:
      1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
      2. Mirror Trim: 12 inches (300 mm) long.

3. INFORMATIONAL SUBMITTALS
   A. Qualification Data: For qualified Installer.
   B. Product Certificates: For each type of mirror and mirror mastic, from manufacturer.
   C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing paint and film and substrates on which mirrors are installed.
   D. Warranty: Sample of special warranty.
4. CLOSEOUT SUBMITTALS
   A. Maintenance Data: For mirrors to include in maintenance manuals.

5. 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.
   B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
   C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.
   D. Glazing Publications: Comply with the following published recommendations:
      1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
      2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
   E. Safety Glazing Products: For film-backed mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
   F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing paint, film and substrates on which mirrors are installed.

6. 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.

7. PROJECT CONDITIONS
   A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.
8. **WARRANTY**

A. **Special Warranty:** Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. **Warranty Period:** Five years from date of Substantial Completion.

2. **PRODUCTS**

1. **SILVERED FLAT GLASS MIRRORS**

A. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Arch Aluminum & Glass Co., Inc.
   b. Avalon Glass and Mirror Company.
   c. Binswanger Mirror; a division of Vitro America, Inc.
   d. D & W Incorporated
   e. Donisi Mirror Company.
   f. Gardner Glass, Inc.
   g. Gilded Mirrors, Inc.
   h. Guardian Industries.
   i. Independent Mirror Industries, Inc.
   j. Lenoir Mirror Company.
   k. Maran-Wurzell Glass & Mirror.
   l. National Glass Industries.
   m. Stroupe Mirror Co., Inc.
   n. Sunshine Mirror; Westshore Glass Corp.
   o. Walker Glass Co., Ltd.

B. Clear Glass: Mirror Glazing Quality.

1. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.

2. **Nominal Thickness:** 6.0 mm.

2. **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 manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Laurence, C. R. Co., Inc.
   b. Macco Adhesives; Liquid Nails Division.
   c. Palmer Products Corporation.
   d. Pecora Corporation.
   e. Royal Adhesives & Sealants; Gunther Mirror Mastics Division.
   f. Sommer & Maca Industries, Inc.

2. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. 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 bottom and top edges of each mirror in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm)
   a. Products: Subject to compliance with requirements, provide the following:
      2) Sommer & Maca Industries, Inc.; Aluminum Shallow Nose "J" Moulding Lower Bar.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).
   a. Products: Subject to compliance with requirements, provide the following:
      2) Sommer & Maca Industries, Inc.; Aluminum Deep Nose "J" Moulding Upper Bar.


B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

4. FABRICATION

A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.

B. Cutouts: 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: Flat polished.
   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.

D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections.

3. EXECUTION

1. EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

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. INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Wall-Mounted Mirrors: Install mirrors with mastic 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 (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.

2. Install mastic as follows:
   a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
   b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
   c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface.

4. CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08 83 00
SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
1. Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: Size and gage to meet height of partition requirements. Minimum 25 gauge
   b. Depth: As indicated on Drawings.

2. Dimpled Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: Size and gage to meet height of partition requirements. Minimum 25 gauge
   b. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Provide slip type head joints to allow for deflection top of wall substrate:
   1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Products: Subject to compliance with requirements, provide the following:
         1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
         2) MBA Building Supplies; FlatSteel Deflection Track.
         3) Steel Network Inc. (The); VertiClip SLD Series.
         4) Superior Metal Trim; Superior Flex Track System (SFT).
         5) Telling Industries; Vertical Slip Track.

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Fire Trak Corp.; Fire Trak System.
      b. Grace Construction Products; FlameSafe FlowTrak System.
      c. Metal-Lite, Inc.; The System.

F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

   1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
   2. Depth: 7/8 inch (22.2 mm).

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch (13-mm) wide flanges.

   1. Depth: 3/4 inch (19 mm).
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch (1.59-mm) diameter wire, or double strand of 0.048-inch (1.21-mm) diameter wire.

2.3 SUSPENSION SYSTEMS

   A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch (1.59-mm) diameter wire, or double strand of 0.048-inch (1.21-mm) diameter wire.

   B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

   C. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.

   D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

      1. Products: Subject to compliance with requirements, provide the following:

         b. Chicago Metallic Corporation; Drywall Grid System.
         c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

   A. General: Provide auxiliary materials that comply with referenced installation standards.

      1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

      B. Isolation Strip: Provide Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

   A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches (406 mm).

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
C. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216
SECTION 092713 - GLASS-FIBER-REINFORCED GYPSUM FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes factory-molded, glass-fiber-reinforced gypsum fabrications for interior applications.
   1. Access doors and frames in gypsum board.

B. Related Requirements:
   1. Division 08 Section “Access Doors and Frames” for access doors in non-public areas.
   2. Division 09 Section "Non-Structural Metal Framing" for steel framing, blocking, and bracing supporting glass-fiber-reinforced gypsum fabrications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, weights, dimensions of individual components and profiles, and finishes.

B. Shop Drawings:
   1. Include plans, elevations, sections, and attachment details.
   2. Detail fabrication and assembly of glass-fiber-reinforced gypsum fabrications.

C. Samples: For each exposed product and for each color and texture specified.
   1. Linear Moldings: 24-inch-long section with finished joint. Show complete pattern.

1.3 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. Ceiling suspension assembly members.
   2. Method of attaching hangers to glass-fiber-reinforced gypsum fabrications and to building structure.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, moldings, and other fixtures.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to set quality standards for fabrication and installation.
   1. Build mockup of each type of glass-fiber-reinforced gypsum fabrication.
   2. Paint mockups to match final decoration scheduled or indicated and to comply with requirements specified in other Division 09 Sections.
   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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C 1467/C 1467M.

1.6 FIELD CONDITIONS

A. Environmental Conditions:
   1. Comply with ASTM C 1467/C 1467M.
   2. Do not deliver or install glass-fiber-reinforced gypsum fabrications until building is enclosed, wet work is complete, and HVAC system is operating and continuously maintaining temperature and relative humidity at levels intended for building occupants.

B. Conditioning: Acclimatize glass-fiber-reinforced gypsum fabrications to ambient temperature and humidity of spaces in which they will be installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.

C. Field Measurements: Where glass-fiber-reinforced gypsum fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED GYPSUM FABRICATIONS

A. Manufacturers for Access Panels: Subject to compliance with requirements, provide glass-fiber-reinforced gypsum fabrications by one of the following.
1. Acudor.
2. Castle Access Panel and Forms, Inc.
3. Wind-lock.

B. Fabrications: Molded, glass-fiber-reinforced gypsum units complying with ASTM C 1381/C 1381M.

C. Embedments: As standard with glass-fiber-reinforced gypsum fabrication manufacturer and as required for reinforcement and for anchorage to substrates and framing.

D. Finish: Smooth for paint finish.

2.2 AUXILIARY MATERIALS

A. Adhesives: As recommended in glass-fiber-reinforced gypsum fabrication manufacturer's written instructions and as follows:

1. Adhesive shall have VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Steel Drill Screws: Of sufficient length and size to securely fasten glass-fiber-reinforced gypsum fabrications to framing members, and as follows:

1. Screws complying with ASTM C 1002 for fastening glass-fiber-reinforced gypsum fabrications to steel members less than 0.033 inch thick.
2. Screws complying with ASTM C 954 for fastening glass-fiber-reinforced gypsum fabrications to steel members from 0.033 to 0.112 inch thick.

C. Joint-Treatment Materials: ASTM C 475/C 475M.

2.3 FABRICATION

A. Fabricate glass-fiber-reinforced gypsum units to comply with ASTM C 1381/C 1381M, with smooth-finished surfaces; repair hollows, voids, scratches, and other surface imperfections. Fabricate units in lengths and sizes that will minimize number of joints between abutting units.

B. Embedments: Incorporate embedments into units to develop the full strength of glass-fiber-reinforced gypsum fabrications. Cover embedments with not less than 3/16-inch thickness of glass-fiber-reinforced gypsum composite.

C. Connection Hardware: Designed and fabricated to support and connect glass-fiber-reinforced gypsum fabrications to hangers, support framing, and substrates.
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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GLASS-FIBER-REINFORCED GYPSUM INSTALLATION

A. Comply with ASTM C 1467/C 1467M.

B. Install glass-fiber-reinforced gypsum fabrications level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

C. Attach glass-fiber-reinforced gypsum fabrications to framing and substrates with steel drill screws unless otherwise indicated. Do not use pneumatic staple guns. Countersink screw heads below adjoining finished surface.

1. Predrill fastener holes in units. Clean fastener holes to remove dirt and oil.
2. Locate fasteners not less than 5/16 inch from edges or ends of units.

D. Where glass-fiber-reinforced gypsum fabrications are joined to form composite units, join fabrications with adhesive. Band or brace units together until adhesive cures.

E. Use joint-treatment materials to finish glass-fiber-reinforced gypsum fabrications to produce surfaces ready to receive primers and paint finishes specified in other Division 09 Sections.

1. Finish joints between units, other than control joints, and countersunk fastener heads to comply with ASTM C 840 for Level 4, unless otherwise indicated to be installed in a Level 5 wall or ceiling, and to match surface texture of units.
2. Repair hollows, voids, scratches, and other surface imperfections on units.

END OF SECTION 092713
SECTION 092900 - GYPSUM BOARD

1. GENERAL

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.

2. SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Cementitious backer units for ceramic tile
   3. Trim
   4. Joint treatment
   5. Auxiliary materials

B. Related Requirements:
   1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
   2. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
   3. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.

3. ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

4. QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Install mockups for the following:
a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.

3. Simulate finished lighting conditions for review of mockups.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

5. DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

6. FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer’s written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

2. PRODUCTS

1. PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying 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."

2. GYPSUM BOARD, GENERAL
   A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
   B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
   C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site.
   D. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

3. INTERIOR GYPSUM BOARD
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. American Gypsum.
      2. CertainTeed Corp.
      3. Georgia-Pacific Gypsum LLC.
      4. Lafarge North America Inc.
      6. USG Corporation.
   B. Gypsum Wall and Ceiling Board, Type X: ASTM C 1396/C 1396M.
      1. Thickness: 5/8 inch (15.9 mm).
      2. Long Edges: Tapered
   C. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
      1. Core: 5/8 inch (15.9 mm), Type X.
      2. Long Edges: Tapered.
      3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

4. TILE BACKING PANELS
   A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. C-Cure; C-Cure Board 990.
   b. Custom Building Products; Wonderboard
   c. FinPan, Inc.; Util-A-Crete Concrete Backer Board
   e. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch (15.9 mm)

3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

5. TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet
   2. Shapes:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.
      g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. High Strength Corner Trim: Provide at all outside corners not receiving solid surface wall protection.
   1. Extruded aluminum corner profile with 1 ¼” faces plus 7/8” fins for 2 1/8” by 2 1/8” total dimension.
      a. Fins shall be tapered to edges and provided with staggered screw holes for fastening to framing.
      b. Fins shall be primed with corrosion-resistant primer and shall have continuous extruded grooves for increased bonding surface.
   2. Product: Pittcon Softforms Model #SO-HSE-90 or equal.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
      a. Fry Reglet Corp.
      b. Gordon, Inc.
      c. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

6. JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound
   a. At Contractor’s option, a high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish may be used for final coat at Level 5 finish areas.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.
7. AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Laminating adhesive shall 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."

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
   2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Acoustical joint sealant shall 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. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

3. EXECUTION

1. EXAMINATION

   A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

2. APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for
locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3. APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the locations indicated in the drawings:
   1. At fire-rated partitions, comply with installation details and sequences required by listing authority for listed assembly.
   2. At acoustic-rated partitions, comply with installation details and sequences required by listing authority for listed assembly

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

4. APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

5. APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile and as indicated.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

6. INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer’s written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges
3. L-Bead: Use where indicated
4. U-Bead: Use where indicated.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

E. Aluminum Trim: Install in locations indicated on Drawings.
7. **FINISHING GYPSUM BOARD**

   A. **General:** Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

   B. Prefill open joints, beveled edges, and damaged surface areas.

   C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

   D. **Gypsum Board Finish Levels:** Finish panels to levels indicated below and according to ASTM C 840:

      1. **Level 1:** Ceiling plenum areas, concealed areas, and where indicated.
      2. **Level 2:**
         a. Panels that are substrate for tile
         b. Panels that are substrate for applied wall panels or millwork
      3. **Level 4:** At panel surfaces that will be exposed to view unless otherwise indicated.

   E. **Cementitious Backer Units:** Finish according to manufacturer’s written instructions.

8. **PROTECTION**

   A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

   B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

   C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

      1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
      2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900
SECTION 093000 - TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: tile as indicated on new surfaces as specified.

1.2 SUBMITTALS

A. Samples:
   1. Submit samples of colors and sizes of tile.

B. Product Data:
   1. Submit printed data and installation instructions for proprietary setting beds, grouts, and cleaning materials.
   2. Submit color charts for grouts.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: A party experienced in the installation of tile as evidenced by successful installation for a minimum period of five (5) years.

B. Preinstallation Conference: Conduct preconstruction conference at the project site.
   1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review special designs and patterns.
   4. Review dust-control procedures and required environmental conditions.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials on the site in a dry location, in original containers, with seals unbroken and labels intact, in accordance with the manufacturer's directions until time of use.

1.5 PROJECT CONDITIONS

A. Existing Conditions: Inspect substrate and conditions under which work is to be installed and report any condition detrimental to the successful or timely installation to the Contractor. Start of Work will evidence acceptance of conditions.

B. Environmental Conditions:
1. Do not begin Work until the space is enclosed, ventilated and maintained between the temperatures of 55°C and 90°C.
2. Do not install materials until surface temperatures are between 60 and 80°C.

C. Protection:
1. Close all areas to traffic during installation of floor.
2. Cover floor with Kraft paper after completion of Work and maintain paper in position.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Factory-mounted Unglazed Porcelain Mosaic Tile: Comply with the requirements of ANSI A137
   1. Basis of Design is American Olean Unglazed Porcelain Mosaic, 2"x2", color A33 “Charcoal”. Provide basis of design or equal product by one of the following:
      a. Dal Tile.
   2. Color and size: 2"x2", color A33 “Charcoal”.
   3. Trim: Provide all trim shapes, bull-nose, cove, and corners of matching characteristics, sizes and coursing.
   4. Grout color: Basis of Design: Mapei 47+ Charcoal

B. Setting Materials
   1. Liquid Latex: Conform to ANSI A118.4, product of same manufacturer as grout.
   2. Latex Dry-Set Mortar: A proprietary factory premix consisting of sand, Portland cement and latex additives conforming to ANSI 118.4.
      a. Manufactured by one of the following:
         1) Bostik; Hydroment Single Step.
         2) Custom Building Products; Custom Multi-Purpose Thin-Set Mortar.
         3) H.B. Fuller; Full Flex.
         4) Laticrete; 4237.
         5) Mapei; Ultra/Flex.
         6) Summitville; S-1000.
   3. Mortar with Liquid Latex Additive: A proprietary factory premix consisting of sand, Portland cements and mixed with a liquid latex additive conforming to ANSI 118.4. Manufactured by one of the following:
      a. Bostik; Hydroment Tile Mate 760 with Hydroment 497.
      b. Custom Building Products; Master Blend with Acrylic Mortar Admix.
      c. TEC; Tec Thin Set with xtra flex additive.
      d. Laticrete; Dry Bond with Laticrete 272.
      e. Mapei; Kerabond with Keralastic

C. Grout Materials
1. Polymer-Modified Tile Grout: ANSI A118.7: Fine aggregate, fast-setting, polymer-modified, color-consistent, non-shrinking, efflorescence-free grout for joint widths from 1/16" to 3/4" (1.5 to 19 mm).
   a. Higher polymer content, High-hydrated cement product to reduce absorption and increase stain resistance.
   b. Basis-of-Design Product: Mapei Ultracolor Plus FA, 47+ Charcoal. Provide basis of design or equal matching product manufactured by one of the following:
      1) Bostik; Hydroment Plus.
      2) Custom Building Products; Polyblend Sanded.
      3) H. B. Fuller; Accucolor sanded.
      4) Laticrete; Tri-Poly Fortified.

2.2 TILE BACKING PANELS

   A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.
      1. Products: Subject to compliance with requirements, provide one of the following:
         a. C-Cure; C-Cure Board 990.
         b. Custom Building Products; Wonderboard.
         c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
         d. USG Corporation; DUROCK Cement Board.
      2. Thickness: 5/8 inch (15.9 mm)

   B. Miscellaneous Materials:

2.3 MIXES

   A. Latex Modified Dry-Set Mortar: Follow manufacturer's directions for mixing latex modified dry-set mortar.

   B. Mortar with Liquid Latex Additive: Follow manufacturer's directions for mixing liquid latex and thin set mortar.

   C. Latex Modified Premix Grout: Commercial premix grout to which liquid latex is added in lieu of water as recommended by grout manufacturer or factory pre-mixed latex ingredient.

PART 3 - EXECUTION

3.1 PREPARATION

   A. Protect floors and other adjacent surfaces prior to beginning work.

   B. Sand substrate to receive new tile to ensure bond. Level and reshape with latex dry set mortar.
C. Dampen concrete and masonry for dry-set applications, leaving no standing water.

3.2 INSTALLATION, GENERAL

A. ANSI tile installation standards: Comply with parts of ANSI A108 Series “Specifications for Installation of ceramic Tile” that apply to the type of setting and grouting materials and to methods required.

B. TCNA Installation Guidelines: Comply with TCNA’s “Handbook for Ceramic Tile Installation” for the installation methods required.

3.3 INSTALLATION OF WALLS

A. Latex Modified Dry-Set Mortar Application use on concrete block and use on tile backer board:
   1. Mix ingredients according to manufacturer's printed instructions.
   2. Apply using size of notched trowel recommended by adhesive manufacturer.
   3. Apply tile and beat in within 20 minutes of notching wall, maintaining uniform joints.

3.4 GROUTING OF WALLS

A. Use the following grout materials:
   1. Unglazed Porcelain Ceramic Mosaic Tile: Latex modified commercial premix grout.

B. Mix ingredients as hereinbefore specified. Do not add other ingredients or excessive water.

C. Completely fill joints.

D. Remove excess grout leaving joint to depth of cushion.

E. Damp cure dry set grout 2 hours, minimum.

3.5 INSTALLATION OF FLOORS

A. Latex Modified Dry-Set Mortar Application:
   1. Waterproofing/Antifracture Membrane:
      a. Trowel Applied Membrane: Mix ingredients in accordance with manufacturer's directions.
      b. Apply in exact accordance with manufacturer's instructions.
      c. Install sheet membranes in mortar recommended by membrane manufacturer.

   2. Mixing Mortar:
      a. Mix mortar ingredients thoroughly before adding water as required. Carefully work in sufficient water as required to obtain desired consistency.
      b. Use caution in mixing to get complete wetting and homogeneity.
      c. Rework mixes from time to time to maintain proper consistency, but do not add additional ingredients. Discard mortar that has reached its initial set.
3. Install Transition systems at each change of floor material.

4. Applying Mortar:
   a. Using the flat side of the trowel, apply with pressure, a layer of mortar to form a thickness of at least 1/8-inch. Cover surface evenly with no bare spots. Do not apply mortar more than 30 minutes before it can be covered with tile.
   b. Immediately before placing tile, comb the mortar diagonally to the direction of the grout lines with the notched trowel.

5. Setting Tile:
   a. Place tile on the freshly notched mortar and beat into a true level and to form complete contact with the mortar. Periodically raise one tile to insure that full contact is being attained and that the final thickness of the mortar bed is not less than 3/32”.
   b. If paper faced, remove paper and glue from tile within one hour after tile is set and adjust all tiles that are out-of-line or level. Use no more water than necessary in removing paper and glue.
   c. As work progresses, make adjustments of out-of-line tile and wipe mortar smears from the surface. When making adjustments, beat in all loosened tiles.
   d. Remove mortar in joints within 1/8” of face of tile.

3.6 GROUTING OF FLOORS

A. Latex Modified Commercial Premix Grout:
   1. Mix ingredients as hereinbefore specified. Do not add other ingredients or an excessive amount of water. Do not mix more grout than can be installed in one hour.
   2. Completely fill joints.
   3. Remove excess grout leaving joint to depth of cushion.

B. Portland Cement Mortar Application of Floors:
   1. Lay cleavage membrane over slab depression for Membrane/Portland Cement application. Lap all edges and ends to form continuous membrane.
   2. Lay welded wire mesh over cleavage membrane.
   3. Install 1/4” expansion joints around perimeter of room, all protruding surfaces, and in the field of the floor as recommended by TCNA.
   4. Mixing Portland Cement Mortar:
      a. Mix mortar ingredients thoroughly before adding water.
      b. Carefully work in sufficient water to obtain desired consistency.
      c. Use caution in mixing to get complete wetting and homogeneity. Rework mixes from time to time to maintain proper consistency, but do not add excessive water. Discard mortar that has reached its initial set.

5. Installation of Mortar Bed:
   a. Install mortar on floor in sufficient thickness to allow for tamping.
   b. Tamp heavily to compact bed.
   c. Screed to proper plane.
   d. Install only as much bed as can be covered in one day.
6. After mortar bed is cured, install tile in accordance with latex modified dry-set mortar application specified hereinbefore.

3.7 CLEANING

A. Use commercially available compounds formulated for the purpose or use diluted sulfammic acid as acceptance to tile manufacturer.

B. If acid based products are used, allow grout to cure a minimum of 3 days and thoroughly rinse the floor.

END OF SECTION 093000
SECTION 096466 - WOOD GYMNASIUM FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Wood gymnasium floor as shown and as specified.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s specifications and installations for gymnasium flooring system. Include instructions for handling, moisture protection, anchorage, finishing, protection and maintenance. Demonstration compliance with performance requirements.
   1. Submit color charts for game line paint.

B. Samples: Provide 3 samples, minimum 1 ft. long demonstrating extremes in color and grain.

C. Mock-Up: Submit mock-up of system, minimum one-foot square having specified finish.

1.3 QUALITY ASSURANCE

A. Installer: A specialized gymnasium flooring firm, with not less than 3 years successful experience in the installation of the types of flooring required and acceptable to the manufacturer.

B. General Standards: Comply with MFMA standards and recommendations for flooring, including grading rules and comply with WSFI standards and recommendations applicable to materials and methods of installation, except as otherwise indicated.

C. Tolerance: Level gymnasium flooring to a tolerance of 1/8” in 10’-0”.

1.4 DELIVERY, STORAGE AND HANDLING

A. Protect wood flooring from excessive moisture in shipment, storage and handling. Deliver in unopened bundles and store in a dry place, with adequate air circulation. Do not deliver materials to building until “wet work” such as concrete and plaster have been completed and cured to a condition of equilibrium.
1.5 PROJECT CONDITIONS

A. Existing Conditions: Examine the substrates on which flooring will be installed, and the conditions under which the Work will be performed, and notify the Contractor of conditions detrimental to the proper completion and maintenance of wood flooring. Start of Work will evidence acceptance of conditions.

B. Conditioning: Do not proceed with the delivery and installation of wood flooring until after the spaces to receive flooring have been enclosed and are dry and maintained at approximately the same humidity conditions as planned for occupancy. Place wood flooring materials in the rooms or spaces to be floored 7 days in advance of the start of installation. Open packages of wood flooring, which are sealed if any to permit natural adjustment of moisture content. Maintain ambient temperatures in range of 60 to 90 degrees F prior to, during and after the installation of wood flooring.

PART 2 - PRODUCTS

2.1 MANUFACTURER/SYSTEM

A. Basis-of-Design Product: Basis-of-Design is Bio-Channel System by Robbins Sports Flooring. Subject to compliance with requirements, provide basis-of-design product or equal product by one of the following:
   1. Action Channel Flex Ultra NR by Action Floor
   2. Rezill-Channel by Connor AGA

2.2 MATERIALS

A. Wood Strip Flooring:
   1. Grade, Cut, and Species: Comply with MFMA grading rules for the following:
      a. Grade: B.
      b. Cut: Flat-grain.
      c. Species: Hard Maple
   2. Lengths: Comply with MFMA grading rules.
   3. Matching: Tongued and grooved and end matched.
   4. Back Channeling: Back channel each piece in accordance with manufacturer’s standards, except when specifically recommended by manufacturer to be plain backed for the application indicated.
   5. Seasoning: Kiln-dried before milling.

B. Subfloor: Pre-assembled panels constructed of two layers of 1/2” CD exterior grade plywood.

C. Resilient Pads: Required to meet performance requirements.

D. Channel: At least 16 – gauge steel.

E. Steel Anchors: 1-1/4” long pins (or longer as dictated by site conditions) applied with an air driven or low velocity powder actuated tool.
F. Vapor Barrier: 6-mil polyethylene.

G. Flooring Fasteners: 2" barbed cleats or 2" epoxy coated staples.

H. Wall Base: 4" x 3" heavy duty, molded, vented rubber cove base with pre-molded outside corners.

I. Finish: Use manufacturer’s standard oil modified polyurethane sealer and finish.

J. Paint: Use manufacturer’s standard game line paint. Provide 8 colors to match architect’s samples.
   1. Volleyball court lines – 2 colors
   2. Large Basketball Court Lines – 2 colors
   3. Small Basketball Side Court – 1 color
   4. Chicago Park District Logo – 3 colors

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Comply with flooring manufacturer’s instructions and recommendations for the applications indicated and specified, but not less than MFMA standards and WSFI standard.

B. Pattern Direction: Lay flooring lengthwise with space to be floored, except as otherwise indicated.

C. Expansion Spaces: Provide space as indicated or required by instructions and standards, at walls and other obstructions, interruptions and terminations of flooring. Cover spaces with bases, trim, saddles, and thresholds, except fill flush with cork expansion strip whenever indicated to be uncovered.

D. Dryness: Before proceeding with the installation of gymnasium flooring over concrete substrate, check for dryness. If not sufficiently dry, as determined by Installer, continue to dry substrate, or provide extra moisture protection for flooring.

3.2 INSTALLATION

A. Install moisture barrier, vapor barrier with mastic sealed lapped joints.

B. Fasten first row of Channels to concrete perpendicular to finish flooring with steel anchors driven approximately 14" on center along base of Channels, fastening pins within 3" of Channel ends.

C. Place subfloor panels with resilient pads attached parallel to Channels, breaking end joints 1/4". Capture exposed side edges of subfloor panels with adjacent Channels.
   1. Align each adjacent row of subfloor panels to form continuous 45° end joints throughout the subfloor assembly.
D. Fasten each row of Channels with ends offset 4’ from previous rows, capturing lower subfloor side edges along each preceding row.

E. Install flooring parallel to main playing court by power nailing or stapling approximately 12” on center.
   1. Size joints between flooring strips to allow for intermediate expansion, in accordance with local humidity conditions.
   2. Provide 1½” expansion voids at the perimeter and at all vertical obstruction.

3.3 SANDING AND FINISHING

A. Allow installed gymnasium flooring to acclimate to ambient conditions for a minimum period of 10 days before sanding.

B. Machine-sand with coarse, medium and fine grades of sandpaper, followed by disc sanding with 000 sandpaper. Clean with power vacuum, and check to confirm that entire surface of each piece has been sanded, and that floor is level and smooth, without ridges or cups. Proceed immediately with finish.

C. Apply floor finish in accordance with manufacturer’s instructions, including two coats of penetrating sealer of the type recommended. Apply coats of finish. Buff between each coat. Prevent traffic on finished floor for a minimum of 10 days.

D. Prior to application of last coat of low finish, layout lines, fields and other markings. Mask flooring to provide sharp edges. Apply gym enamel in 1.0 mil thickness, in colors as indicated, or to be selected by Architect.

E. Install expansion base trim and other cove trim as indicated, for expansion spaces at edges and interruptions of flooring.

3.4 PROTECTION

A. Installer shall advise the Contractor of procedures required for protection of gymnasium flooring during remainder of construction period, so that flooring and finish will be without damage or deterioration at time of acceptance.

END OF SECTION 096466
SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Resilient base indicated and as specified.

1.2 SUBMITTALS

A. Product Data: Product data for each type of product specified.

B. Samples: Submit samples in manufacturer's standard sizes, but not less than 4 inches long, of each different color and pattern of product specified.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility for Products: Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Fire Performance Characteristics: Provide products with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

   1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
   2. Smoke Density: Less than 450 per ASTM E 662.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).

C. Move products into spaces where they will be installed at least 48 hours in advance of installation.

1.5 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive products specified in this Section for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
B. Do not install products until they are at the same temperature as that of the space where they are to be installed.

C. Close spaces to traffic during installation of products specified in this Section.

1.6 SEQUENCING AND SCHEDULING

A. Sequence installing products specified in this Section with other construction to minimize possibility of damage and soiling during remainder of construction period.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Not less than ten (10) linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product: Basis-of-design: Johnsonite Traditional Rubber Wall Base. Subject to compliance with requirements, provide basis of design or products by one of the following.

1. Armstrong.
2. Burk Mercer
3. Roppe.
4. VPI.

2.2 RESILIENT BASE

A. Rubber Wall Base: Complying with ASTM F 1861, Type TP, Group I, solid.

1. Height: 4 inches (102 mm)
2. Thickness: 1/8 inch (0.125 inch, 2.2 mm)
3. Lengths: 120-foot rolls
4. Style: Top set coved base
5. Finish: Matte.
7. Exterior Corners: Pre-formed.
8. Interior Corners: Pre-formed.
10. Color: Johnsonite 40 Black B.

2.3 INSTALLATION ACCESSORIES

A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient flooring product and substrate conditions indicated.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where installation of products specified in this Section will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section.

1. Notify Contractor of any unsatisfactory conditions and verify correction of defects prior to commencing work.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications for preparing substrates indicated to receive products indicated.

B. Use trowelable patching compounds per manufacturers directions to fill cracks, holes, and depressions in substrates.

C. Clean substrates to be covered immediately before installing products specified in this Section. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.3 INSTALLATION

A. General: Install products specified in this Section using methods indicated according to manufacturer's installation directions.

B. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

1. Install inside and exterior corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers of resilient product involved.

2. Damp-mop resilient accessories to remove black marks and soil.

B. Protect against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096513
SECTION 099100 - FINISH PAINTING

1. GENERAL

1.1. SUMMARY

A. This Section includes requirements for field painting of new construction including the following:
   1. Exterior and interior exposed items and surfaces.
   2. Priming, and finish coats in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the surface or material is specifically indicated not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1.2. DEFINITIONS

A. Standard coating terms defined in ASTM D 16 apply to this Section.

1.3. SUBMITTALS

A. Samples: Submit three (3) drawdowns of each product and color combination. Drawdowns shall be applied using a 4 mil wet drawdown bar on Leneta form WD plain white coated cards size 3-7/8” x 6”
   1. Label each card with the following:
      a. Job name
      b. Date
      c. Product name
      d. Product number
      e. Color number as stated in the color schedule
      f. Name, address, and phone number of the supplying facility.
   2. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
   3. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

B. Qualification Data: When requested, submit qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
1.4. REGULATORY REQUIREMENTS

A. It shall be the responsibility of the contractor to comply with all applicable regulations, laws and building codes of all governing Federal, State and Local agencies.

1.5. QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
a. After finishes are accepted, the Architect will use the room to evaluate coating systems of a similar nature.
3. Final approval of colors will be from job-applied samples.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7. PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.
B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

D. Apply paint to acoustical decking before batt insulation is installed in deck cells.

1.8. EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
   1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. of each material and color applied. Mark each container with color identification and room names or numbers where paint was used without obscuring manufacturer’s label.

2. PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
   1. ICI Dulux/Devoe Coatings (ICI – Dulux)
   2. Benjamin Moore and Co. (B. Moore)
   3. PPG Industries, Pittsburgh Paints (PPG)
   4. The Sherwin-Williams Company (S-W)

2.2. PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other specified manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

B. Colors: Provide color selections made by the Architect. Refer to Drawings for pre-established colors. Colors not established in the drawings will be selected by Architect.
2.3. EXTERIOR PAINT SCHEDULE

A. Wood Color coat
   1. Primer: Dry film thickness of not less than 1.5 mils (0.038 mm).
      
      B. Moore: Moorcraft Super Spec Latex Exterior Primer #169
      ICI Dulux: #2010 Ultra Hide Durus 100% Acrylic Prime Coat.
      PPG: Speedhide Exterior Acrylic Latex Primer, 6-609.
      S-W: A-100 Latex Wood B42.

   2. First and Second Coats: Two (2) full and separate coats, dry film thickness of not less than 2.2 mils (0.056 mm).
      
      B. Moore: Moorcraft Super Spec Flat Latex House Paint #171
      ICI Dulux: #2210 Ultra Hide Durus 100% Flat.
      PPG: Speedhide Exterior Flat Latex, 6-610 Series.
      S-W: A-100 Acrylic B12WF series.

B. Ferrous Metal:
   1. Exterior ferrous metal items are shop galvanized: Condition and prime if necessary in accordance with recommendations of paint system manufacturer.
   2. Primer: Remove spot rust and contaminants with mineral spirits, sanding and wire brushing to bare metal. Dry film thickness of not less than 1.3 mils (0.033 mm).
      
      B. Moore: IMC DTM Acrylic Semi-Gloss M29
      ICI Dulux: #4020 Devlex DTM Waterborn Primer.
      PPG: Pitt-Tech Primer 90-715

   3. First and Second Coats: Two (2) full and separate coats, dry film thickness of not less than 2.6 mils (0.066 mm)
      
      B. Moore: IMC DTM Acrylic Semi-Gloss M29
      PPG: Pitt-Tech Int/Ext Satin DTM Industrial Enamel, 90-

      474 series.

2.4. INTERIOR PAINT SCHEDULE

A. Gypsum Board (Overhead Ceiling and Soffits):
   1. Primer dry film thickness of not less than 1.2 mils (0.031 mm).

      B. Moore: Pristine Eco Spec Interior Latex Primer Sealer #231
      ICI Dulux: #LM9116 Lifemaster 2000 Primer Sealer.
      PPG: Pure Performance Interior Low Odor Zero VOC Premium

      Latex Primer 9-2.
      S-W: Harmony Interior Primer B11WS00.
2. **First and Second Coats**: Two (2) full and separate coats, dry film thickness of not less than 2.5 mils (0.064 mm).

   B. Moore: Pristine Eco Spec Interior Latex Flat #219
   S-W: Harmony Interior Latex Flat B5W900 series.

B. **Gypsum Board (Mechanical Rooms and Janitor's Closets) (Epoxy)**
1. **Primer**: Dry film thickness of not less than 1.2 mils (0.031 mm).

   B. Moore: Pristine Eco Spec Interior Latex Primer Sealer #231.
   ICI Dulux: #LM9116 Lifemaster 2000 Primer Sealer.
   S-W: Harmony Interior Primer B11WS00.

2. **First and Second Coats**: Two (2) full and separate coats, dry film thickness not less than 2.5 mils per coat: 2-component waterbased catalyzed epoxy, Min. Volume Solids: 38% (catalyzed), Sheen: 20-30 units @60 degrees.

   B. Moore: IMC Acrylic Epoxy Gloss Coating M43/M44.
   S-W: Water Based Catalyzed Epoxy B70 series/B60V25.
   ICI Dulux: TruGlaze WB Waterborne 00.

C. **Gypsum Board (unless scheduled otherwise)**
1. **Primer**: Dry film thickness of not less than 1.2 mils (0.031 mm).

   B. Moore: Pristine Eco Spec Interior Latex Primer Sealer #231.
   ICI Dulux: #LM9116 Lifemaster 2000 Primer Sealer.
   S-W: Harmony Interior Primer B11WS00.

2. **First and Second Coats**: Two (2) full and separate coats, dry film thickness of not less than 2.8 mils (0.071 mm).

   B. Moore: Pristine Eco Spec Interior Latex Eggshell Enamel #223

D. **Field Painted Woodwork and Hardboard:***
1. **Primer**, dry film thickness of not less than 1.4 mils (0.036 mm).

   B. Moore: Pristine Eco Spec Interior Latex Primer Sealer #231
   ICI Dulux: #LM9116 Lifemaster 2000 Primer/Sealer.
2. First and Second Coats: Two (2) full and separate coats, dry film thickness of not less than 2.8 mils (0.071 mm).

   B. Moore: Pristine Eco Spec Interior Latex Eggshell Enamel #223
   ICI Dulux: #LM9300 Lifemaster 2000 Eggshell Finish
   PPG: Pure Performance 9-411.

E. Overhead Exposed Construction (Deck, Joists, Steel beams)
1. One (1) coat flat dry fallout coating system to cover formulated for compatibility with all substrates by any paint manufacturer specified herein. Use 100% Acrylic, flash-rust-resistance dryfall. Apply paint to acoustical decking before batt insulation is installed in deck cells.

   B. Moore: Sweep-Up Spray Latex Flat M53
   ICI Dulux: #1280 Spraymaster Pro-Uni-Grip – WB Aquacrylic Dryfall Flat (or non-flat if required to meet VOC limits).
   S-W: Waterborne Acrylic Dryfall B42W2-Eg-Shel
   PPG: Speedhide Flat 6-713 Series Dryfall (or non-flat if required to meet VOC limits)

F. Railings - High Performance Paint System:
1. Zinc-rich shop primer. Provide compatible field spot primer if differing producer.
2. Remove loose primer all rust and surface contaminants to ensure bond.

   B. Moore: IMC M08/M09 Waterborne Epoxy Primer
   ICI Dulux: ICI Devoe 302H Catha-Coat Reinforced Inorganic Zinc Primer
   PPG: Moisture Cure Urethane Zinc-Rich Primer, UC6 5147/97-674 or Aquapon Zinc Rich Epoxy Primer 97-670
   S-W: Corothane I Galvapal Zinc Primer

4. Intermediate Coat – 5.0 mils Dry Film Thickness (two coats on galvanized surfaces)

   B. Moore: IMC M43/M44 Acrylic Epoxy Coating
   ICI Dulux: Bar Rust #231 Multi-Purpose Epoxy Mastic
   PPG: Aquapon Epoxy HB Polyamide 97 130 Series
   S-W: Macropoxy 646

5. Top Coat – 4.0 Mils Dry Film Thickness

   B. Moore: IMC DM74/DM75 Aliphatic Urethane Acrylic Urethane Gloss
   ICI Dulux: Devoe 378 Devthane Aliphatic Urethane
   PPG: Pittthane High Build Urethane, 95 8800 Series
   S-W: Acrolon Multi-Mil
6. Protective Coat – 1.5 mil Dry Film Thickness

B. Moore: IMC CM74-00/DM75 Aliphatic Urethane Clear Gloss
ICI Dulux: Devoe 379 Clear, Aliphatic Urethane
PPG: Pitthane 35 Gloss Urethane Enamel, 95-8000
S-W: Diamond Clad

G. Ferrous Metal, except as otherwise scheduled:
1. Primer: Dry film thickness of not less than 1.5 mils (0.038 mm).

   B. Moore: M04 Acrylic Metal Primer.
   ICI Dulux: #4020 Devflex DTM Waterborne Primer/Finisher.
   PPG: Pitt-Tech Primer 90-715.
   S-W: Pro-Cry Universal Metal Primer B66-310 series.

   2. First and Second Coat: Two (2) full and separate coats dry film thickness of not less than 1.3 mils (0.033 mm).

      B. Moore: Pristine Eco Spec Interior Latex Semi-Gloss Enamel #224

H. Exposed Concrete clear coat
1. Two coats spray-applied acrylic concrete sealer.

   B. Moore: Super Spec HP Clear Acrylic Sealer (P27)
   S-W: H&C Concrete Stain Water Based Clear
   PPG: Perma-crete Plex-Seal WB Interior/Exterior Clear Sealer

I. Exposed Concrete Color coat (Epoxy)
1. Primer: Dry film thickness of not less than 1.2 mils (0.031 mm).

   B. Moore: Pristine Eco Spec Interior Latex Primer Sealer #231.
   ICI Dulux: #LM9116 Lifemaster 2000 Primer Sealer.
   PPG: Premium Latex primer 9-2
   S-W: Harmony Interior Primer B11WS00.

   2. First and Second Coats: Two (2) full and separate coats, dry film thickness not less than 2.5 mils per coat: 2-component waterbased catalyzed epoxy, Min. Volume Solids: 38% (catalyzed), Sheen: 20-30 units @60 degrees.

      B. Moore: IMC Acrylic Epoxy Gloss Coating M43/M44.
      S-W: Water Based Catalyzed Epoxy B70 series/B60V25.
      ICI Dulux: TruGlaze WB Waterborne 00.
3.EXECUTION

3.1. EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
   1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2. PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
      a. Use low dust emission wet methods to prepare the surface as recommended by the paint manufacturer.
      b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
      c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
   a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when using low dust emission, wet method and when dried.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent environmentally friendly or mechanical cleaning methods that comply with the Steel Structures Painting Council’s (SSPC) recommendations.
   a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer and spot prime with rust-inhibitive metal primer recommended by the topcoat manufacturer. Primer coats should be applied without delay, before rust reappears, with rust inhibitive primer.

5. Galvanized Surfaces: Clean per SSPC-SP1 with non-hydrocarbon solvent such as Simple Green. Weathered, unpainted galvanized metal surfaces must be wire brushed or power washed to remove deposits of "white rust," then primed with an acrylic latex metal primer. Rusted areas must be sanded clean, and spot primed with an acrylic latex metal primer, then coated overall with same. Peeling and scaling paint and chalk must be removed by scraping, sanding and wirebrushing. Rusted and abraded surfaces must be cleaned by scraping, sanding, and wirebrushing, then primed, without delay, with an acrylic latex metal primer.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
   2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
   3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3. APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
   1. Paint colors, surface treatments, and finishes are indicated in the schedules.
   2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
   3. Provide finish coats that are compatible with primers used.
   4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convектор covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.

7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

9. Sand lightly using low-dust emission wet methods between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. Omit primer on metal surfaces that have been shop primed and touchup painted.

3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Allow sufficient time between successive coats to permit proper drying as per manufacturer's recommendations.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.

2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as defined in these specifications and as recommended by the manufacturer (whichever is greater).

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Piping, pipe hangers, and supports.
3. Tanks.
4. Ductwork.
5. Insulation.
6. Motors and mechanical equipment.
7. Accessory items.

G. Electrical items to be painted include, but are not limited to, the following:
1. Conduit and fittings.
2. Switchgear.
3. Panelboards.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4. FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5. CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site in accordance with the Waste Management plan.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

B. The testing agency will perform on site and laboratory tests for the following characteristics as required by the board:
1. ASTM D3359 and D6677 Adhesion Tests.
2. Film thickness tests.
3. Quantitative materials analysis.
4. Apparent reflectivity.
5. Washability.
6. Dry Capacity.

3.6. PROTECTION

A. Confine dust and odor emissions by using low-dust wet methods. If this is insufficient, the contractor must use barriers, containment and HEPA filtered negative air equipment to limit migration of dust and odors beyond the work areas.

B. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

C. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
   1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 099100
SECTION 101100 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Tackboard assemblies

1.2 SUBMITTALS

A. Product Data: Submit complete printed data and installation details indicating products to be provided as specified.
   1. Submit color charts for selections by the Architect.

B. Shop Drawings: Submit complete installation details. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.

C. Samples: Submit minimum one-foot square fabricated unit of each type required, complete with factory-applied trim, chalk rail and head rail with accessories as specified for each type of unit demonstrating fabrication.

1.3 PROJECT CONDITIONS

A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting where required. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.4 WARRANTY

A. Two year warranty against defects in materials and installation, including colorfastness of bulletin board surface.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements and availability, provide products by one of the following:
   1. Forbo
   2. Approved equal

2.2 MATERIALS

A. Plastic-Impregnated Cork Tackboards: Seamless sheet, 1/4-inch- (6.4-mm-) thick, ground natural cork compressed with a resinous binder with washable vinyl finish and
integral color throughout, laminated to burlap backing. Provide color and texture as scheduled or as selected from manufacturer's standards.

1. Basis of Design: Forbo Bulletin Board

2.3 ACCESSORIES

A. Backing board: ½ inch hardboard

B. Adhesives: Manufacturer’s standard adhesive to provide permanent bond

2.4 FABRICATION

2.5 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

2.6 TACKBOARD ASSEMBLIES

A. Plastic Impregnated Cork Board:

1. 1/4" thick resilient tackable composite of linseed oil, rosin ground cork and jute factory laminated to 1/2" thick hardboard backing.

   a. Product: Basis of design is Forbo Bulletin Board. Provide basis of design or equal product.

   1) Color: 2162 Duck Egg"

   b. Refer to Material Finish Schedule on Drawings

2. Trim: Trimless installation, all edges factory-cut straight and true to specified sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.

1. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate.

2. Do not proceed with installation until unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Deliver factory-built units completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting heights indicated tight to surface, secure, and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.3 ADJUSTING AND CLEANING

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units according to manufacturer's written instructions.

END OF SECTION 101100
SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Illuminated, fabricated channel dimensional characters.

1.2 DEFINITIONS

A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign units.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For dimensional letter signs.
   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
   4. Show locations of electrical service connections.
   5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
   1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
   1. Dimensional Characters: Full-size Sample of each type of dimensional character.
   2. Exposed Accessories: One of each accessory type.
1.5 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer and manufacturer.
   B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE
   A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
   B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

1.8 PROJECT CONDITIONS
   A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.
   B. Coordinate fabrication schedule with construction progress to avoid delay.

1.9 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Failure of electrical components or controls
         b. Deterioration of finishes beyond normal weathering.
         c. Separation or delamination of sheet materials and components.
      2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DIMENSIONAL CHARACTERS

A. Fabricated Channel Characters: Metal face and side returns formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability and for securing fasteners; and as follows.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Gemini Incorporated.
   c. Metallic Arts.
   d. OMC Industries, Inc
   e. The Southwell Co..

2. Illuminated Characters: Backlighted character construction with LED lighting including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.

   a. Power: 120 V, 60 Hz, 1 phase, 15 A
   b. Weeps: Provide weep holes to drain water at lowest part of exterior characters. Equip weeps with permanent baffles to block light leakage without inhibiting drainage.

3. Character Material: Sheet or plate stainless steel.
4. Material Thickness: 0.100 inch (2.54 mm)
5. Character Height: As indicated
6. Character Depth: As indicated
7. Finishes:
   a. Integral Stainless-Steel Finish: Non-directional No. 6 finish, 200 grit.
   a. Hold characters at distance as selected by Architect from wall surface.
9. Typeface: As indicated
2.3 DIMENSIONAL CHARACTER MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:
   a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
   b. Fastener Heads: For nonstructural connections, use oval countersunk screws and bolts with tamper-resistant one-way-head slots unless otherwise indicated.

4. Sign Mounting Fasteners:
   a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

B. Adhesives: As recommended by sign manufacturer and 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."

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability and for securing fasteners.
6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 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.

2.7 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. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2. Non-directional Satin Finish: No. 6. (200 grit)

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 signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
   a. Stone Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
   b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419
SECTION 101423 - INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior signs as indicated on the drawings

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.
   1. Submit color charts for background color within contract range specified against white graphics for selection by Architect.

B. Shop Drawings: Submit shop drawings for fabrication and erection of specialty signs. Include plans, elevations and large-scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

C. Message Schedule: Submit message schedule and sign location plans.

D. Samples: Submit samples of each sign type and material showing finishes, colors, surface textures and qualities of manufacture and design component, including graphics.
   1. Submit full-size samples, if requested by Architect. Acceptable units may be installed as part of the work.

1.3 QUALITY ASSURANCE

A. Uniformity of Manufacturer: For each sign type and graphic image process indicated, furnish products of a single manufacturer.


C. Installer Qualifications: Engage an experienced Installer who is acceptable to the sign manufacturer and has completed installation of interior signs similar in material, design, and extent to those indicated for the Project and that has resulted in construction with a record of successful in service performance.

1.4 PROJECT CONDITIONS

A. Coordination:
1. Provide sheet metal wall reinforcing at sign mounting locations using screw fasteners.
2. Meet with the school principal to establish the room numbering and naming system.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fabricate signs to comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction.
   1. Raise copy 1/32” and provide Grade 2 Braille text where required by accessibility codes.

B. Produce smooth, even, level sign surfaces, constructed to remain flat under installed condition with in a tolerance of plus or minus 1/16” measured diagonally form corner to corner, square corners.

2.2 SIGNS

A. Room-Identification Signs: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
   1. Laminated-Sheet Sign: Sandblasted polymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
      a. Composite-Sheet Thickness: 0.25 inch (6.35 mm).
      c. Color: Match Architect's sample
      a. Edge Condition: Square cut
      b. Corner Condition in Elevation: Square
   3. Frame: Frameless
   4. Mounting: Surface mounted to wall with concealed tamper-proof mounting.
   5. Text and Typeface: Accessible raised characters and Braille. Raised character typeface shall be as selected by Architect. Raised characters to contrast with background color and finish. Provide Braille to match background color.

B. Cutout Wall Signage and Graphics:
   1. Fabricated characters, shapes and symbols with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:
   2. Material: Solid Surface
   3. Height: As indicated
   4. Thickness: 0.250 inch (6 mm)
   5. Finishes:
a. Smooth sanded, 1/64-inch eased edges.

C. Field-Applied Vinyl Character Signs
   1. Field-Applied, Vinyl-Character Sign: Prespaced characters die cut from 3- to 3.5-mil (0.076- to 0.089-mm) thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.
      a. Size: As indicated
      b. Substrate: Glass Doors, Fixed Glass Lites.
      c. Text and Font: As selected by Architect
      d. Symbols and pictograms: Digital artwork will be provided by Architect

2.3 PANEL-SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

D. Cast Acrylic Sheet: Cast methacrylate plastic sheet with a minimum flexural strength of 16,000 psi. ASTM D 790, minimum allowable continuous service temperature of 180° F; minimum 1/8" thick.

E. Photopolymer: Photopolymer on metal substrate for raised graphics signs.

F. Fasteners: Aluminum or stainless steel ovalhead screws having slots requiring special driver tool for vandal resistance and expansion shields for mountable in CMU or Gypsum board.
   1. Provide two (2) screwdrivers to fit slotted heads to Owner.

2.4 FINISHES

A. GENERAL FINISH REQUIREMENTS
   1. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
   2. 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.
   3. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
4. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

B. ACRYLIC FINISHES
1. Non-directional abraded surface treatment to produce matte translucent surface. Background Color: Clear Translucent. Message Color: To be selected by Architect. Background and message color must contrast by a minimum of 70%.
2. Final colors to match Architect’s sample color chips.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Locate sign units and accessories where indicated, using mounting methods of type described and in compliance with manufacturer's instructions, unless otherwise indicated.
2. Install sign units level, plumb and at height indicated, with sign surfaces free from distortion or other defects of appearance.
3. Comply with ADA requirements. Room identification signs are typically located:
   a. On the wall to the latch side of the door.
   b. 60” above the finished floor to the centerline of the sign.
   c. 5 inches from the doorframe.
4. Room signs mounted on clear glass panels must have a 1/16” acrylic backplate the sign color, attached to the opposite side of the glass.

B. Attach signs to wall surfaces using methods indicated below:
1. Manufacturer’s standard concealed, tamper-proof mounting method.

3.2 CLEANING AND PROTECTION

A. At completion of installation, clean soiled sign surface in accordance with manufacturer’s instructions. Protect units from damage until acceptance by Owner.

END OF SECTION
SECTION 101426 - POST AND PANEL SIGNAGE

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Nonilluminated post and panel signs, custom fabricated to meet Chicago Park District standards.

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for concrete foundations, concrete fill in postholes, and setting anchor bolts in concrete foundations for signs.
   2. Section 101423 "Interior Signage" for wall-mounted sign panels.

1.3 COORDINATION
A. Furnish templates and tolerance information for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.

B. Shop Drawings: For post and panel/pylon signage.
   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   3. Show message list, typestyles, graphic elements, and layout for each sign at half full scale.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly, showing all components and with the required finish(es), in manufacturer’s standard size unless otherwise indicated and as follows:

1. Post and Panel Signs: Not less than 12 inches (300 mm) square, including corner and post.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Deterioration of finishes beyond normal weathering.
   b. Deterioration of embedded graphic image.
   c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.


2.2 POST AND PANEL/PYLON SIGNS

A. Post and Panel Signs: Provide custom fabricated signs to meet the Chicago Park District Signage Standards.

1. Steel post and flat stock support assembly and steel sheet sign faces as indicated on the drawings.
   a. Provide smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles.

2. Text and Typeface: As indicated on the drawings.

3. Colors: As indicated on the drawings.

2.3 MATERIALS

A. Steel Materials:

1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, either commercial or forming steel.
2. Steel Sheet: electrolytic zinc-coated, ASTM A 879/A 879M, Coating Designation 08Z (24G), with steel sheet substrate according to ASTM A 1008/A 1008M, commercial steel, exposed.
3. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529/A 529M or ASTM A 572/A 572M, 42,000-psi (290-MPa) minimum yield strength.
4. Steel Tubing or Pipe: ASTM A 500, Grade B.
5. Bolts for Steel Framing: ASTM A 307 or ASTM A 325 (ASTM A 325M) as necessary for design loads and connection details.
6. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.
2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:
   a. Fabricated from stainless steel unless otherwise indicated.
   b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant, slots as indicated.
4. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

C. Anchoring Materials:

1. 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.
   a. Water-Resistant Product: At exterior locations, 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.

2.5 FABRICATION

A. General: Provide sign assemblies to meet Chicago Park District Signage Standards and according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in locations concealed from view after final assembly.
2. Mill joints to tight, hairline fit. Form joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
4. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
5. Internally brace signs for stability and for securing fasteners.

B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

1. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
2. Provide panel subframe as indicated on drawings.
   a. Continuously weld joints and seams unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.
   b. Hot-dip galvanize frame assemblies after fabrication according to ASTM A 123/A 123M.

C. Post Fabrication: Fabricate posts designed to withstand wind pressure indicated for Project location and of lengths required for installation method indicated for each sign.

1. Steel Posts: Fabricate from minimum [0.120-inch- (3.05-mm-)] <Insert dimension> thick steel tubing unless otherwise indicated. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
   a. Hot-dip galvanize post assemblies after fabrication according to ASTM A 123/A 123M.
2. Combination Sleeves / Baseplates: Fabricate sleeves with baseplates welded to bottom of pipe to provide surface-mounted mounting sleeve. Provide anchor holes for through bolts and drill holes in baseplate for anchor-bolt connection.
   a. Provide preset anchor bolts of size required for connecting posts to concrete foundations.

2.6 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.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.
2.7 METALLIC-COATED STEEL FINISHES

A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A 780/A 780M.

B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.

C. Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).

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 signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Verify that electrical service is correctly sized and located to accommodate signs.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Install signs so they do not protrude or obstruct according to accessibility standard.

3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.

4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
3.3 INSTALLING POSTS

A. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

B. Baseplate Method:
   1. Preset Anchor Bolts: Set post baseplate in position over anchor bolts projecting from concrete foundation, shim and support post to prevent movement, place washers and nuts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.
   2. Drilled-in-Place Anchor Bolts: Set post baseplate in position over concrete foundation, locate and drill anchor holes, shim and support post to prevent movement, place washers and anchor bolts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.

C. Sleeve Method: Set post in position in sleeve and support post to prevent movement, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with manufacturer's written instructions.
   1. Leave anchorage joint exposed with 1/8-inch (3-mm) anchoring material sloped away from post

D. Reverse-Sleeve Method: Set post in position over the projecting insert and support post to prevent movement, drill posts and inserts for through bolts, and install and tighten through bolts.

3.4 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

POST AND PANEL SIGN DESIGN STANDARDS SHEETS FOLLOW – 13 PAGES

END OF SECTION 101426
The purpose of this sign is twofold, depending upon the size of the park. For large parks, it affirms that users are on Chicago Park District property. It does so by communicating the name of the park. It also assures them by locating their position within the park. For this size property, it is generally located within the confines of the park. For small to mid-sized parks that have more than one activity or facility, this sign type communicates the name of the park, and helps communicate the locations of park activities.

**FRONT**
The front of the panel communicates the Park Name and illustrates up to six activities that can take place in the park.

**BACK**
This sign type always has either a vertical (B.V.) or horizontal (B.H.) map on the back.

**OPTION B.V or B.H**
The back panel illustrates to the user his/her location within the park by means of a Park Map. It communicates historical information about the park. This panel also illustrates all the activities or facilities found within the park and communicates their location.

**REFERENCES**
The following pages are those that contain information pertinent to the Secondary Park Map ID (A4):

- **PANEL 04**: 2'-6" x 2'-6"
  - LAYOUT—FRONT: page 12.11
  - LAYOUT—BACK: OPTION B.H page 12.13
  - OPTION B.V page 12.14
  - SUPPORT STRUCTURE: page 13.04
- **PROGRAMMING**: page 04.12 & 04.17
- **PANEL MOUNTING—POST**: page 13.16

**SPECIFICATIONS**
The following are some of the specification for details, and the pages on which they can be found. All heights are measured from top of baseplate.

- **NUMBER OF POSTS**: ONE
- **OVERALL HEIGHT**: 7'-1" (to top of finial)
- **TOP OF POST/SIGN PANEL**: 6'-6"
- **POST DIAMETER**: 3" page 13.16
- **FINIAL HEIGHT**: 7" dwg 2, page 13.22
- **BASE DIAMETER**: 10.5" dwg 1, page 13.23
- **SLEEVE HEIGHT**: 1'-6" dwg 1, page 13.23
- **FOOTER**: AUGER-TYPE dwg 2, page 13.26
This sign was designed to identify major Chicago Park District facilities, typically, where numerous activities take place. The facility may either be a building or an activity structure. Because of the number of activities that take place and the size of the facility, a bulletin board may be located nearby.

**FRONT**
The front of the panel communicates the name of the facility and illustrates up to six of the activities that take place.

**BACK**
This sign type has four back panel options.

**OPTION A**
The back of the panel clearly communicates operating hours of the facility, should they exist, as well as the appropriate types of behavior for the facility. The same symbols that appear on the front are also repeated on this side.

**OPTION B.V or B.H**
The back may also display a map, either vertical (B.V) or horizontal (B.V.) of the park. This map will communicate the users and facilities location within the park. The map will also contain historical information about the park only.

**OPTION C**
Should the facility be of major historical importance, the back will contain an interpretive narrative. It will also include a relevant historical photograph of the facility. The image will be chosen to communicate an earlier view that is significantly different from the current view of it.

**OPTION D**
This back panel can communicate information regarding hours of operation, admission, or rules and regulations specific to the facility.

**REFERENCES**
The following pages are those that contain information pertinent to the Primary Facility ID (C1):

- **Panel 04:** 2'-6" x 2'-6"
  - **Layout-Front:** page 12.11
  - **Layout-Back:** Option A page 12.12
  - **Option B.H:** page 12.13
  - **Option B.V:** page 12.14
  - **Option C:** page 12.15
  - **Option D:** page 12.16
- **Support Structure:** page 13.04
- **Programming:** pages 6.06 & 6.07
- **Panel Mounting-Post:** page 13.16

**SPECIFICATIONS**
The following are some of the specification for details, and the pages on which they can be found. All heights are measured from top of baseplate.

- **Number of Posts:** Two
- **Overall Height:** 7'-1" (to top of finial)
- **Top of Post/Sign Panel:** 6'-6"
- **Post Diameter:** 3" page 13.16
- **Finial Height:** 7" dwg 2, page 13.22
- **Base Diameter:** 10.5" dwg 1, page 13.23
- **Sleeve Height:** 1'-6" dwg 1, page 13.23
- **Footer:** Concrete dwg 1, page 13.26
CHICAGO PARKS DISTRICT
SIGNAGE PROGRAM

LAYOUT

SIGN PANEL 04

FRONT

MATERIALS AND FABRICATION
• Panel is 12 gauge painted steel surface with message (support structure, page 13.04)
• All corners are to be radius 5/8" before painting

TYPE SPECIFICATIONS
PARK NAME
• FF Scala Sans Bold, u&lc, 4" cap height, fl/kb
• Park Name not to exceed three lines

DATE ESTABLISHED
• FF Scala Sans Regular, 1" cap height, fl/kb, u&lc

CHICAGO PARK DISTRICT MARK
• Use eps file, supplied by owner (d wg 1, page 218), fr, to 1"-4 3/4" max width

CPD SYMBOLS
• Six cpd Symbols maximum per panel
• Symbols are 4" outside diameter
• Symbols are placed 4 1/2" horizontally apart on center

COLORS
• Top background is painted Plum, PMS 518
• Stripe is Red
• Bottom background is painted Tan, P&L 2080
• Park Name and Date Established are White
• CPD Symbols and Chicago Park District Mark are Plum
• Panel edges and 1" minimum onto back of panel are painted Tan, P&L 2080

DATE 06.99
SCALE 1"=1'0"
PAGE 12.11
MATERIALS AND FABRICATION
- Panel is 12 gauge porcelain enamel surface
  (support structure, page 13.04)
- All corners are to be radiused 3/8" before enameling

TYPE SPECIFICATIONS
PARK NAME
- FF Scala Sans Bold, 1 3/4" cap height,
  FT/RR, U/C/C
- Park Name not to exceed three lines

BODY COPY
- FF Scala Sans Regular, between 30pt/36pt
  and 32pt/37pt lead
- Two FT/RR, U/C/C columns, each 7 1/2" wide

SYMBOL NAMES AND "YOU ARE HERE"
- FF Scala Sans Regular, 32pt/32pt lead,
  FT/RR, U/C/C

CPD SYMBOLS
- Seventeen CPD Symbols maximum per panel
- One "You Are Here" symbol always appears
  in bottom right corner, as shown
- Symbols are 7/8" outside diameter
- Symbols are placed 7 1/4" horizontally and
  1 1/4" vertically apart on center

COLORS
- Entire background is Tan, P&L 2080
- Stripe is Plum, PMS 518
- Park Name, CPD Symbols, Symbols' Names,
  and body copy are Plum, PMS 518
- Map: see "CPD Maps" (pages 2.18-24)
- Panel edges and 1" minimum onto back
  of panel are painted Tan, P&L 2080

DATE  06.99
SCALE  1"=1'-0"  
PAGE  12.13
MATERIALS AND FABRICATION
- Panel is 12 gauge painted steel surface with message (support structure, p. 13.04)
- All corners are to be radiused "1/8" before painting

TYPE AND SYMBOL SPECIFICATIONS
CHICAGO PARK DISTRICT MARK
- Use eps file supplied by owner (dwg 1, page 2.18), FL to 1'-4 3/4" maximum width

CPD SYMBOL
- One CPD Symbol max per panel
- Symbol is 4" external diameter

PARK HOURS
- FF Scala Sans Bold, 20pt/24pt lead, FLRR, UL

PARK RULES
- FF Scala Sans Regular, 19pt/20pt lead, FLRR, copy tab at 3/16"
- 0.25" space before paragraph

COLORS
- Top background is painted Plum, PMS 518
- Stripe is Red
- Bottom background is painted Tan, P&L 2080
- CPD Symbol and Chicago Park District Name are Plum
- Hours and Rules are White
- Panel edges and 1" minimum onto back of panel are painted Tan, P&L 2080
MATERIALS AND FABRICATION
- Welded flat stock construction
- All members 1/2" thick steel
- Cut plate when necessary
- Grind smooth all welds
- Oversize all holes, fabricator to verify all hole locations and diameters

COLORS
- Paint all sides Gray, P&L 2304
CONSTRUCTION

DETAILS

TYPICAL MOUNTING-POST

DRAWING 1
MATERIALS AND FABRICATION
- Two 5/8" thick steel panels, fabricator to verify all thicknesses
- Adhere panels to structure with VHB tape before using mechanical fasteners
- Fabricator to verify all bolt hole dimensions and locations
- Use tamper proof fasteners to secure panels to structure

DRAWING 2
MATERIALS AND FABRICATION
- Oversize all holes, fabricator to verify all hole locations and diameters
- Weld structure to post as needed per sign type
- Grind smooth all welds

DRAWING 3
MATERIALS AND FABRICATION
- Grind smooth all welds
- Location of structure will vary, verify with individual sign type

DATE 06.99
SCALE 3"=1'-0"
PAGE 13.16
CONSTRUCTION DETAILS

4" AND 3" FINIAL

DRAWINGS 1, 2 & 3
MATERIALS AND FABRICATION

- Grind smooth all welds
- Ensure tight fit between finial and post, caulk joint
- Close top of finial with cap to fit tight the inside diameter of pipe
- Weld and grind smooth cap

COLORS

- Paint all sides of finial Red, P&L 1006
- Paint all sides of post Gray, P&L 2304

NOTE:
Finial may be constructed as cast detail

DATE 06-99
SCALE 3"=1'-0"
PAGE 13-22
CONSTRUCTION

SLEEVE & BASEPLATE

DRAWINGS 1 & 2
MATERIALS AND FABRICATION
- 1/2" thick base plate
- Verify diameter of post per sign type
- Use larger pipe for base sleeve
- Use three SS 3/8" diameter bolts each location, provide teflon tape and neoprene washers
- Provide weep holes for water drainage, three places minimum

COLORS
- Paint all sides of sleeve, baseplate, and post
  Gray, P&I 2304

DRAWING 1
10.5" DIAMETER BASEPLATE
3" POST, 1'-6" HIGH SLEEVE

DRAWING 2
10.5" DIAMETER BASEPLATE
3" POST, 1'-0" HIGH SLEEVE

DATE 06.99
SCALE 1-1/2"=1'-0"
PAGE 13-23
CONSTRUCTION DETAILS

MATERIALS AND FABRICATION
- Use all stainless steel J-bolts and nuts provide teflon tape and neoprene washers
- All bolts to be flush with top of nut
- Verify diameter and placement of J-bolts per sign type
- Sign fabricator to coordinate w/concrete work for location of anchors and supply base plate templates as needed
- Concrete pad shown is optional for some sign types
- Concrete footer to be engineered by concrete fabricator per location and condition

DRAWING 1
- 3" diameter sch 40 by 4"-6" pipe
- Top plate matches base plate of sign
- Match bolt location per base plate of sign
- Bent 8" diameter 3/8" thick plate bent to 3 1/2" height
- 5/8" SS bolts and nuts, verify length
- 1/2" base plate (diam varies)
- 1" non-shrink grout
- 4" concrete pad
- 12" long J-bolt w/3" hook
- 3 horiz ties @ 6" vert. or continuous spiral
- bolt length to be flush with top of nut
- s.s. bolts and nuts, provide teflon tape and neoprene washers
- 2" min clear
- varies

DRAWING 2
- 8" x 3/8" thick bent plate (same detail)
- verify w/post diameter
- 8" x 3/8" thick base plate
- 3/8" x 2 1/2" heavy duty hex bolt
- 1/4" thick plate-match diameter and bolt pattern to base plate of sleeve.
- 1/4" base plate (diam varies see sleeve detail)
- 1" non-shrink grout
- 4" concrete pad

DATE 06.99
SCALE 1/2" = 1'-0"
PAGE 13.26
CONSTRUCTION DETAILS

TYPICAL MOUNTING-POST

DRAWING 1
MATERIALS AND FABRICATION
• Typical structure to post condition
• Oversize all holes, fabricator to verify all hole locations and diameters

COLORS
• Paint all sides of post and structure Gray, P&L 2304

DRAWING 2
MATERIALS AND FABRICATION
• Tamper-proof fasteners
• Typically referred to as "one-way sex bolts"

COLORS
• Unpainted stainless steel

DATE 06.99
SCALE 3"=1'-0"
PAGE 13.17
SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes: Overhead braced toilet compartments constructed of solid polymer.

1.2 SUBMITTALS
   A. Product Data: Submit complete printed data for each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
      1. Submit full line color charts for color selections by the Architect.
   B. Maintenance Data: Submit maintenance and cleaning data for inclusion in Maintenance Manual.

1.3 PROJECT CONDITIONS
   A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Product: Basis of design product is ASI Global Partitions, solid plastic with Tough Texture finish. Subject to compliance with requirements, provide basis of design product or equal product by one of the following manufacturers:
      1. Accurate
      2. Ampco
      3. General Partitions
      4. Global Partitions
      5. Metpar

2.2 SOLID-POLYMER UNITS
   A. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or polypropylene (PP) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
2. Maximize the percentage of recycled materials, but not less than 20%.

B. Pilaster Shoes: Stainless steel, ASTM A 666, Type 302 or 304, not less than 0.0312 inch (0.8 mm) specified thickness and 3 inches (75 mm) high, finished to match hardware.

C. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum or stainless steel.

D. Door Sightline Guards: Provide 1/4” x 2” full length aluminum or stainless-steel strap secured to the out swing edge of both side of door secured at 4” centers and each end with one way screws to eliminate sight lines.

E. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
   1. Material: Stainless steel or Chrome-plated brass.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be accessible to people with disabilities.
   1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
   2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper.
Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.

3. Coat Hook: Manufacturer's standard combination hooks and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.

4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.

5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install unit's 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).
   c. Door Edges: 1/4 inch nominal (7 mm).

2. Brackets: Secure panels to walls and to pilasters with full height continuous brackets.
   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturers written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113
SECTION 10 22 38 - OPERABLE PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manually operated, acoustical panel partitions.

B. Related Requirements:
   1. Section 055000 "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.

1.2 DEFINITIONS

A. STC: Sound Transmission Class.

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. Shop Drawings: For operable panel partitions.
   1. Include plans, elevations, sections, details, numbered panel installation sequence, and attachments to other work.
   2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

C. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing.
   1. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:
   1. Textile Facing Material: Full width by not less than 36-inch- (914-mm-) long section of material from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
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. Partition track, track supports and bracing, switches, turning space, and storage layout.
2. Suspended ceiling components.
3. Structural members to which suspension systems are attached.
4. Size and location of initial access modules for acoustical tile.

B. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

C. Seismic Qualification Certificates: For operable panel partitions, tracks, accessories, and components, from manufacturer. Include seismic capacity of partition assemblies to remain in vertical position during a seismic event and the following:

1. Basis for Certification: Indicate whether certification is based on analysis, testing, or experience data, according to ASCE/SEI 7.
2. Detailed description of partition anchorage devices on which the certification is based and their installation requirements.

D. Delegated-Design Submittal: For operable panel partitions.

1. Include design calculations for seismic restraints.

E. Product Test Reports: For each operable panel partition, for tests performed by a qualified testing agency.

F. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.

b. Seals, hardware, track, track switches, carriers, and other operating components.
1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Faulty operation of operable panel partitions.

   b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design seismic bracing of tracks to structure above.

B. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the partition panels will remain in place without separation of any parts from the system when subjected to the seismic forces specified."

C. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
   a. STC: 50

D. Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 0-25.
   b. Smoke-Developed Index: 200 or less.

2. Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.2 OPERABLE ACOUSTICAL PANELS

A. Operable Acoustical Panels: Partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
   1. Basis-of-Design Product: Basis of Design is Huffcor 600 Series. Provide Basis of Design or equal product, meeting the specified requirements, by one of the following:
      a. DORMA Group company
      b. Modernfold
      c. Panelfold

B. Panel Operation: Manually operated, paired panels.

C. Suspension and Stacking: Single-point suspension for 90 degree stacking

D. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

E. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
   1. Panel Width: Equal panel width across all panels, as indicated on the drawings.

F. STC: Not less than 50.

G. Panel Thickness: Not less than 3 inches (75 mm)
H. Panel Materials:
   1. Steel Frame: Steel sheet, manufacturer's standard nominal minimum thickness for uncoated steel.
   2. Gypsum Board: ASTM C 1396/C 1396M.

I. Panel Closure: Manufacturer's standard unless otherwise indicated.
   1. Initial Closure: Flexible, resilient PVC, bulb-shaped acoustical seal.
   2. Final Closure: Constant-force, lever-operated mechanical closure expanding from panel edge to create a constant-pressure acoustical seal.

J. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

2.3 SEALS

A. General: Provide seals that produce operable panel partitions complying with performance requirements and the following:
   1. Manufacturer's standard seals unless otherwise indicated.
   2. Seals made from materials and in profiles that minimize sound leakage.
   3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.

B. Horizontal Top Seals: Continuous-contact, extruded-PVC seal exerting uniform constant pressure on track.

C. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
   1. Horizontal bottom seals shall be automatic and provide up to 2" (50 mm) nominal operating clearance.

2.4 PANEL FINISH FACINGS

A. General: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.

B. Cap-Trimmed Edges: Protective perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing, finished as follows:
   1. Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.
      a. Color: Custom color to match architect's sample.

C. Finish:
1. Full Height Marker Board – Both sides of all panels.
   a. Color: White

2.5 SUSPENSION SYSTEMS

A. Tracks: Steel or aluminum mounted directly to overhead structural support, designed for operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch (2.54 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
   1. Finish: Custom powder-coated, white.

B. Carriers: 4-wheel trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.

C. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.
   1. Finish for exposed items: Custom powder-coated, white.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.

B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.

C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.
3.3 ADJUSTING

A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust pass door and storage pocket doors to operate smoothly and easily, without binding or warping.

C. Verify that safety devices are properly functioning.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 10 22 38
SECTION 102800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Under lavatory guards.
3. Custodial accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated in Contract Drawings.
2. Identify products using designations indicated in Contract Drawings.
3. Identify each mounting configuration and indicate compliance with applicable accessibility codes.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.
1.5  CLOSEOUT SUBMITTALS
   A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6  QUALITY ASSURANCE
   A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
   B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7  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.

1.8  WARRANTY
   A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
      1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1  MATERIALS
   A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
   B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
   C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
   D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Products: Basis-of-Design product are as noted below. Subject to compliance with requirements, provide basis-of-design product or equal product by one of the following:

1. A & J Washroom Accessories, Inc.
2. ASI

B. Toilet Tissue (Roll) Dispenser

1. Basis-of-Design Product: Bobrick B-2892
2. Material and Finish: Stainless steel, No. 4 finish (satin)

C. Liquid-Soap Dispenser:

2. Material and Finish: Stainless steel, No. 4 finish (satin)
3. Lockset: Tumbler type.
4. Refill Indicator: Window type.

D. Grab Bar:

3. Material: Stainless steel, finish: Smooth, No. 4 finish (satin)
4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings

E. Sanitary Napkin Vendor

2. Type: Sanitary napkin and tampon
3. Operation: No coin, 25 cents or 50 cents as selected by Owner.
4. Exposed Material and Finish: Stainless steel, No. 4 finish (satin)
5. Lockset: Tumbler type with separate lock and key for coin box.

F. Sanitary-Napkin Disposal Unit – Dual partition-mount

1. Basis-of-Design Product: ASI 0472-1
2. Mounting: Recessed, dual-sided for partition mount serving two stalls.
3. Material and Finish: Stainless steel, No. 4 finish (satin)
4. **Lockset:** Tumbler type

**G. Sanitary-Napkin Disposal Unit – Recessed at end stalls**

1. **Basis-of-Design Product:** ASI 0473-1
2. **Mounting:** Recessed, for wall mount at end stalls.
3. **Material and Finish:** Stainless steel, No. 4 finish (satin)
4. **Lockset:** Tumbler type

**H. Hand Dryer**

1. **Basis-of-Design Product:** Dyson Airblade db.
2. **Material and Finish:** Polycarbonate, White

**I. Combination Utility Shelf, mop holder and rag hook unit:**

1. **Basis-of-Design Product:** ASI 1315-4
2. **Material and Finish:** Stainless steel, No. 4 finish (satin)

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**2.3 UNDERLAVATORY GUARDS**

**A. Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

**B. Underlavatory Guard:** Provide at all exposed sink drain and hot water supply piping.

1. **Description:** Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. **Material and Finish:** Manufacturer’s standard insulating material with antimicrobial, molded plastic, white cover.

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**2.4 FABRICATION**

**A. General:** Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

**B. Keys:** Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of 10 keys to Owner's representative.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800
SECTION 104413 - FIRE EXTINGUISHERS, EXTINGUISHER CABINETS, AND ACCESSORIES

1. GENERAL

1. SUMMARY

A. Section Includes: Provide fire extinguishers, cabinets, and accessories as indicated on drawings or inferable therefrom and as specified.

2. SUBMITTALS

A. Product Data: Submit manufacturer’s technical data and installation instructions

3. QUALITY ASSURANCE

A. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

B. Fire rating: Provide fire extinguisher cabinets, UL listed with UL listing mark for use in fire rated construction. Provide the rating required for rating of construction indicated on Drawings.

C. Applicable Standards: Comply with NFPA 10 "Portable Fire Extinguishers" and requirements of authorities having jurisdiction.

2. PRODUCTS

1. MATERIALS

A. Fire Extinguisher Cabinets:
   1. Fire cabinet types in locations as indicated on the Drawings.
      a. Recessed cabinet suitable for one fire extinguisher.
   2. Metal Gauge:
      a. Box: 18 ga.
      b. Tubular Door Perimeter Frame: 20 ga.
   3. Construction: One-piece tubular door frames, mitered and welded. Weld all joints and grind smooth. Provide manufacturer’s standard steel box with white baked enamel finish.
   4. Doors: Vertical Duo flush baked enameled steel with clear acrylic panel.
      a. Vertical lettering "FIRE EXTINGUISHER" in red lettering.
5. Door Hardware: Continuous type hinge permitting door to open 180 degrees. Provide pull handle and cylinder lock capable of locking door and releasing in the event of an emergency.

6. Color: Custom color to match Architect’s sample matching adjacent surface or finish.
   a. Two custom colors to be chosen.

7. Products: Subject to compliance with requirements, provide Larsen Manufacturing Co Vertical Duo or equal products by one of the following.
   a. J.L. Industries.
   b. Potter-Roemer.

B. Fire Extinguishers
1. Multi-Purpose Dry Chemical Type: UL-rated 2-A:10-B: C, 5 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.
   a. Product: Subject to compliance with requirements, provide products by Larsen Manufacturing Co as indicated on Fire Protection Drawings or products by one of the following.
      1) Cosmic 5E; J.L. Industries.
      2) Model 3005; Potter-Roemer.

2. Carbon dioxide Type: UL-rated 10-B:C, 10-lb nominal capacity, with carbon dioxide in enameled-steel container
   a. Product: Subject to compliance with requirements, provide products by Larsen Manufacturing Co as indicated on Fire Protection Drawings or products by one of the following.
      1) J.L. Industries.
      2) Potter-Roemer.

3. Provide additional ten (10) fire extinguishers, types as selected by Architect to be located as directed by Architect.

2. MOUNTING BRACKETS

A. Provide manufacturer’s standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher indicated, in manufacturer’s standard plated finish.
   1. Provide brackets for extinguishers not located in cabinets.

3. EXECUTION

1. INSTALLATION

A. Install cabinets in locations and mounting height shown. Securely fasten cabinets to structure, square and plumb, in accordance with manufacturer’s instructions.
B. Install fire extinguishers at substantial completion one per cabinet and mounting bracket.

C. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer's instructions.

D. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location as selected by Architect.

END OF SECTION 104133
SECTION 113100 - APPLIANCES

1. GENERAL

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.

2. SUMMARY
   A. Section Includes:
      1. Refrigeration appliances.
      2. Microwave Oven.
   B. Related Sections:
      1. Section 112600 "Unit Kitchens" for small, compact kitchen units that include residential appliances.

3. ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.
   B. Product Schedule: For appliances. Use same designations indicated on Drawings.

4. INFORMATIONAL SUBMITTALS
   A. Product Certificates: For each type of appliance, from manufacturer.
   B. Warranties: Sample of special warranties.

5. CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

6. QUALITY ASSURANCE
   A. Manufacturer Qualifications: Maintains, within 10 miles Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
B. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

C. Source Limitations: Obtain residential appliances from single source.

D. Regulatory Requirements: Comply with the following:
   1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.

E. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board’s ADA-ABA Accessibility Guidelines, Illinois Accessibility Code, the Chicago Building Code and ICC/ANSI A117.1

F. Preinstallation Conference: Conduct conference at Project site.

7. WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Microwave Oven: Limited warranty including parts and labor for first year and parts thereafter for on-site service.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Refrigerator/Freezer/Icemaker, Sealed System: Limited warranty including parts and labor for first year and parts thereafter for on-site service on the product.
   1. Warranty Period: Five years from date of Substantial Completion.

2. PRODUCTS

1. MICROWAVE OVENS
   A. Basis-of-Design Product: Shelf-mounted countertop microwave oven.
      1. Color: Stainless steel
   B. Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
1. Amana; a division of Whirlpool Corporation.
2. BOSCH Home Appliances.
3. Electrolux Home Products (Frigidaire).
5. General Electric Company (Hotpoint).
6. KitchenAid; a division of Whirlpool Corporation.
7. LG Appliances.
8. Maytag; a division of Whirlpool Corporation.
10. Sears Brands LLC (Kenmore).

2. REFRIGERATORS

A. Refrigerator / Freezer RF-1

2. Dimensions:
   a. Width: 78 inches
   b. Depth: 35 ½ inches
   c. Height: 86 ½ inches

3. GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

3. EXECUTION

1. EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance 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.

2. INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Comply with plumbing and electrical requirements.

3. FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.

2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After installation, start units to confirm proper operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

C. An appliance will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

4. DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.
SECTION 116623 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Volleyball stanchion floor inserts.
   2. Basketball equipment
   3. Safety pads.

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for installation of floor insert sleeves to be cast in concrete slabs and footings.
   2. Section 096466 "Wood Athletic Flooring" for game lines and markers.
   3. Section 116653 "Gymnasium Dividers."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.

B. Shop Drawings: For gymnasium equipment.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.
   3. Include transport and storage accessories for removable equipment.

C. Samples: For each exposed product and for each item and color specified.
   2. Pad Fabric: Wall padding not less than 3 inches (76 mm) square, and corner and column Samples not less than 3 inches (76 mm) long, with specified treatments applied. Mark face of material.
1.4 INFORMATIONAL SUBMITTALS
   A. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.
   B. Qualification Data: For Installer.
   C. Product Certificates: For each type of gymnasium equipment.
   D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.6 FIELD CONDITIONS
   A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.7 COORDINATION
   A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
   B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL
   A. Source Limitations: Obtain each type of gymnasium equipment from single source from single manufacturer.
   B. Manufacturers: Provide products by one of the following:
      1. AALCO
      2. Draper
      3. Jaypro
      4. Performance Sports Systems
2.2 VOLLEYBALL EQUIPMENT

A. General:  Provide equipment complying with requirements in FIVB's "Official Volleyball Rules"

A. Floor Insert:  Aluminum floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit Owner’s post standards, not less than 9 inches (230 mm) long to securely anchor pipe sleeve with anchors designed for securing floor insert to floor substrate indicated.

1. Floor Plate: Manufacturer's standard hinged access cover, designed to be flush with adjacent flooring. Provide 10 tools for unlocking access covers.

2.3 BASKETBALL EQUIPMENT

A. General:  Provide equipment complying with requirements in NCAA's "Men's and Women's Basketball Rules"

B. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.

C. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.

D. Wall-Mounted Backstops: Complete assembly extending from wall, including support framing to building structure, bracing, cables, support chains, pulleys, fittings, hardware, pipe anchors, equipment pads, and fasteners.

1. Stationary Adjustable-height Type: Provide manufacturer's standard assembly for stationary backstop.
2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
   a. Finish: Manufacturer's standard polyester powder-coat finish.

3. Extension: As indicated.
4. Goal Height Adjuster: Adjustable from 6 to 10 feet (1.8 to 3 m) with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
   a. Operation: Electric with integral gear-drive motor, with limit switches preset to goal heights, and two detachable electric control devices.

E. Basketball Backboards:

1. Shape and Size:
   a. Rectangular, 72 by 48 inches (1800 by 1200 mm) width by height
2. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:
   a. Steel: Single-piece, steel face sheet, not less than 0.1046-inch (2.7-mm) nominal thickness, with 1-1/2-inch- (38-mm-) deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to back side of backboard; with mounting slots for mounting backboard frame to backboard support framing at standard mounting centers.
3. Target Area and Border Markings: Permanently marked in color, pattern and stripe width according to referenced rules.

F. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern for goal attachment.
   1. Direct Mount: Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard, and rigidity and stability of goal are maximized.

G. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
   1. Double-Rim Basket Ring: Fabricated with two rims, each consisting of a 5/8-inch- (16-mm-) diameter steel rod welded into 18-inch (460-mm) ID rings.
   2. Type: Fixed, nonmovable.
   3. Mount: Rear.

H. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit rim diameter, and as follows:
   1. Competition Cord: Antiwhip, made from white nylon cord not less than 120-gm thread and not more than 144-gm thread.

I. Backboard Safety Pads: Designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports.
   1. Attachment: Bolt on
   2. Color: As selected by Architect from manufacturer's full range.

2.4 SAFETY PADS

A. Pad Covers: Provide safety pad fabric covers fabricated from puncture- and tear-resistant, not less than 14-oz. (397-g) PVC-coated polyester or nylon-reinforced PVC fabric treated with fungicide for mildew resistance, with the fire-test-response characteristics indicated, lined with fire-retardant liner.

B. Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric cover, free from sag and wrinkles and firmly attached.
to back of backer board. Corner and column pads standard with manufacturer where indicated.

1. **Backer Board:** Not less than 3/8-inch- (9.5-mm-) thick plywood, mat-formed, or composite panel.
2. **Fill:** Multiple-impact-resistant foam not less than 2-inch- (50-mm-) thick bonded polyurethane, 6-lb (2.7-kg) density.
3. **Installation Method:** Concealed mounting Z-clips. Provide hook and loop attachment at stage as indicated on Drawings.
4. **Fabric Cover Colors:** As selected by Architect from manufacturer's full range for two colors.

C. **Cut-out Trim:** Provide manufacturer's standard flanged cut-out trim kits for fitting pads around switches, receptacles, and other obstructions.

1. **Color:** As selected by Architect.

### 2.5 MATERIALS

#### A. **Aluminum:**
Alloy and temper recommended by manufacturer for use and finish type indicated.

1. **Extruded Bars, Profiles, and Tubes:** ASTM B 221 (ASTM B 221M).
2. **Cast Aluminum:** ASTM B 179.
3. **Flat Sheet:** ASTM B 209 (ASTM B 209M).

#### B. **Steel:**
Comply with the following:

1. **Steel Plates, Shapes, and Bars:** ASTM A 36/A 36M.
2. **Steel Tubing:** ASTM A 500/A 500M or ASTM A 513, cold formed.
3. **Steel Sheet:** ASTM A 1011/A 1011M.

#### C. **Anchors, Fasteners, Fittings, and Hardware:**
Manufacturer's standard corrosion-resistant or noncorrodible units; concealed, tamperproof.

#### D. **Grout:**
Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C 1107/C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, and other conditions affecting performance of the Work.

1. **Verify critical dimensions.**
2. Examine supporting structure, subfloors, and footings below finished floor.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.

B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.

C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.

1. Floor Insert Location: Coordinate location with application of game lines and markers, and core drill floor for inserts after game lines are applied.
2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and floor-plate type.

D. Wall, Corner and Column Safety Pads: Mount with bottom edge at 4 inches (102 mm) above finished floor unless indicated otherwise.

E. Cut-out Trim: Limit cuts in face of padding from trim unit's corner-to-corner outside dimensions. Install with ends of cuts concealed behind trim flange.

3.3 ADJUSTING

A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.
3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623
SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Manually operated roller shades with single rollers.

B. Related Requirements:
   1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
   2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
   1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.
   1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.
1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark inside face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches (400 mm) wide by 36 inches (900 mm) long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

F. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.
B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

1.5 CLOSEOUT SUBMITTALS
A. Maintenance Data: For roller shades 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. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE
A. Installer Qualifications: Fabricator of products.
B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.
1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. BTX Window Automation, Inc.
2. DFB Sales.
3. Draper Inc.
5. Lutron Electronics Co., Inc.
8. OEM Shades Inc.
9. Shade Techniques, LLC.
10. Silent Gliss USA, Inc.
11. SM Automatic, Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

   a. Loop Length: Full length of roller shade
   b. Limit Stops: Provide upper and lower ball stops.
   c. Chain-Retainer Type: Chain tensioner, sill mounted
   a. Provide for shadebands that weigh more than 10 lb (4.5 kg) shades or as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Shadebands:
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.

F. Installation Accessories:
   1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
      a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than height indicated on Drawings.
      b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
      c. Closure-Panel Width: As indicated on Drawings
   2. Installation Accessories Color and Finish: White

2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
   a. Keyed Control Station: Keyed, momentary-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.
   b. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
   c. Color: White
4. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
5. Operating Features:
   a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
   b. Override switch.
B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.
E. Shadebands:
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.
F. Installation Accessories:
   1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
a. Height: Manufacturer’s standard height required to enclose roller and shadeband when shade is fully open, but not less than height indicated on Drawings.

b. Provide pocket with lip at lower edge to support acoustical ceiling panel.


2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer
2. Type: PVC-coated fiberglass
3. Weave: Mesh
4. Thickness: Manufacturer’s standard heavy-duty thickness for material indicated
5. Roll Width: To match window width. Where window width exceeds manufacturer’s maximum roll width, provide equal roll widths across entire window group opening.
6. Openness Factor: 10 percent.
7. Color: As selected by Architect from manufacturer's full range

2.5 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams if possible:
1. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.
PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION
   A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
   B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.3 ADJUSTING
   A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION
   A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
   B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
   C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION
   A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413
SECTION 124816 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Recessed floor grilles and frames.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide floor grilles and frames capable of withstanding and supporting a uniform load of 200 lbf/sq. ft. (9.58 kN/sq. m) without exceeding the allowable design working stress of the materials involved, including anchors and connections.

1.3 SUBMITTALS

A. Product Data: Submit complete printed data. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Submit complete drawings. Show fabrication, assembly, joint locations, installation details, layout, plans, elevations, full-scale sections, details of patterns or designs, anchors, and accessories for floor grilles and frames.

C. Samples: Submit 12-inch (300-mm-) square assembled sections of floor grille, frame members, and tread rails with the selected tread surface of each type of metal finish and color of exposed grille treads, tread rails, frames, and accessories required.

D. Maintenance Data: For cleaning and maintaining floor grilles. Include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Accessibility Requirements: In addition to requirements of authorities having jurisdiction, provide installed floor grilles that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify blocked-out openings in floors by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1.6  COORDINATION

A. Coordinate size and location of oversized recesses in concrete work to receive floor grilles and frames. Defer frame installations until building enclosure is completed and related interior finish work is in progress. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product: Subject to compliance with requirements, provide Gridline G6 as manufactured by Construction Specialties, Inc. or equal products by one of the following.
   1. Arden Architectural Specialties, Inc.
   2. Balco, Inc.
   5. KADEE Industries, Inc.
   6. Mats, Inc.
   7. Pawling Corporation.
   8. Reese Enterprises, Inc.

2.2 MATERIALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15.

B. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6061-T6 or Alloy 6063-T5, T6, or T52 as standard with manufacturer. Coat surface of frame in contact with cementitious materials with manufacturer’s standard protective coating

2.3 FRAMES

A. Provide manufacturer’s standard embedded frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Fabricate frame of same material and finish as grilles.
   1. Basis of design: Mats Inc., VV embedded frame for installation in cast concrete recess sloped to drain.
      a. Provide intermediate supports to level the grille surface and align adjacent grille sections.
      b. At contractor’s option, manufacturer’s integral drain pan may be used.
2.4 FLOOR GRILLES

A. General: Provide manufacturer's standard floor grille assemblies consisting of treads, joined together by cross members or interlocked, and with support legs (if any) and other components needed to produce a complete installation.

B. Aluminum Floor Grilles: Provide manufacturer's standard floor grilles with extruded members, top-surfaced tread rails, and as follows.
      a. Provide continuous edge band at angled cut edge, welded to cut ends of tread rails.

2.5 SUPPORT SYSTEM

A. Level Bed Applications: Provide manufacturer's standard, vinyl cushion support system.

2.6 FABRICATION

A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated. If not otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, and floor conditions, and floor recesses for compliance with requirements for location, size, and minimum recess depth, and other conditions affecting installation of floor grilles and frames.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed floor grilles and frames to comply with manufacturer’s written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor grille tops at height for most effective cleaning action. Coordinate top of floor grille surfaces with doors that swing across grilles to provide clearance under door.

3.3 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124816