HAYWARD

PROJECT MANUAL FOR THE CONSTRUCTION OF
HAYWARD FIRE STATION #6 & FIRE TRAINING CENTER

PROJECT NOS. 07481 & 07482

VOLUME 2 OF 8
PROJECT SPECIFICATIONS (DIVISIONS 02-21)
DSA INCREMENT #1

APRIL 2020

RossDrulisCusenbery ARCHITECTURE

KITCHELL

TO DOWNLOAD PLANS AND SPECIFICATIONS
AND TO CHECK BID RESULTS
Contact Engineering & Transportation at (510) 583-4730

FOR INFORMATION REGARDING THIS PROJECT
Contact Dave Hung at (510) 583-4752

FOR CONTRACT COMPLIANCE
Contact Rita Perez at (510) 583-4801

Hayward Fire Station #6 Fire Training Center

1401 West Winton Avenue,
Hayward, California

PROJECT MANUAL

Volume 2

Permit Submittal V3

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RossDrulisCusenbery Architecture
18294 Sonoma Highway
Sonoma, CA 95476
707.996.8448

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SECTION 02 4000

DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removing above-grade site improvements within limits indicated.

B. Disconnecting, capping or sealing, and abandoning site utilities in place.

C. Disconnecting, capping or sealing, and removing site utilities.

D. Disposing of objectionable material.

1.2 RELATED SECTIONS

A. Section 31 2300 – Excavation and Fill.

1.3 DEFINITIONS

A. ANSI: American National Standards Institute.

B. CAL-OSHA: California Occupational Safety and Health Administration.

1.4 PROJECT CONDITIONS

A. Except for materials indicated to be stockpiled or to remain the Owner's property, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store where indicated on the Plans or where designated by the Owner. Avoid damaging materials designated for salvage.

C. Unidentified Materials: If unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the Owner. If necessary, the Owner will arrange for any testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials. If contaminated material is encountered, work must stop until a work plan has been approved in writing by the City Fire Department and the San Francisco Regional Water Quality Control Board (NCRWQCB).

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to structural backfill defined in Section 31 2300 – Excavation and Fill

PART 3 - **EXECUTION**

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points during construction.

B. Protect existing site improvements to remain during construction.

3.2 RESTORATION

A. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.

B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless authorized in writing by the Owner, and then only after arranging to provide temporary utility services according to requirements indicated.

D. Coordinate utility interruptions with utility company affected.

E. Do not proceed with utility interruptions without the permission of the Owner and utility company affected. Notify Owner and utility company affected two working days prior to utility interruptions.

F. Excavate and remove underground utilities that are indicated to be removed.

G. Securely close ends of abandoned piping with tight fitting plug or wall of concrete minimum 6-inches thick.

3.4 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, and gutters, as indicated. Where concrete slabs, curb, gutter and asphalt pavements are designated to be removed, remove bases and subbase to surface of underlying, undisturbed soil.

C. Unless the existing full-depth joints coincide with line of pavement demolition, neatly saw-cut to full depth the length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

D. Remove driveways, curbs, gutters and sidewalks by saw cutting to full depth. All sidewalks shall be removed to the nearest joint or score mark beyond the point indicated in the plans.

3.5 BACKFILL

A. Place and compact material in excavations and depressions remaining after site clearing in conformance with Section 31 2300 – Excavation and Fill.

3.6 DISPOSAL

A. Remove surplus obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the Owner's property.

END OF SECTION 02 4000

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SECTION 02 4200 – REMOVAL AND SALVAGE OF CONSTRUCTION MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Demolition and reuse of wood flooring from existing Training Tower for reuse as a reclaimed wall finish.

1.3 RELATED SECTIONS

A. Section 01 1000 – Summary of Work: For use of the premises and phasing requirements.

B. Section 01 5000 - Temporary Facilities and Controls: For temporary construction and environmental-protection measures for selective demolition operations.

C. Section 01 7329 - Cutting and Patching: For cutting and patching procedures for selective demolition operations.

D. Section 01 7419 – Construction Waste Management and Disposal: Recycling, recovery and diversion requirements for demolished building materials.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.6 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.7 SUBMITTALS

A. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Waste Diversion Reports and Data: For waste materials, indicating achievement of minimum 50 percent waste diversion goal.

B. Provide detailed information, for review prior to demolition commencement, on methods and sequencing for accomplishing this Work.
   1. Information may be in the form of drawings, print mark-overs or field markings, and walk-throughs with Architect and Owner as required to adequately describe the Work to be done and procedures to be followed.

1.8 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Section 01 3119. Review methods and procedures related to selective demolition including, but not limited to, the following:
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Identify building elements to be salvaged.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

1.9 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials for Reinstallation:
   1. Repair and clean salvaged items for reuse as indicated.
   2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label 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 unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make item functional for use indicated.

B. Storage Space:
   1. Owner will arrange for on-site location(s) for storage of salvaged material. This storage space does not include security and climate control for stored material.

1.10 SITE CONDITIONS

A. Owner assumes no responsibility for condition of areas to be selectively demolished.
   1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Storage or sale of removed items or materials on-site will not be permitted.

C. Provide bracing and support as required to maintain integrity and security of portion of existing structures as materials are removed to prevent building collapse.

1.11 HAZARDOUS MATERIALS

A. Hazardous materials are not anticipated to be present in building to be selectively demolished. If encountered proceed as follows:
   1. Do not disturb hazardous materials or items suspected of containing hazardous materials. Contact Owner for directions on how to proceed with construction in areas where such materials are found.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Salvaged and Refurbished Material: Retain and protect salvaged and refurbished materials as indicated.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.3 DEMOLISHED MATERIALS

A. Removed items become the property of the Contractor for disposal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas affected by Work of this Section and verify that required protection is in place.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed, salvaged, and reused elsewhere in the Project.

D. Do not commence demolition Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide protection as necessary and in accordance with applicable regulations, and insure that protection is properly in place prior to Work commencement:
   1. For workmen, public, Owner's employees, and other contractors.
   2. For existing finishes, structures, equipment, utilities, systems, and improvements to remain.
   3. To prevent damage or injury due to dust or dirt; see Section 01 5000.

B. Lay out cutting work at jobsite and coordinate with related work for which cutting is required. Review proposed layout with Architect prior to performing cutting operations.

C. Reuse of Building Elements: Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.

3.3 REMOVALS

A. Where required by the Drawings or specified, and when so directed to be salvaged and reinstalled, remove existing materials and fixtures, equipment, etc. in the most careful manner possible to avoid damage; and, if damaged, restore such items to conditions satisfactory to the Architect.

B. Materials to be removed and not reinstalled shall become the property of the Contractor who shall be responsible for their timely removal from the Project site and their legal disposal.
1. Recycle removed materials to greatest extent possible. Provide manifests showing extent and content of recycled material diverted or recovered from the waste stream, including total weight of each. See Section 01 7419.

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

D. Removed and Reinstalled Items: Comply with the following:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

B. Provide cleaning during demolition as necessary and to the acceptance of the Architect.

C. Leave all portions of demolition area in a level, safe, and sanitary condition acceptable to public authorities and Architect.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 02 4200

SECTION 02 4320 - MEMORIAL STRUCTURE MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Preparation, transportation from storage yard to Project Site, temporary storage and protection, and installation and protection as required for completion of moving and installing WTC memorial beam as indicated on Drawings.
   1. Coordinate Work with work under other sections and under separate contracts, including earthwork, foundation construction, roof structure construction, and installation of WTC memorial beam.
   2. Provide protection of installed WTC memorial beam during remainder of construction period.

B. Location:
   Simms Metal Management
   600 South 4th Street
   Richmond, CA 94804
   Contact: Jill Rodby
   Direct Phone: (510) 412.5336
   Email: jill.rodby@simsmm.com

1.3 RELATED SECTIONS:

A. Section 05 1200 – Structural Steel Framing.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Transport: Carefully examine structure and design structural supports, framing, reinforcement, and bracing to transfer loads of structure to transport carrying structure.

B. Route: Investigate and confirm load bearing capacity of route over which structure will be moved.

C. Coordination: Arrange with applicable authorities for traffic control, police escorts, relocation of services, and arrangements for legally moving structure.
   1. Coordinate exact route with authorities.
   2. Verify locations of utility services and establish and obtain approvals for methods of avoiding.

D. Pre-Moving Conference: Convene pre-moving conference at least one week prior to commencing work for moving structure. Require attendance of parties involved with moving memorial beam.
   1. Ascertain method for determining damage to memorial beam and finishes before and after moving.
   2. Identify method and responsibility for repairs after moving.

3. Review location for temporary storage and protection of memorial beam until time of installation.
4. Inspect and discuss condition of construction to receive memorial beam.
5. Review temporary protection requirements for memorial beam during and after installation.
6. Verify availability of materials, moving personnel, equipment, and facilities needed to transport and store memorial beam.
7. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 INFORMATIONAL SUBMITTALS

A. Subcontractor Experience: Submit experience information including details regarding damages from moving existing historic structures and methods used to be prevent such damages on this Project.

B. Methods: Submit detailed description of method of moving structure along with designated route for move.

C. Permits: Submit permits for moving structure.

1.6 QUALITY ASSURANCE

A. Moving Subcontractor Qualifications: Company with minimum five years successful experience moving historical structures similar to building in Project and capable of providing complete information regarding experience.
1. Submit complete information indicating experience in historic building moving including list of projects, dates, name of owner, telephone number, and pictures of before and after move.

B. Exercise special care to protect the memorial beam while stored on Project Site and awaiting installation.
1. Damage or disturbance to the beam shall be promptly restored and repaired.

1.7 PROJECT CONDITIONS

A. Place markers to indicate location of disconnected services.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Utilize packing materials that are adequate for the intended purpose of transporting the WTC beam on road transport apparatus.

B. Design and package WTC beam so that the loads incurred and vehicles utilized in transportation of the beam can negotiate across roads to the storage site.

C. Ensure that the packing materials provide full support of the WTC beam and make adequate provision for slinging and handling the packaging.

D. Be responsible for off-loading of WTC beam to temporary storage location on Project Site. Craneage and handling equipment required in such off-loading shall meet all requirements

of the State of California highway transportation laws and local jurisdictional laws as applicable.

E. Obtain all permits and approvals required to transport the WTC beam from the storage yard to the Project Site.

F. Provide equipment, supports, framing, reinforcement, and bracing as required to transfer loads of the beam to transport carrying structure and to prevent damage to beam.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare site, route of transport, and destination site.

B. Secure operating, moving, and suspended items such as doors, windows, and light fixtures, in manner to prevent damage to items and to structure during move.
1. Items may be removed and reinstalled after move.

3.2 APPLICATION

A. Prevent movement of structure and components to maximum degree possible, provide and place bracing and be responsible for safety and support of structure and components.
1. Assume liability for damage and injury.

B. Move memorial beam in one piece, unless otherwise approved in writing, maintaining structural integrity.
1. Raise memorial beam in manner to prevent damage.
2. Cease operations if safety of memorial beam appears to be endangered; take precautions to properly support memorial beam.
3. Do not resume operations until safety is restored.
4. Move memorial beam, control speed, and provide anchor and restraining devices so integrity of memorial beam is maintained at all times.

C. Transport memorial beam by methods which minimize transfer of movement to structure and which prevents racking, twisting, and distortion.
1. Protect adjacent structures and property from damage during move.

D. Carefully position and lower memorial beam onto new platform and secure in place to resist seismic loads in conformance with California Building Code.
1. Do not remove bracing, shoring, and supports until memorial beam is fully secured to new platform.
2. Adjust memorial beam to position indicated on Drawings.

E. Reinstall items temporarily removed prior to moving to prevent damage.

F. Remove tools and equipment upon completion of work; leave both areas in condition acceptable to Owner and Architect.

3.3 REPAIR

A. Repair damage to memorial beam and adjacent construction caused as result of moving beam.

B. Refinish damaged surfaces to match original condition.

C. Pay third party claims for incidental damages.

END OF SECTION 02 4320

SECTION 02 4400 – MANAGEMENT OF SOIL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 and 2 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Nothing in these special provisions shall relieve the Contractor of the responsibility for compliance with Federal, State, and local laws regarding storage, handling, transportation, and disposal of designated or hazardous wastes.

B. This section includes specifications for excavating, stockpiling, transporting, placing, and disposing of soil that is to be hauled offsite that may contain elevated or hazardous waste concentrations.

C. Elevated arsenic concentrations (normal background for this geological unit) are present in soil within the Project limits as identified in ERAS's Revised Soil Sampling Investigation dated 6/26/18 and EBA's Pre-construction Hazardous Materials Assessment date 5/31/19 attached as reference to these specifications. Any soil removed from the Project is subject to the recommendation in the ERAS and EBA's reports and requires the Contractor to dispose of the soil at a licensed disposal facility; soil removed from the Project may not be used for any other purpose.

D. Excavation and disposal of material must comply with rules and regulations of the following agencies:

- US DOT
- US EPA
- California Environmental Protection Agency
- CDPH
- DTSC
- Cal/OSHA
- California Department of Resources Recycling and Recovery
- RWQCB, Region 2, San Francisco Bay
- California Air Resources Board
- Bay Area Air Quality Management District
- Alameda County Environmental Health Department

1.3 SITE CONDITIONS

Soil concentration data and sample location maps are indicated in ERAS's Revised Soil Sampling Investigation dated 6/26/18, Soil Sampling Investigation (for PFAS) dated 12/3/18 attached as reference to these specifications. Site geotechnical report are indicated in Rockridge Geotechnical's Final Geotechnical Investigation dated 7/14/17 as reference to these specifications.

1.4 SUBMITTALS

A. Excavation and Transportation Plan

Within 7 days after approval of the Contract, submit 3 copies of an excavation, stockpile and transportation plan for soil that is to be removed from the Project. Allow 3 days for review. If revisions are required, as determined by the City, submit the revised plan within 3 days of receipt of the City's comments. For the revision, allow 3 days for the review. Minor changes to or clarifications of the initial submittal may be made and attached as amendments to the excavation and transportation plan. In order to allow construction to proceed, the City may conditionally approve the plan while minor revisions or amendments are being completed.

Prepare the written, Project specific excavation and transportation plan establishing the procedures you will use to comply with requirements for excavating, stockpiling, transporting, and disposing of material.

The excavation and transportation plan must comply with:
1. DTSC regulations
2. Cal/OSHA regulations

The excavation and transportation plan must include the following elements:
1. Procedures for excavating, stockpiling, transporting, and disposing of the material;
2. Excavation schedule by location and date;
3. Locations for temporary stockpiles;
4. Dust control measures;
5. Measures to avoid spreading or tracking soils to other parts of the Project;
6. Transportation equipment and routes;
7. Method for preventing spills and tracked material onto public roads;
8. Truck waiting and staging areas;
9. Name and address of the waste disposal facility;
10. Spill Contingency Plan for stockpiled material;

1.5 CONSTRUCTION

A. Material Management

Elevated arsenic concentrations (normal background for this geological unit) are present in soil within the Project limits as identified in ERAS's Revised Soil Sampling Investigation dated 6/26/18 and EBA's Pre-construction Hazardous Materials Assessment date 5/31/19 attached as reference to these specifications. Excess soils to be removed from the Project must be disposed of at a licensed disposal facility and are therefore subject to testing and profiling requirements of the disposal facility, as well as State of California and Federal regulations. Excavation, stockpiling, transport and disposal shall meet appropriate regulations will require disposal at a Class II landfill facility. The volume of material to be excavated and disposed of shall be determined by the Contractor based on the requirements of the approved Project plans and specifications. Mixing of soils that is not part of the normal course of grading with the intent to dilute soil concentrations is specifically prohibited.

Material shall only be reused on-site or disposed of at an appropriately classified and approved landfill facility.

B. Dust Control

Excavation, transportation, placement, and handling of soil that may contain elevated metals concentrations or hazardous materials must result in no visible dust migration. A water truck or tank must be on the job site at all times while clearing and grubbing or performing earthwork operations. Apply water to prevent visible dust.

C. Material Transportation

Before traveling on public roads, remove loose and extraneous material from surfaces outside the cargo areas of the transporting vehicles and cover the cargo with tarpaulins or other cover, as outlined in the approved excavation and transportation plan. Contractor is responsible for costs due to spillage of any soil or hazardous material during transport. As required by classification of transported material, material identified as hazardous must be transported by a hazardous waste transporter registered with the DTSC using the required procedures for creating a manifest for the material. The vehicles used to transport the hazardous material shall conform to the current certifications of compliance of the DTSC.

D. Disposal

Coordination for, and disposal of, the soil scheduled for offsite disposal is the responsibility of the Contractor. Contractor must transport and dispose of material under federal and state laws and regulations and county and municipal ordinances and regulations. Laws and regulations that govern this work include but is not limited to:

i) Health & Safety Code § 25100 et seq
ii) 22 CA Code of Regs § 66250 et seq
iii) 8 CA Code of Regs

Owner shall be responsible for obtaining and providing an EPA Generator ID number and the signing of any required waste manifests.

1.6 HEALTH AND SAFETY

The health and safety plan is indicated in EBA's Project Health and Safety Plan dated 8/20/19 attached as reference to these specifications. The Contractor is responsible for implementing the procedures outlined in the health and safety plan. The health and safety plan should include procedures to protect the Contractor's employees and other onsite personnel, as well as the surrounding members of the community, as required by all laws and regulations including the Cal/OSHA Lead Construction Standards.

1.7 PAYMENT

The Contractor shall pay for excavating, handling, stockpiling, transporting and disposing of the soil scheduled for offsite disposal that may contain elevated concentrations of waste or hazardous materials.

The Contractor shall pay for additional sampling and analysis required by the receiving landfill.

The Contract's base bid shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in excavation and earthwork, included but not limited to material handling, stockpiling, profiling, transport and disposal; complete in place, including any required health or site safety plans; as shown on the plans and these specifications.

Owner shall also be responsible for payment of any State Hazardous Waste Generator Fees.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 02 4400

SECTION 03 1000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: All labor, materials and equipment and all operations required to complete all formwork as indicated on the drawings; to produce shapes and configurations as shown, as required; and as specified herein, including:
1. Forms, shores, bracing, removal and other operations as necessary for all cast-in-place concrete and masonry placed.
2. Setting and securing anchor bolts and other metal items embedded in concrete into formwork, using materials and layouts furnished and delivered to jobsite as specified under other sections.
~~2.~~3. Special formwork requirements for architectural, exposed concrete.

B. Related Sections:
1. Pertinent Sections of Division 03 specifying concrete construction. See section 033500 for concrete finishing requirements.
2. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete foundations and formwork.

1.2 REFERENCES

A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 19A Concrete.

B. American Concrete Institute (ACI) 347 "Recommended Practice for Concrete Formwork".

C. American Plywood Association (APA) “Concrete Forming Guide”.

D. West Coast Lumberman Inspection Bureau (WCLIB) “Standard Grading Rules for West Coast Lumber”.

E. ACI SP-066 “ACI Detailing Manual”.

F. ACI 301 “Specifications for Structural Concrete”.

G. Concrete Reinforcing Steel Institute (CRSI) “Manual of Standard Practice”.

1.3 DESIGN REQUIREMENTS

A. Design, engineer, and construct formwork, shoring and bracing to conform to design and code requirements, resist imposed loads; resultant concrete to conform to required shape, line and dimension.

1.4 ACTION SUBMITTALS

A. Formwork Drawings: As specified in Section 031000 and as follows. Submit detailed shop drawings of the system, detailing all aspects of the form, including indicating pertinent dimensions, materials, tie systems and locations, embedded items and locations, form joints, corner joints, construction and control joints, pour sequence, methods of bracing, leakage control, and all related details affecting Architectural quality for both horizontal and vertical elements.

1. Indicate type of forming materials, type and location of form ties, location of form joints and method of sealing joints.
2. Indicate areas of exposed architectural concrete finish on project.

B. Coordination Submittal: Submit shop drawings of coordinated work for structural steel, mechanical, electrical, fire protection, and plumbing. These drawings shall be approved prior to first concrete pour.
1. The shop drawings shall include floor plan diagrams indicating the intended sequencing and re-use of forms.
2. Contractor shall submit formwork calculations signed by a California Civil Engineer.
3. Do not proceed with concrete pour until shop drawings have been accepted by Architect and Structural Engineer.

~~A.~~C. Limitation of review: Structural Engineer's review will be required only where specifically requested for general architectural applications and features only. Contractor is responsible for structural stability, load-resisting characteristics and sufficiency of form work design.

~~B.~~D. Submit elevations for formwork at cambered slabs.

1.5 QUALITY ASSURANCE

A. General: All form materials shall be new at start of work. Produce high quality concrete construction. Minimize defects due to joints, deflection of forms, roughness of forms, nonconforming materials, concrete or workmanship.

B. Qualification of Installer: The Architectural Grade Concrete Subcontractor shall have built at least three buildings with a significant amount (defined as at least 1,000 SF of wall area) of architecturally exposed cast-in-place concrete that has a smooth finish upon the removal of the formwork without patching, repairing, refinishing or painting, each completed within the last ten years.

C. Reuse of Forms: Plywood forms may be reused, if thoroughly cleaned of all dirt, mortar, and foreign materials, and undamaged at edges and contact face. Reuse shall be subject to permission from the Architect without exception, and issued in writing. Reuse of any panel which will produce a blemish on exposed concrete, will not be permitted.

D. Preinstallation Conference: Conduct conference at Project site. Conduct this pre-installation conference at the same time as conference required in Section 03 3500.
1. At least 35 days prior to submitting formwork drawings and materials, conduct a meeting to review detailed requirements and procedures for satisfactory concrete operations. Review requirements for submittals and status of coordinating work.
2. Require representatives of each entity directly concerned with cast-in-place architectural grade concrete to attend, including the following:
   a. Architect.
   b. Owner.
   c. Structural Engineer.
   d. Contractor's superintendent.
   e. Independent testing agency responsible for concrete design mixtures.
   f. Ready-mix concrete manufacturer.
   g. Agency responsible for field quality control
   h. Cast-in-place architectural concrete subcontractor.
   i. Formwork fabricator
3. Review concrete finishes and finishing, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural grade concrete.

E. Mock-up: Before casting architectural exposed concrete, provide samples to demonstrate representative typical joints, surface finish, texture, tolerances and standard of fabrication and installation. Samples shall comply with the following requirements, using materials indicated for the completed Work: Sample shall demonstrate all typical conditions. See Section 03 3500 for complete mockup requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide smooth concrete surfaces at exposed cast-in-place concrete, utilizing steel, fiberglass or plastic coated forms or any other kind of material that will impart no pattern to concrete and so that a minimum of the following will be evident when the concrete is subject to imposed loads, temperatures and weather conditions including:
1. Damage of any kind.
2. Cracking.
3. Adjoining concrete elements out of alignment.
4. Incorrect profiles.

B. Pour joints of cast-in-place concrete shall align with reveals, rustication joints and/or control joints as indicated on the Drawings.

~~2.1~~2.2 MATERIALS

A. Form Materials:
1. Non-Exposed Surface Formwork Facing: Forms for concrete which is not exposed to view, may be of plywood as specified for exposed surfaces, or square edge 1x nominal Douglas Fir, Construction Grade, S4S.
2. Exposed Surface Formwork Facing:
   a. Forms for all horizontal exterior and interior concrete ~~flat~~ surfaces unless otherwise specified as board formed shall be new Douglas Fir Plywood (APA) ply, 5/8-inch, B-B Plyform, Class 1, Exterior Type, oiled and edged and edge-sealed conforming to U.S. Product Standard PS 1 in large sheet sizes to achieve joint patterns shown.
   b. All exposed concrete edges shall be chamfered 3/4" minimum or as noted on the drawings.
3. Exposed Surface Formwork - ~~Special Pattern Form Liner~~Architectural, Exposed Concrete Form Liner:
   a. Forms for all vertical exterior ~~and interior~~ concrete ~~flat~~ surfaces indicated shall be as designated by Architect.
   b. Architectural Smooth Form Finish: Use plywood, tempered concrete form-grade hardboard, metal, plastic, or other acceptable materials capable of producing the ~~desired~~ specified finish. Form-facing materials shall produce a smooth, uniform texture on the concrete. Do not use form-facing materials with raised grain, torn surfaces, worn edges, patches, dents, or other defects that will impair the texture of concrete surfaces. Set the facing materials in an orderly and symmetrical arrangement and keep the number of seams to a practical minimum. ~~Plywood forms: Phenolic resin impregnated fiber overlay sheet, MDO, Crezon or other pre-approved equivalent alternative~~.
      1) Form Quality: Meeting ACI 117, Class A.
      2) Concrete Formwork, General: Rigid forms such as plastic, high density overlay (HDO), or smooth metal designed to provide uniform smooth finish to impart a smooth, glossy finish, upon removal of the form, with no patching, stoning, or other form of repair, and resulting in uniform finished concrete free of patterns from formwork.

3) Panel faces on both sides to be sealed by impregnation of phenolic resins prior to application of phenolic plastic faces.

B. Rustication Strip: Taper joints as shown on Drawings.
1. Provide at reveal locations shown on Drawings.

~~B.~~C. Earth Forms: Allowed, subject to soil standing in excavations without ravel or caving.

D. Form Release Agent: Spray-on compound, not affecting color, bond or subsequent treatment of concrete surfaces. Maximum VOC content shall comply with local requirements and California Green Building Code.
1. Provide release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
2. Formulate form-release agent with rust inhibitor for steel form-facing materials.
3. Prepare forms as required to produce a CCS Class 2 (Cresset Concrete Standard Class 2) surface.

~~C.~~E. Accessories: Types recommended by manufacturers or referenced standards to suit conditions indicated;
1. Anchors, spacers, void in-fill materials: sized to resist imposed loads.
~~2. Form Ties: Prefabricated rod, flat band, or wire snap ties with 1" break-back or threaded internal disconnecting type with external holding devices of adequate bearing area. Ties shall permit tightening and spreading of forms and leave no metal closer than 1" to surface.~~

~~D.~~F. Corner Chamfers and Rustications: Filleted, wood strip or foam type; sizes and shapes as detailed, or 3/4 x 3/4 inch size minimum if not detailed; maximum possible lengths.

~~E.~~G. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

~~F.~~H. ~~Form Ties: Plastic cone snap-tie, 1"x1-1/4": include high density grout sealing.~~

I. Form Ties: Factory-fabricated, exposed stainless steel internally disconnecting tie rods designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish internally disconnecting ties that will leave no metal closer than 1-1/2 inches (38 mm), from the architectural concrete surface.
2. Provide rods designed to snap flush with inside face as shown on Drawings.
3. Drill tie holes to provide snug fit of tie.
4. Seal cut form panel edges and tie holes with two coats of a high quality polyurethane varnish to retard moisture penetration.

~~G.~~J. Acceptable manufacturer: Shall be based on "Burke – Snaplug Types (a) flush type BAL for concrete work above elevation 141'-0" and (b) Reveal type MF for concrete work below elevation 141'-0" or where indicated per approved architectural drawings.

2.3 FORMWORK FABRICATION

A. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

B. Radius all exposed corners and edges 1/4-inch, using sealant or rubber strips fabricated to produce uniform smooth lines and tight edge joints. Provide architectural rustications (reveals) where indicated on Drawings using rustication strips to produce uniform smooth lines and tight edge joints.

C. Formwork: Design, erect, support, brace, and maintain formwork to support vertical and lateral loads until such loads are supported by structure.
   1. Construct formwork to ensure correct size, shape, alignment, elevation and positioning of concrete elements and prevent the formation of ledges, shoulders, and fins.
   2. Space form supports sufficiently close to prevent deflection.
   3. Design formwork for easy removal so that no damage occurs to concrete surfaces.

D. 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 to prevent cement paste leakage and fins.
   2. Do not use rust-stained steel form-facing material.

E. 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.

F. Formwork Joints and Ties: Arrange in geometric pattern indicated on Drawings and as shown in accepted shop drawings.
   1. Design and install form ties to prevent form deflection beyond tolerances and to prevent spalling upon tie removal.

G. Formwork sequencing shall be designed to provide monolithic pours as set out in Part 3 below.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect the substrate and the conditions under which concrete formwork is to be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates and conditions.

B. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

A. If natural soil or compacted fill can be accurately cut and maintained, foundations and grade beams may be poured against earth without forming. Provide positive protection of trench top corners.

B. Maintain earth forms free of water and foreign materials.

3.3 ERECTION – FORMWORK

A. General: Construct formwork in accordance with calculations, and recommendations of Chapter 3 of ACI 347. Construct forms to the sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finished structure. Provide for openings, offsets, sinkages, keyways, recesses, moldings,

rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes.

1. Construct cambers specified in concrete members and slabs in the formwork.
2. Schedule the work and notify other trades in ample time so that provisions for their work in the formwork can be made without delaying progress of the project. Install all sleeves, pipes, etc. for building services systems, or other work. Secure information about and provide for all openings, offsets, recessed nailing blocks, channel chases, anchors, ties, inserts, etc. in the formwork before concrete placement.
3. Deflection: Formwork and concrete with excessive deflection after concrete placement will be rejected. Excessive deflection is that which will produce visible and noticeable waves in the finished concrete.
4. Measure formwork for elevated structural slabs, columns, wall elevations points of maximum camber and submit in writing to the Architect/Engineer prior to placing concrete.

B. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

~~B.~~C. Formwork Construction: Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301, uniform, substantial and sufficiently tight to prevent leakage of concrete paste, readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials See ~~part 2.1A.3~~ paragraph 2.2.A.3 and 03 3500 for additional architectural smooth form finish requirements. ~~Uniform, substantial and sufficiently tight to prevent leakage of concrete paste, readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials~~. Tie, brace, shore, and support to insure stability against pressures from any source, without failure of any component part and without excessive deflection. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

~~C.~~D. Provide all openings, offsets, inserts, anchorages, blocking, and other features of the work as shown or required. See INSERTS, EMBEDDED PARTS, AND OPENINGS for detailed requirements.

~~D.~~E. Warped, checked, or scuffed forms will be rejected.

~~E.~~F. Maintain membranes, reinforcing and other work free of damage; protect with plywood runway boards or other positive, durable means.

~~F.~~G. Align joints and make watertight. Keep form joints to a minimum.

~~G.~~H. Provide fillet and chamfer strips on external corners of exposed locations and as indicated to form patterns in finished work. Extend patterns around corners and into alcoves, on backs of columns and similar locations not otherwise shown.

1. Coat contact surfaces of wood rustications with sealer before placing reinforcement, anchoring devices, and embedded items.
~~1.~~2. Produce beveled, smooth, solid, unbroken lines, except as otherwise indicated to conform to patterns.
~~2.~~3. Form corners and chamfers with 3/4 inch x 3/4 inch strips, unless otherwise indicated, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer at changes in direction.

~~H.~~I. Unexposed corners may be formed either square or chamfered.

~~I.~~J. Ties and Spreaders: Arrange in a pattern acceptable to the Architect when exposed. Snap-ties may be used except at joints between pours where threaded internal disconnecting type shall be used.

~~J.~~K. Coordinate this section with other sections of work that require attachment of components to formwork.

~~K.~~L. Reglets and Rebates: Accurately locate, size, and form all reglets and rebates required to receive work of other trades, including flashing, frames, and equipment.

3.4 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not allow excess form coating material to accumulate in the forms or to come into contact with reinforcement or surfaces which will be bonded to fresh concrete.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork will be rejected.

E. Leave no residue or stain on the face of the concrete, nor affect bonding of subsequent finishes or work specified in other sections.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.
   1. Provide openings in concrete formwork to accommodate work of other sections including those under separate contracts (if any). Size and location of openings, recesses and chases shall be in accordance with the section requiring such items. Accurately place and securely support items to be built into forms.

B. Construction Joints: Construct and locate generally as indicated on Drawings and only at locations approved by Structural Engineer, so as not to impair the strength of the structure. Form keys in all cold joints shown or required.

C. Locate and set in place items that will be cast directly into concrete.

D. Rough Hardware and Miscellaneous Metal: Set inserts, sleeves, bolts, anchors, angles, and other items to be embedded in concrete. Set embedded bolts and sleeves for equipment to template and approved shop drawings prepared by trades supplying equipment.

E. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

F. Wood Inserts and Nailers: Provide approved preservative-treated lumber. Set all required nailing blocks, grounds, and other inserts as required to produce results shown. Wood plugs shall not be used.

G. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

H. Piping: Do not embed piping in structural concrete unless locations specifically approved by Structural Engineer.

I. Conduit: Place conduit below slabs-on-grade and only as specifically detailed on structural drawings. Minimum clear distance between conduits shall be 3 diameters. Location shall be subject to Engineer's written approval and shall not impair the strength of the structure.

J. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
1. Provide openings for the introduction of vibrators at intervals necessary for proper placement.
2. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

K. Install Form Liner inserts in accordance with manufacturer's recommendations, to produce patterns and textures indicated.

L. Install waterstops in accordance with manufacturer's recommendations to provide continuous waterproof barrier.

3.6 FORM CLEANING

A. Clean forms as erection proceeds, remove foreign matter within forms. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

B. Clean formed cavities of debris prior to placing concrete.
1. Remove all dirt, chips, sawdust, rubbish, water and foreign materials detrimental to concrete.
2. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

C. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.7 FOOTINGS

A. Verify elevations and provide final excavation required for footings prior to placing of concrete.

3.8 EQUIPMENT BASES

A. Form concrete bases for all mechanical and electrical equipment in accordance with approved shop details furnished by other sections.

B. Sizes and locations as indicated and as required to produce results shown.

C. Provide coved base for all equipment bases placed on concrete slabs.

3.9 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.10 REMOVING AND REUSING FORMS FOR ARCHITECTURAL, EXPOSED CONCRETE

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.

B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved 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.

~~3.10~~3.11 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

C. Clean and repair surfaces to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.

D. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

~~3.11~~3.12 FORM REMOVAL

A. Do not loosen or remove forms before minimum curing period has elapsed without employment of appropriate alternate curing methods, approved by the Architect in writing.

B. Remove forms without damage to the concrete using means to insure complete safety of the structure and without damage to exposed beams, columns, wall edges, chamfers and inserts. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Do not remove forms until the concrete has hardened sufficiently to permit safe removal and the concrete has attained sufficient strength to safely support imposed loads. The minimum elapsed time for removal of forms after concrete has been placed shall be as follows:
   1. Columns and Walls: 7 days, provided members are not subjected to overhead loads.
   2. Retaining Walls: 21 days minimum.
   3. Footings: 7 days minimum. If backfilled immediately, side forms may be removed 24 hours after concrete is placed.
   4. Beams, elevated slab, and similar overhead conditions: 28 days unless adequate shoring is provided.

D. Durations listed above are minimums and are subject to extension at the sole judgment of the Architect/Engineer.

E. Reshoring: Reshore members where and if required by Formwork Design Engineer.

F. Do not subject concrete to superimposed loads (structure or construction) until it has attained full specified design strength, nor for a period of at least 14 days after placing.

G. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

H. Elevated slabs with Camber: Submit measured elevations of completed work at the same locations as provided for formwork, within 7 days of removing forms.

~~3.12~~3.13 CLEANING

A. Remove excess material and debris associated with this work from the job site.

END OF SECTION 03 1000

SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Reinforcing steel work for all concrete and masonry work as indicated on the drawings and specified herein.

2. Coordinate this work with other work affected by these operations, such as forms, electrical work, mechanical work, structural steel, masonry and concrete.

B. Related Sections:

1. Pertinent Sections of Division 01 specifying Quality Control and Testing Laboratory services.

2. Pertinent Sections of Divisions 03 specifying concrete construction.

3. Pertinent Sections of Divisions 04 specifying masonry construction.

4. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete work.

1.2 REFERENCE STANDARDS

A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC) Chapter 19A Concrete.

B. American Concrete Institute (ACI) 301 “Specifications for Structural Concrete for Buildings”.

C. ACI 318 “Building Code Requirements for Reinforced Concrete and Commentary”.

D. ACI SP-066 “ACI Detailing Manual”.

E. American Society for Testing and Materials (ASTM) A185 “Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete”.

F. ASTM A615 “Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement”.

G. ASTM A706 “Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement”.

H. American Welding Society (AWS) D1.4 – “Structural Welding Code for Reinforcing Steel”.

I. Concrete Reinforcing Steel Institute (CRSI) - “Manual of Standard Practice”.

J. CRSI - “Placing Reinforcing Bars”.

1.3 SUBMITTALS

A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. Submit for review prior to fabrication.

B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer.

C. Shop Drawings: Show complete fabrication and placing details of all reinforcing steel. Comply with requirements of ACI SP-66. Include:

1. Bar sizes and schedules;

2. Shapes of bent bars, layout and spacing of bars, location of splices.

3. Stirrup spacing, arrangements and assemblies,

4. References to Contract Document detail numbers and designations.

5. Wall elevations corresponding to elevations shown in Contract Documents.

D. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.

E. Certificates: Submit all certifications of physical and chemical properties of steel for each heat number as manufactured, including location of material in structure as specified below in Article titled QUALITY ASSURANCE. All materials supplied shall be tagged with heat numbers matching submitted Mill Test Report analyses.

F. Samples: Provide to the Owner's Testing laboratory as specified in Article SOURCE QUALITY CONTROL.

1.4 QUALITY ASSURANCE

A. Perform work of this Section in accordance with the CRSI “Manual of Standard Practice”, CRSI “Placing Reinforcing Bars”, ACI 301, and ACI 318.

B. Requirements of Regulatory Agencies, refer to pertinent Sections of Division 01 and CBC.

C. Certification and Identification of Materials and Uses: Provide Owner's Testing Agency with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection and all material identification/test information listed below.

1. Provide manufacturer's Mill Test Reports for all materials. Include chemical and physical properties of the material for each heat number manufactured. Tag all fabricated materials with heat number.

2. Provide letter certifying all materials supplied are from heat numbers covered by supplied mill certificates. Include in letter the physical location of each grade of reinforcing and/or heat number in the project (i.e. foundations, walls, etc.).

3. Unidentified Material Tests: Where identification of materials by heat number to mill tests cannot be made, Owner's Testing Agency shall test unidentified materials as described below.

D. Testing and Inspection: Tests and Inspections required by Independent Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and test reports in conformance with pertinent Sections of Division 01.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent requirements of Division 01.

B. Deliver reinforcement to project site in bundles marked with durable tags indicating heat number, mill, bar size and length, proposed location in the structure and other information corresponding with markings shown on placement diagrams.

C. Handle and store materials above ground to prevent damage, contamination or accumulation of dirt or rust.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel: Deformed billet steel bars, ASTM A706 Grade 60 or ASTM A615 Grade 60.

1. Exception: Bars #3 and smaller shall be Grade 40 minimum, unless otherwise noted on the drawings.

2. Exception: Mast slab reinforcing shall be A615 GR 80, unless otherwise noted.

3. Welded reinforcement shall be ASTM A706, or A615 meeting carbon requirements of AWS D1.4. Welding shall conform with AWS D1.4.

4. All reinforcement to be unfinished.

5. ASTM A615 reinforcement at special structural concrete walls, concrete coupling beams, and special concrete moment frames shall have maximum yield stress of 78,000 psi and the tensile strength shall be greater than 125% of the actual yield strength. Test ASTM A615 reinforcement for conformance to these criteria prior to fabrication and/or installation.

B. Welded Wire Reinforcement: ASTM A185.

C. Tie Wire: No. 16 AWG or heavier, black annealed.

D. Concrete Blocks: Slab-on-grade conditions only, as required to support reinforcing bars in position.

E. Reinforcing Supports: Plastic or galvanized steel chairs, bolsters, bar supports, or spacers sized and shaped for adequate support of reinforcement and construction loads imposed during concrete placement, meeting ACI and CRSI standards.

1. For use over formwork: Galvanized wire bar type supports complying with CRSI recommendations. Provide plastic tips where exposed to view or weather after removal of formwork. Do not use wood, brick, or other unacceptable materials.

2. For slabs on grade: Supports with sand plates or horizontal runners where base material will not support chair legs.

F. Reinforcement Splice Couplers: For use only where specified on drawings. Submit other locations proposed for use to Engineer for review. "L-Series Bar Lock" Coupler Systems for Splicing Reinforcement Bars, ESR-2495, by Dayton-Superior Corporation.

2.2 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4), unless specifically shown otherwise. Details not specifically shown or indicated shall conform to SP-066 and specified codes and standards.

1. Accurately shop-fabricate to shapes, bends, sizes, gauges and lengths indicated or otherwise required.

2. Bend bars once only. Discard bars improperly bent due to fabricating or other errors and provide new material; do not re-bend or straighten unless specifically indicated. Rebending of reinforcement in the field is not allowed.

3. Do not bend reinforcement in a manner that will injure or weaken the material or the embedding concrete.

4. Do not heat reinforcement for bending. Heat-bent materials will be rejected.

B. Unacceptable materials: Reinforcement with any of the following defects will not be permitted in the work.

1. Bar lengths, depths and bends exceeding specified fabrication tolerances.

2. Bends or kinks not indicated on Drawings or final shop drawings.

3. Bars with reduced cross-section due to rusting or other cause.

C. Tag reinforcement with durable identification to facilitate sorting and placing.

2.3 SOURCE QUALITY CONTROL

A. The Testing Agency, as specified in the Article QUALITY ASSURANCE, will perform the following:

1. Material Testing:
   a. Identified Steel: When samples are taken from bundled steel identified by heat number, matched with accompanying mill analyses as delivered from the mill, supplemental testing of reinforcing steel is not required.
   b. Unidentified Steel: When identification of materials by heat number matched to accompanying mill analyses cannot be made, perform one tensile test and one bend test per each two and one-half tons or fraction thereof for each required size of reinforcing steel. Tests of unidentified steel shall be performed by the Owner's Testing Agency and costs for these tests shall be paid by the Contractor by deductive change order.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect the conditions under which concrete reinforcement is to be placed. Do not proceed with the work until unsatisfactory conditions have been corrected.

B. Coordinate with work of other sections to avoid conflicts or interference. Bring conflicts between reinforcement and other elements to Architect's attention. Resolve conflicts before concrete is placed.

C. Notify Architect, Structural Engineer, and Authority Having Jurisdiction for review of steel placement not less than 48 hours before placing concrete.

3.2 PLACEMENT

A. General: Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean bars free of substances which are detrimental to bonding. Maintain reinforcement clean until embedded in concrete.

C. Place reinforcement to obtain the minimum coverages for concrete protection. Do not deviate from required position. Maintain required distance, spacing and clearance between bars, forms, and ground.

D. Location and Support: Provide metal chairs, runners, bolsters, spacers and hangers, as required.

E. Provide additional steel reinforcement as necessary or as directed, to act as spreaders or separators to maintain proper positioning.

F. Tying and Attachment: Securely tie at all intersections and supports with wire. Prevent dislocation or movement during placement of concrete. Direct twisted ends of wire ties away from exposed concrete surfaces.

G. Separate reinforcing from pipes or conduits with approved non-metallic separators. Do not use wood or steel form stakes or reinforcement used as stakes as support for reinforcement.

H. Accommodate placement of formed openings required by other sections.

I. Obstructions:

1. Where obstructions, block-outs, or penetrations (conduits, raceways, ductwork) prevent continuous placement of reinforcement as indicated, provide additional reinforcing as detailed and as directed by the Structural Engineer to supplement the indicated reinforcement around the obstruction.

2. Place additional trim bars, ties, stirrups, or other elements as detailed and as directed at all opening, sleeves, pipes or other penetrations through structural elements.

J. Welded Wire Reinforcement: Reinforce slabs with 6"x 6"-W1.4 x W1.4 welded wire reinforcement reinforcing, unless otherwise noted on drawings.

1. Provide flat sheets only, no rolls. Straighten, cut to required size, and lay out flat in place.

2. Securely wire-tie reinforcement to other reinforcement at frequent intervals.

3. Extend reinforcement over supporting beams and walls, and to within 1 inch of edge of slabs, construction joints, and expansion joints.

4. Support reinforcement in mid-depth of slab.

5. Lift reinforcement at intervals as slab concrete is placed, ensure proper embedment.

3.3 REINFORCING SPACING AND COVERAGE

A. Spacing: Do not space bars closer than four (4) diameters of the largest of two adjacent bars, except at bar laps, which shall be placed such that a minimum of 2 bar diameters is clear between bars.

B. Where reinforcing in members is placed in two layers, the distance between layers shall not be less than four bar diameters of the largest bar and the bars in the upper layers shall be placed directly above those in the bottom layer, unless otherwise detailed or dimensioned.

C. Coverage of bars (including stirrups and columns ties) shall be as follows, unless otherwise shown:

1. Footings and Mat Foundation: 3 inches to any soil face, 2 inches to top.

2. Slabs (on grade): 2 inches to grade face, 1-1/2 inches to top face.

3. Slabs (elevated): 1-1/2 inches top and bottom.

4. Beam & Column: 1-1/2inches to form.

5. Walls: 1-1/2 inches clear to form and 2 inches clear to form at soil face.

3.4 DOWELS, SPLICES, OFFSETS AND BENDS

A. Provide standard reinforcement splices at splices, corners, and intersections by lapping ends, placing bars in contact, and tightly tying with wire at each end. Comply with details shown on structural drawings and requirements of ACI 318.

B. Provide minimum 1-1/2 inch clearance between sets of splices. Stagger splices in horizontal bars so that adjacent splices will be 4 feet apart.

C. Laps of welded wire reinforcement shall be at least two times the spacing of the members in the direction lapped but not less than twelve inches.

D. Splices of reinforcement shall not be made at points of maximum stress. Provide splice lengths as noted on the structural drawings, with sufficient lap to transfer the stress between bars by bond and shear.

E. Spacing:

1. Space bars minimum distance specified and all lapped bars 2 bar diameters (minimum) clear of the next bar.

2. Stagger splices of adjacent bars where possible and where required to maintain bar clearance.

3. Beam or slab top bars shall be spliced mid-span of column support and bottom bars spliced at column supports.

4. Request Architect/Engineer review prior to placement for all splices not shown on the drawings.

F. Reinforcement Couplers: Install at all locations indicated and may be used as an alternate to lap splices in general. Install couplers in accordance with manufacturer's recommendations.

3.5 WELDING

A. No reinforcing shall be welded unless specifically indicated or without prior approval of the Structural Engineer and the Authority Having Jurisdiction.

B. Only when so approved for use as noted above, all welding shall conform to AWS D1.4, ACI 318 Section 26.6.4, and the following;

1. All welding performed by certified welders.

2. All reinforcement requires preheat prior to welding. All preheat and welding shall be continuously inspected by the Testing Agency.

3.6 MISPLACED REINFORCEMENT

A. Notify Architect/Engineer immediately if reinforcing bars are known to be misplaced after concrete has been placed.

B. Perform no correction or cutting without specific direction. Do not bend or kink misplaced bars.

C. Correct misplaced reinforcing only as directed in writing by the Architect/Engineer. Bear all costs of redesign, new, or additional reinforcing required because of misplaced bars at Contractor's expense.

3.7 FIELD QUALITY CONTROL

A. The Testing Agency as specified in the Article QUALITY ASSURANCE, will inspect the work for conformance to contract documents before concrete placement.

1. Inspection: Provide inspection and verification of installed reinforcement. Confirm that the surface of the rebar is free of form release oil or other coatings.

2. Inspect all preheat and welding activities for steel reinforcement, when these occur.

3. Exception: Shallow foundations & non-structural slabs-on-grade supporting buildings of no greater than three stories and either of concrete design strength 2500psi (or greater) or supporting light-frame construction do not require special inspection. Non-structural patios, driveways, and sidewalks do not require special inspection.

3.8 CLEANING

A. Remove excess material and debris associated with this work from the job site.

END OF SECTION 03 2000

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SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Provide all labor, materials, equipment and services to complete all concrete work required, including, but not limited to, the following:
   1. Foundations, beams, columns, elevated slabs, slabs-on-grade, walls, and retaining walls.
   2. Installation of all bolts, inserts, sleeves, connections, etc. in the concrete.
   3. Joint devices associated with concrete work.
   4. Miscellaneous concrete elements, including, but not limited to: equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.
   5. Concrete curing.
   6. Coordination with other sections:
      a. Make all preparations and do all work necessary to receive or adjoin other work. Install all bolts and anchors, including those furnished by other sections, into formwork and provide all required blocking.
      b. Install all accessories embedded in the concrete and provide all holes, blockouts and similar provisions necessary for the work of other sections. Provide all patching or cutting made necessary by failure or delay in complying with this requirement at the Contractor's expense.
      c. Coordinate with other sections for the accurate location of embedded accessories.

B. Related Sections:
   1. Pertinent Sections of Division 01 specifying Quality Control and Testing Laboratory services.
   2. Pertinent Sections of Division 03 specifying concrete construction.
   3. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete.
   4. Pertinent sections of other Divisions specifying floor finishes and sealants applied to concrete substrates.
   5. Section 03 1000 – Concrete forming and Accessories: Formwork requirements for architectural, exposed concrete.
   ~~4.~~6. Section 03 3500 – Concrete Finishing: Special finishing requirements for architectural, exposed concrete.

1.2 REFERENCES

A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC) Chapter 19A Concrete.

B. American Concrete Institute (ACI) 211.1 “Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete”; ACI 211.2 “Standard Practice for Selecting Proportions for Lightweight Concrete”.

C. ACI 301 “Specifications for Structural Concrete”.

D. ACI 302.1R “Guide for Concrete Floor and Slab Construction”.

E. ACI 304R “Guide for Measuring, Mixing, Transporting, and Placing Concrete”.

F. ACI 305R “Hot Weather Concreting”.

G. ACI 306R “Cold Weather Concreting”.

H. ACI 308 “Standard Practice for Curing Concrete”.

I. ACI 318 “Building Code Requirements for Reinforced Concrete and Commentary”.

1.3 SUBMITTALS

A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review. Submit for review prior to fabrication.

B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.

C. Product Data: Submit manufacturers' data on manufactured products and other concrete related materials such as bond breakers, cure/sealer, admixtures, etc. Demonstrate compliance with specified characteristics. Provide samples of items upon request.

D. Mix Designs: Submit Mix Designs for each structural concrete type required for work per requirements of articles CONCRETE MIXES and QUALITY ASSURANCE. Resubmit revised designs for review if original designs are adjusted or changed for any reason. Non-Structural mixes need not be submitted for review by Structural Engineer.

E. Shop Drawings: Proposed location of construction and cold joints. Proposed location of all slab construction/dowel joints, control joints, and blockouts.

F. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.

G. Batch Plant Certificates: Include with delivery of each load of concrete. Provide Certificates to the Testing Agency and the Architect/Engineer as separate submittals. Concrete delivered to the site without such certificate shall be rejected and returned to the plant. Each certificate shall include all information specified in Article SOURCE QUALITY CONTROL below.

H. Engineering Analysis: Prepared by a California-licensed Civil or Structural Engineer, justifying construction-imposed loads on slabs, beams, and walls which exceed those allowed by CBC for the specified use.

I. 2000 lbs maximum allowable construction load without analysis.

J. 10,000 lbs maximum allowable construction load with analysis.

K. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.4 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Concrete construction verification and inspection to conform to CBC 1705A.3.

C. Common Sourcing: Provide each of the following materials from a single source for entire project.
   1. Cement.
   2. Fly ash.
   3. Aggregate.

D. Follow recommendations of ACI 305R when concreting during hot weather. Follow recommendations of ACI 306R when concreting during cold weather.

E. Services by the Independent Testing Agency (includes "Special" Inspections) as specified in this Section and as follows:
   1. Perform tests and inspections specified below in articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and reports to be in conformance with pertinent Sections of Division 01.

F. Contractor shall bear the entire cost of remediation, removal, and/or replacement of concrete determined defective or non-conforming, including Architect/Engineer fees for redesign.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Materials specified by brand name shall be delivered in unbroken packages bearing manufacturer's label and shall be brand specified or an approved equal.

B. Delivery, Handling and Storage of other materials shall conform to the applicable sections of the current editions of the various reference standards listed in this Section.

C. Protect materials from weather or other damage. Sort to prevent inclusion of foreign materials.

D. Specific Requirements:
   1. Cement: Protect against dampness, contamination, and warehouse set. Store in weather tight enclosures.
   2. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregates. Use only one supply source for each aggregate stock pile.
   3. Admixtures:
      a. Store to prevent contamination, evaporation, or damage.
      b. Protect liquid admixtures from freezing and extreme temperature ranges.
      c. Agitate emulsions prior to use.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather (Freezing or near-freezing temperatures) per ACI 306R:
   1. Heat concrete materials before mixing, as necessary to deposit concrete at a temperature of at least 50°F but not more than 90°F.
   2. Do not place concrete during freezing, near-freezing weather, snow, rain or sleet unless protection from moisture and/or cold is provided.
   3. Protect from freezing and maintain at a temperature of at least 50°F for not less than seven days after placing. Take special precautions to protect transit-mixed concrete.
   4. No salts, chemical protection or admixture are permitted without written approval of Architect/Engineer.
   5. Contractor shall maintain an air temperature log for the first 7 days after placement with entry intervals not to exceed 8 hours.

B. Hot Weather per ACI 305R:
1. Cool concrete materials before mixing, or add ice in lieu of mix water as necessary to deposit concrete at a temperature below 85°F.
2. Do not place concrete in hot/windy weather without Architect/ Engineer review of procedures.
3. Provide sunshades and/or wind breakers to protect flat work during finishing and immediate curing operations. Do not place flatwork concrete at air temperature exceeding 90°F.
4. Provide modified mix designs, adding retarders to improve initial set times and applying evaporation reducers during hot/windy weather for review by Independent Testing Agency prior to use.

1.7 MOCK-UP

A. Construct and erect mock-up panel for architectural concrete surfaces indicated to receive special treatment or finish, as result of formwork.
1. Panel Size: Sufficient to illustrate full range of treatment.
~~2. Number of Panels: 2.~~
~~2. Locate as indicated on drawings.~~
3. See Section 03 3500 for complete mockup requirements.

B. If requested by Architect / Engineer, cast concrete against mock-up panel. Obtain acceptance of resulting surface finish prior to erecting formwork.

C. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.

D. Mock-up may remain as part of the Work.

1.8 SCHEDULING AND SEQUENCING

A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the Testing Agency.

B. Provide schedule and sequence information to Testing Agency in writing upon request. Update information as work progresses.

PART 2 - PART 2 - PRODUCTS

2.1 FORMWORK

A. Comply with requirements of Section 03 1000.

2.2 REINFORCEMENT

A. Comply with requirements of Section 03 2000.

2.3 MATERIALS

A. General Requirements: All materials shall be new and best of their class or kind. All materials found defective, unsuitable, or not as specified, will be condemned and promptly removed from the premises.

B. Cementitious Materials:
1. Portland Cement: ASTM C150, Type II, low alkali conforming to CBC 1903A.1.

2. Fly Ash (Pozzolan): ASTM C618, Class F.

C. Concrete Aggregates:
1. Coarse and Fine Aggregates: ASTM C33; Stone aggregate and sand. Specific source aggregate and/or sand or shrinkage characteristics as required for class of concrete specified.
2. Lightweight aggregate: ASTM C330 and C332.
3. Source shall remain constant throughout the duration of the job. The exact portions of the fine aggregates and coarse aggregates to be used in the mix shall be determined by the mix design.

D. Water: Potable, clean, from domestic source.

E. Admixtures: All admixtures shall be used in strict accordance with the manufacturer's recommendations. Admixtures containing calcium chlorides or other accelerators shall not be used without the approval of the Architect/Engineer and the Owner's Testing Laboratory.
1. Mid Range Water Reducing Admixtures: ASTM C494 Type A, "MasterPolyHeed" (formerly “PolyHeed”) series by BASF, "WRDA" series by W.R. Grace, or equal.
2. High Range Water-Reducing Admixtures: ASTM C494 Type F, "MasterRheoBuild 1000" (formerly “RheoBuild 1000”) or “MasterGlenium” (formerly “Glenium”) series by BASF or equal.
3. Water Reducing Admixture and Retarder: ASTM C494 Type B or D, "MasterPozzolith" (formerly “Pozzolith”) series or “MasterSet DELVO” (formerly “DELVO”) series by BASF, "Plastiflow-R" by Nox-crete, or equal.
4. Air Entraining Admixtures: ASTM C260, product suit condition by BASF or equal.
5. Viscocity Modifiers: ASTM C494 Type S.

F. Slurry: Same proportion of cement to fine aggregates used in the regular concrete mix (i.e. only coarse aggregate omitted); well mixed with water to produce a thick consistency.

G. High Strength Grout: See section 05 1200 or 05 1100 for requirements.

H. Dry Pack: Dry pack (used only for cosmetic concrete repairs) shall consist of:
1. One part cement to 2-1/2 parts fine aggregate (screen out all materials retained on No.4 sieve), mixed with a minimum amount of water, added in small amounts.
2. Mix to consistency such that a ball of the mixture compressed in the hand will retain its shape, showing finger marks, but without showing any surface water.

2.4 ACCESSORIES

A. Bonding Agent: ASTM C881, Type II Grade 2 Class B or C. Do not allow epoxy to set before placing fresh concrete.
1. “MasterEmaco ADH 326” (formerly “Concresive Liquid LPL”) by BASF;
2. “Rezi-Weld 1000” by W.R. Meadows.

B. Chemical Hardener: Fluorosilicate solution designed for densification of cured concrete slabs. “MasterKure HD 310 WB” (formerly “Lapidolith”) by BASF, "LIQUI-HARD" W.R. Meadows Co, or equal.

C. Moisture-Retaining Cover: ASTM C171, type 1, one of the following;
1. Regular Curing Paper, Type I, reinforced waterproof: Fortifiber Corporation "Orange Label Sisalkraft", "Pabcotite" paper, or equal.
2. Polyethylene Film: ASTM D 2103, 4 mil thick, clear or white color.
3. White-burlap-polyethylene sheet, weighing not less than 10 oz/per linear yd.

D. Liquid Curing Compound: ASTM C 309, Type 1, Class B, clear or translucent, 25% minimum solids, water base acrylic cure/sealer which will not discolor concrete and

compatible with bonding of finishes specified in related sections. W.R. Meadows Co. “Vocomp 25” or equal. Maximum VOC content shall comply with local requirements and California Green Building Code.

E. Under Slab Water Vapor Retarder: ~~Vapor retarder sheet to be ASTM E1745 Class A; 15 mil, single ply extruded polyolefin; permeance no greater than 0.01 U.S. Perms per ASTM E154, ASTM E96 procedure B or ASTM F1249~~. See Section 07 2616.
~~1. “Stego Wrap Vapor Barrier (15mil)” by Stego Industries LLC.~~
~~2. “Vaporguard” by Reef Industries.~~
~~3. Approved Equal.~~

F. Evaporation Reducer: "MasterKure ER 50” (formerly Confilm), by BASF.

G. Permeability Reducer: Use only where specifically referred to.
1. Admixture Type: Xypex Chemical Corporation "XYPEX Admix C-500". Dosage: 2-3% of cement content by weight; 15 lb/cu. yd. max. or BASF “MasterLife 300D” (formerly “Rheomac 300D”). Dosage: 2% of cement by mass.
2. Surface-Applied Type: Xypex Chemical Corporation "XYPEX Concentrate. Brush application: 1.25-1.50lb/sq. yd., 5 parts powder to 2 parts water. BASF “MasterSeal 500” (formerly Tegraproof”). Slurry coat: one part water to 2.25-2.5 parts powder by volume.
3. Approved equal.

2.5 JOINT DEVICES AND MATERIALS

A. Waterstops: Resilient type, meeting Corps of Engineers CRD-C 572. Consult manufacturer for appropriate product for specific use. Submit for review. Install per manufacturers recommendation. Provide W. R. Meadows “Seal Tight” PVC waterstop, Sika “Greenstreak” PVC waterstop, or approved equal.

B. Expansion Joint Filler: ASTM D1751, Nonextruding, resilient asphalt impregnated fiberboard or felt, 3/8 inch thick and 4 inches deep; tongue and groove profile.
1. Products: "Servicised Products", W.R. Meadows, Inc., "National Expansion Joint Company", "Celotex Corporation", or equal.

C. Joint Filler: ASTM D944, Compressible asphalt mastic with felt facers, 1/4 inch thick and 4 inches deep.

D. Sealant and Primer: As specified in Section 07 9105.

E. Slab Joint Sealant: Compatible with floor finishes specified in related sections.

2.6 CONCRETE MIXES

A. General requirements for mix design and submittal of structural class concrete:
1. Provide Contractor submittals to Architect/Engineer not less than 15 days before placing concrete.
2. Contractor shall review mix designs and proposed placing requirements prior to submittal for compatibility to insure that the concrete as designed can be placed in accordance with the drawings and specifications.
3. Changes or revisions require re-submittal: All variations to approved mix designs, including changing type and/or quantity of admixtures shall be resubmitted to the Architect/Engineer for review prior to use.
4. Mix design(s) for all structural classes of concrete to be prepared by qualified person experienced in mix design. Allow for time necessary to do trial batch testing when required.
5. Preparer to provide backup data and certify in writing that mix design meets:

a. Requirements of the specifications for concrete durability and quality;
b. Requirements of the California Building Code and ACI 318 Section 26.4, including break histories, trial batching test results, and/or a mix designed by a California Registered Civil Engineer per ACI 318 Section 5.4 and bearing the Engineer's seal & signature.

6. Clearly note on mix designs with specified maximum WCR if design permits addition of water on site, or clearly identify in the mix design that no water is to be added on site.
7. Deviations: Clearly indicate proposed deviations, and provide written explanation explaining how the deviating mix design(s) will provide equivalent or better concrete product(s) than those specified.
8. Include adjustments to reviewed mix designs to account for weather conditions and similar factors.

B. Proportioning - General: The following provisions apply to all mix designs:
1. Proportion concrete mixes to produce concrete of required average strength (as defined by CBC Section 1904A and ACI 318 Section 19.2.1). Select slump, aggregate sizes, shrinkage, and consistency that will allow thorough compaction without excessive puddling, spading, or vibration, and without permitting the materials to segregate, or allow free water to collect on the surface.
2. Select aggregate size and type to produce dense, uniform concrete with low to moderate shrinkage, free from rock pockets, honeycomb and other irregularities.
3. Mix designs may include water reducing and retarding admixtures to meet or exceed minimum set times (time required to place and finish) and to minimize Water Cement Ratios (WCR). Minimum and maximum criteria presented in this section are guidelines and do not represent a specific mix design.
4. Cement Content: Minimum cement content indicates minimum sacks of cementitious material. Increasing cement content to increase early strengths or to achieve specified WCR while maintaining water content is discouraged in order to minimize effects of shrinkage.
   a. Substitution of fly ash for Portland cement on an equivalent weight basis up to 25% replacement is permitted, except at high early strength concrete. Replacement in excess of 25% is not permitted unless part of a specified mix design that has been submitted for review.
   b. Such substitution requests may be denied by the Engineer.
5. Water Content: Mix designs with a specified maximum Water Cement Ratio (WCR) may be designed with a lower WCR than specified in order to allow addition of water at the site.
6. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301 and this section.
   a. For trial mixtures method, employ independent testing agency acceptable to Architect/Engineer for preparing and reporting proposed mix designs.
7. Placement Options: Mix designs may, at the Contractor's option, be designed for either pump or conventional placement with aggregate size, slumps, etc. to be maintained as specified in this section.

C. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations and this section.

D. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations and this section. Maximum cured weight of lightweight concrete shall be 110 pounds per cubic feet.

E. Special mix design requirements for interior concrete floor slabs on grade to receive floor coverings or coatings:
1. Proportion concrete mixes per this specification, ACI 211.1, and the requirements below:

2. Minimum strength at 28 days to be 3000 psi; minimum strength at 56 days to be 4000 psi.
3. Fly Ash Type F, shall be substituted for cement on a 1 lb. per 1 lb. basis, with a minimum replacement of 25% and a maximum of 35%.
4. 200 lbs. of 3/8(-) aggregate shall be added to reduce total sand.
5. Reduce total sand to minimum practical.
6. Admixture dosage shall be per manufacturer's recommendations. Dosage may be increased for workability as long as set times are not excessive for placement and finishing.
7. Special mix design requirements for high volume fly ash concrete:
8. Proportion concrete mixes per this specification, ACI 211.1, and the requirements below:
9. Fly Ash Type F, shall be substituted for cement on a 1 lb. per 1 lb. basis, with a replacement of 50%.
10. Minimum strength at 28 days to be 2500 psi; minimum strength at 56 days to be 3000 psi.
11. Add 200-300 pounds 3/8" aggregate to replace portion of fine aggregate.
12. Admixture dosage shall be per manufacturer's recommendations. Dosage may be increased for workability as long as set times are not excessive for placement and finishing.
13. Concrete shall be wet cured per CONCRETE CURING.

F. Mix Design Minimum Requirements:

Concrete Class	Coarse Aggregate Size (Inches) & Fine Aggregate[3]	Maximum WCR or Maximum Nominal Slump & Tolerance (Inches)[1,2]	Minimum 28-Day Design Strength	Minimum Cement Sacks/per yd[4]
NON-STRUCTURAL				
1) Lean Concrete (use only where specified)	---	---	---	3.0
2) Slab on Grade Exterior (Walks & Patios)	1" x #4	4" ± 1"	2,500	4.5
STRUCTURAL				
3) Interior Slab on Grade w/floor coverings/coatings[5]	1" x #4	WCR = .45	__	6.1
4) Interior Slab on Grade w/o floor coverings/coatings	1" x #4	WCR = .45	3,000 (4,000 at 56-days)	5.0
5) Foundation (including stem walls, Retaining Walls)	1" x #4	WCR = .42	5,000	6.0
6) Mat Slab Foundations	1" x #4	WCR =.42	5,000	
7) Formed Cast Slab Above Grade, Beams	1" x #4	WCR = .42	5,000	6.0
8) Cast Slab Above Grade on Metal Deck	3/4" x #4	WCR = .42	5,000	6.0
9) Columns, Walls	1/2" x #4	WCR = .42	5,000	6.0
10) Light Weight Concrete	3/4" x #4 Expanded Shale	3" ± 1/2"	3,000	5.5
11) High Volume Fly Ash Concrete[6]	1" x #4	WCR = .45	__	6.0

1. The tolerance is the maximum deviation allowable without rejection. The mix design shall be based on the nominal value specified and is without water reducing mixtures. Slump to be measured at the end of the hose.
2. The maximum water cement ratio (WCR) is limited at time of placement as noted. No water is to be added on site such that the specified WCR or maximum slump is exceeded without approval of the testing laboratory and the Architect/Engineer. Workability is to be achieved utilizing an acceptable mid range to high range water reducing admixture.
3. Gradation of aggregate is per CBC Section 1903A, ACI 318 section 26.4.1.2, and ASTM C33.
4. Minimum cement content includes all cementitious materials.
5. See Article 2.6E for additional requirements at slabs on grade with coverings/coatings.
6. See article 2.6F for additional requirements at high volume fly ash concrete.

2.7 MIXING CONCRETE

A. Batch final proportions in accordance with approved mix designs. All adjustments to approved proportions, for whatever reason, shall be reviewed by the Architect/Engineer prior to use.

B. Batch and mix concrete in accordance with ASTM C94, at an established plant. Site mixed concrete will be rejected.

C. Provide batch and transit equipment adequate for the work. Operate as necessary to provide concrete complying with specified requirements.

D. Place mixed concrete in forms within 1-1/2 hours from the time of introduction of cement and water into mixer or 300 revolutions of the drum whichever comes first. Use of, re-mixing, and/or tempering mixed concrete older than 1 hour will not be permitted.

E. Do not add water at the site to concrete mixes with a maximum specified WCR unless the water content at batch time provides for a WCR less than specified and this provision, including the quantity of water which may be added at the site, is specifically noted on the mix design and certification by the mix preparer. See ASTM C94 for additional requirements.

2.8 SOURCE QUALITY CONTROL

A. Services by independent Testing Agency:
   1. Batch Plant Certificates: Obtain the weighmaster's Batch Plant Certificate at arrival of truck at the site. If no batch plant certificate is provided, recommend to the General Contractor that the truckload of concrete be rejected. So note in daily log, along with the location of the load of concrete in the structure if the load is not rejected.
      a. Laboratory's inspector shall obtain for each transit mixer Batch Plant Certificates to verify mix design quantities and condition upon delivery to the site.
      b. Certificates to include: Date, time, ingredient quantities, water added at plant and on job, total mixer revolutions at time of placement, and time of departure.
      c. Concrete with specified water cement ratio: Add no water on site unless mix design and batch records each show additional water may be added. See ASTM C94 for additional requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

B. Verify work of other sections is complete and tested as required before proceeding.

3.2 PREPARATION

A. Observation, Inspection and Testing:
   1. Architect/Engineer: Notify not less than 2 working days before each concrete placement, for observation and review of reinforcing, forms, and other work prior to placement of concrete.
   2. Testing Agency: Notify not less than 24 hours before each placement for inspection and testing.

B. Placement Records: Contractor shall maintain records of time, temperature and date of concrete placement including mix design and location in the structure. Retain records until completion of the contract. Make available for review by Testing Agency and Architect/Engineer.

C. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

D. Verify location, position and inclusion of all embedded and concealed items.

E. Verify installation of vapor retarder under interior slabs on grade, as specified in related section, is complete.

F. Cleaning and Preparation:
   1. Remove loose dirt, mud, standing water, and foreign matter from excavations and cavities.
   2. Close cleanout and inspection ports securely.
   3. Thoroughly clean reinforcement and other embedded items free from loose rust and foreign matter. Maintain reinforcing securely in place. Do not place concrete on hot reinforcing.
   4. Dampen form materials and substrates on which concrete is to be placed at least 1 hour in advance of placing concrete; repeat wetting as necessary to keep surfaces damp. Do not saturate. Do not place concrete on saturated material.
      a. Thoroughly wet wood forms (except coated plywood), bottom and sides of trenches, adjacent concrete or masonry and reinforcement.
      b. Concrete slabs on base rock, dampen rock.
      c. Concrete slabs on vapor retarder, do not wet vapor retarder.
   5. Verify that metal forms are clean and free of rust before applying release agent.
   6. Thoroughly clean metal decking. Do not place concrete on wet deck surface.
   7. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

G. Drill holes in existing concrete at locations where new concrete is doweled to existing work. Insert steel dowels and prepare connections as detailed.

H. Do not overcut at existing concrete work to remain. Contractor is responsible for repair/replacement of overcut concrete to the Owner’s satisfaction.

3.3 PIPES AND CONDUITS IN CONCRETE

A. Slabs-on-Grade:
   1. No pipe or conduit exceeding 1 inch outside diameter shall be embedded within the specified slab thickness except as specifically detailed.
   2. Do not stack or abut pipes, maintain 3 inches minimum clearance.

B. Sleeving and Wrapping:
   1. Foundations: Sleeve or wrap all individual pipe penetrations, minimum 1-1/2 inches clear to reinforcing all around.
      a. Sleeves: PVC. Provide 1 inch minimum clear all around O.D. pipe to I.D sleeve, UNO at ends, fill void space with mastic or plastic bituminous cement.
      b. Wrapped Vertical Pipes: Provide 1/8 inch nominal sheet foam with three wraps minimum, UNO.
      c. Wrapped Horizontal Pipes: Provide 1/8 inch nominal sheet foam with eight wraps minimum, UNO.
      d. Underground Fire Lines 4” and Larger: At sleeves provide 2 inch minimum clear all around O.D. pipe to I.D sleeve. At wrapped pipes, provide 1/8 inch nominal sheet foam with sixteen wraps minimum.
   2. Slabs or Curbs: Wrap pipes as described above.

C. Space groups of pipes/conduits at least 3 sleeve diameters apart, do not interrupt specified concrete and reinforcement.
   1. Provide block-outs as detailed when grouping of pipes/conduits in foundation or other structural member prevents spacing as described. Notify Architect/Engineer for review of any conditions not conforming to details.
   2. Center pipe/conduit penetrations in the depth and/or thickness of foundations.
   3. Maximum size of pipe/conduit penetrations shall not exceed the least dimension of concrete divided by 3.

D. Do not embed pipes/conduits in concrete slabs on metal deck.

E. Provide the following at pipes/conduits detailed to be embedded in a concrete beam, wall or column:
   1. Place as near as possible to center of member with reinforcing as specified on each side.
   2. Where reinforcing is located near or at center of member, place pipe or conduit 1 inch minimum clear from reinforcing and provide #3 at 12 inches on center perpendicular to the pipe/conduit. Reinforcing to extend 12 inches minimum past pipe/conduit each side.
   3. Maintain ¾ inch clear minimum from added reinforcing to face of concrete where not exposed to weather and 1-1/2 inches clear where exposed to weather.
   4. Space embedded items (groups of pipe/conduit, junction boxes or other elements) minimum 3 inches apart.
   5. Provide reinforcing in walls, beams, columns as detailed for groups of pipe/conduit. Provide minimum replacement reinforcement of same size and number for interrupted or displaced reinforcement for the full height, length, width of the wall, beam, and/or column on each side of the “effective opening.”

3.4 CONCRETE PLACEMENT

A. Transporting:
   1. Provide clean, well-maintained equipment of sufficient quantity and capacity to execute the work and produce concrete of quality specified.
   2. Handle and transport concrete from mixer to final deposit location as rapidly as practicable. Prevent separation or loss of ingredients.

B. Perform concrete placement by methods which will not puncture, damage or disturb vapor retarder membrane. Repair all damage to vapor retarder membrane before covering.

C. Placement - General: Placement, once started, shall be carried on as a continuous operation until section of approved size and shape is completed. Provide construction joints as detailed on the drawings. Engineer's written approval required for all deviations.
   1. Deposition:
      a. Deposit concrete to maintain an approximately horizontal plastic surface until the completion of the unit placement.
      b. Deposit as neatly as practicable in final position, minimize re-handling or flow.
      c. Do not drop concrete freely where reinforcing bars, embeds, or obstructions occur that may cause segregation. Provide spouts, elephant trunks, or other means to prevent segregation during placement.
   2. Depth: Layered placement in columns and walls shall not exceed ten feet vertical depth.
      a. Place concrete in minimum 32 inch horizontal lifts.
      b. Schedule placement to ensure that concrete will not take initial set before placement of next lift.
      c. No horizontal cold joints are allowed in columns or walls.
   3. Progress Cleaning: Remove all concrete spilled on forms or reinforcing steel in portions of structure not immediately concreted. Remove completely before concrete sets.
   4. Interruptions: Shut down placement operations and dispose of all remaining mixed concrete and concrete in hoppers or mixers following all interruption in placement longer than 60 minutes.
      a. If such interruption occurs, provide new or relocate existing construction joints as directed by Engineer.
      b. Cut concrete back to the designated line, cleaning forms and reinforcing as herein specified.
      c. Prepare for resumption of placement as for new unit when reason for interruption is resolved.

D. Placement - Elevated Structural Systems: Place as noted for "General" above and as follows:
   1. Metal Decking and Structural Steel Beam Systems that are not to be shored: Locate screed lines on primary structural members. Review proposed screed line locations and expected structural deflections with the Architect/Engineer prior to placement of concrete.
   2. Place screed lines to match camber of primary girders made of material other than concrete. Locate screeds to provide the minimum specified thickness of concrete at all locations.
   3. Compensate for deflection of intermediate structural members and decking by placement of additional concrete.
   4. Adjust embedded items to compensate for camber and deflection. Maintain locations within specified tolerances.

E. Consolidation:
   1. Consolidate all concrete thoroughly during placement with high-speed mechanical vibrators and other suitable tools. Perform manual spading and tamping to work around reinforcement, embedded fixtures, and into corners of formwork as required to obtain thorough compaction.
      a. Provide vibrators with sufficient amplitude for adequate consolidation.
      b. Use mechanical vibrators at each point of concrete placement.
      c. Keep additional spare vibrators, in addition to those required for use, at the site for standby service in case of equipment failure.
   2. Consolidate each layer of concrete as placed.
      a. Insert vibrators vertically at points 18 to 30 inches apart; work into top area of previously placed layer to reconsolidate, slowly withdraw vibrator to surface.

b. Avoid contact of vibrator heads with formwork surfaces.
c. Systematically double back and reconsolidate wherever possible. Consolidate as required to provide concrete of maximum density with minimized honeycomb.

F. Unacceptable Materials:
1. Do not place concrete that has started to set or stiffen. Dispose of these materials.
2. Do not add water on site to concrete except as specified in the approved mix design, see PART 2 above.

G. Protection of installed work:
1. Do not introduce any foreign material into any specified drainage, piping or duct systems.
2. Contractor shall bear all costs of work required to repair or clean affected work as a result of failure to comply with this requirement.

3.5 ARCHITECTURAL, EXPOSED 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. Adjustment to Concrete Mixes:
1. Adjustment to concrete mix design shall be submitted and accepted prior to any concrete work. Concrete mix design cannot change once concrete has been poured on site.
2. Do not add water to concrete during delivery, at Project site, or during placement.

C. Batch Control and Pour Sequencing: Intent is to produce monolithic, uniform concrete surfaces.
1. Forms and sequencing to be scheduled with intention of providing continuous uniform surfaces.
2. Where possible, allow for same-day pour of single wall surfaces. Control joint locations shown on Drawings are for control of concrete only and do not indicate an acceptance of cold joints at these locations.
3. Mix to be controlled so as to provide uniform coloration. Time arrival of batches to minimize waiting time of concrete on site.
4. Formwork shall be able to withstand excessive deflection when filled with wet concrete.
5. Forms shall be tight to prevent leakage or washing out of cement mortar from concrete.
6. Provide additional bracing, shoring, and accessories as required to achieve specified tolerances.
7. Use extra studs, walers and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.
8. Provide sealers, trim, corner bracing, stiffeners, to achieve profiles of joints and seams, as shown on Drawings.

D. Concrete Placement: Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seas or planes of weakness. Deposit concrete to avoid segregation at its final location. Deposit concrete continuously or consecutively to ensure consistency of raw materials.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

E. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.

1. Deposit and vibrate special finished concrete to ensure proper consolidation, elimination of unintended cold joints, and to minimize entrapped air on exposed surfaces.
2. Proper placement and thorough effective compaction of architectural concrete are most important. Place vibrators in the concrete rapidly to minimize entrapped air between the concrete and the form and to blend the two layers. Insert vibrators in accordance with manufacturer's recommended radius of influence. Vibrate with rubber type heads and, in addition, spade along forms with flat strap or plate. Keep vibrator heads a minimum of 2-1/2 inches from the architectural concrete face.
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.

F. See Section 03 3500 for defective architectural, exposed concrete repair requirements.

~~3.5~~3.6 CONCRETE JOINTS

A. Structural Joints (Construction/Cold Joints):
1. Locate joints only where shown, or as approved.
2. Review Required: Joints not indicated on the plans shall be located to meet the minimum requirements below, shall not impair the strength of the structure and shall be submitted to Architect/Engineer for review prior to placement of concrete.
   a. Indicate proposed location(s) of construction/cold/expansion joints on shop drawing submittals for review prior to placing concrete.
3. Clean and roughen all surfaces of previously placed concrete at construction joints by washing and sandblasting to expose aggregate to 1/4 inch amplitude.
4. Slabs-On-Grade: Maximum Length of continuous placement shall not exceed 60 feet without special review by the Architect/Engineer. Alternate or stagger placement sections.
5. Foundations, Beams, Elevated Slabs and Joists: Maximum Length of continuous placement shall not exceed 200 foot increments. Provide “keyed” shut-off locations made up with form boards. Extend reinforcing one lap length or more through shut-off.
   a. All reinforcement shall be continuous through construction/cold joint, lapping to adjacent reinforcing in future placement.
   b. Construction Joints in Elevated Slabs: Review all proposed locations with Architect/Engineer.
   c. Construction Joints in Slabs on Metal Decking: Review all proposed locations with Architect/Engineer. Do not locate closer than 24 inches to faces of girder or beam.
6. Horizontal Construction Joints: Place 2 inch slurry (specified concrete mix less coarse aggregate) at beginning of pour at the bottom of walls unless a prior review of a mock-up section demonstrates that segregation of aggregate will not occur.
~~6.~~7. Vertical Construction Joints: Maintain vertical joint alignment and uniform joint width as erection progresses. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

B. Expansion/Construction Joints (Dowel Joints and Control Joints):
1. Interior and Exterior Floor Slabs-on-Grade:
   a. Expansion/Construction Joints: Provide dowel joints or control joints at a maximum dimension (in feet) of three times the slab thickness (in inches) in each direction unless noted otherwise (15'-0” maximum). Install joints to match slab level and in straight lines. Locate joints at all reentrant corners including blockouts.
   b. Proportions: Install joints to divide slab into rectangular areas with long dimensions less than 1.5 times short dimension.

2. Exterior Concrete Paving (walkways, patios) and other non-structural concrete flatwork at grade:
   a. Expansion/ construction joints: Provide a 2 inch deep troweled groove or asphalt impregnated joint material embedded 50 percent of the slab depth at 12 feet on center, maximum.
   b. Proportions: Place no section with a length larger than two times width. Additionally, place joints at all inside corners and at all intersections with other work.
3. Elevated Structural Slabs: Locate construction joints as specifically indicated on the drawings. All additional proposed locations shall be reviewed by the Architect/Engineer prior to placement.

C. Joint Types:
1. Dowel Joint: A keyed joint with smooth dowels passing through to allow unrestricted movement due to contraction and expansion. Joints are as specified on the drawings.
2. Control Joint(s): Shrinkage crack control joints may be of the following types when shown on the drawings. Install joints in a straight line between end points with edges finished appropriate to type. Depth shall be 25% of the slab thickness, unless noted otherwise. Fill joints with sealant as shown on the drawings or as required by related sections.
   a. 1/4 inch wide troweled joint.
   b. Keyed joint: Only at locations where concealed by other finishes.
   c. Masonite Strip, 1/8 inch: Only at locations where concealed by other finishes.
   d. Saw Cut, 1/8 inch: Must be performed within eight hours of completion of finishing. Do not make saw cuts if aggregate separates from cement paste during cutting operation. Prevent marring of surface finish. Fill with flexible sealant.

~~3.6~~3.7 VAPOR RETARDER

A. Vapor Retarder Installation: Install as specified in PART 2, ASTM E1643, and per manufacturer's recommendations including taping and lapping of seams, sealing of penetrations, and repair of damage. Do not extend vapor retarder below footings.

~~3.7~~3.8 FLATWORK

A. General Requirements for All Concrete Formed & Finished Flat:
1. Edge Forms and Screeds: Set accurately to produce indicated design elevations and contours in the finished surface, edge forms sufficiently strong to support screed type proposed.
2. Jointing: Located and detailed as indicated.
3. Consolidation: Concrete in slabs shall be thoroughly consolidated.

B. Flatwork Schedule:
1. Exterior Slabs-On-Grade: Place concrete directly over sub-base as indicated.
   a. Sub-Base: Clean free-draining, crushed base rock, 6 inch minimum thickness, thoroughly compacted.
2. Interior Slabs-On-Grade without floor covering:
   a. Sub-Base: Clean free-draining, crushed base rock, 6 inch minimum thickness, thoroughly compacted.
3. Concrete Slabs-On-Grade with floor coverings specified in related sections:
   a. Sub-Base: Clean free-draining, crushed base rock, 6 inch minimum thickness, thoroughly compacted.
   b. Vapor Retarder: Install over sub-base.

~~3.8~~3.9 FORMED SURFACES

A. Form all concrete members level and plumb, except as specifically indicated. Comply with tolerances specified in ACI 318 Section 26.11, ACI 301 Section 2, and this specification, except that maximum permissible deviation is 1/4 inch end-to-end for any single member.

B. Cambers: Provide all cambers indicated in the formwork construction. Set screeds to produce specified cambers in the finished concrete.

~~3.9~~3.10 CONCRETE FINISHES

A. Flatwork Finishing:
   1. Perform with experienced operators.
   2. Finish surfaces monolithically. Establish uniform slopes or level grades as indicated. Maintain full design thickness.
   3. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on drawings.
   4. Flatwork Finish Types:
      a. Wood Float Finish: Surfaces to receive quarry tile, ceramic tile, or cementitious terrazzo with full bed setting system, or wood frame for raised finished floors.
      b. Steel Trowel Finish: Surfaces to receive carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set tile or similar finishes specified in related sections. Trowel twice, minimum.
      c. Broom Texture Finish: Exterior surfaces as indicated or for which no other finish is indicated. Finish as for steel trowel finish, except immediately following first troweling, (depending on conditions of concrete and nature of finish required) provide uniform surfaces texture using a medium or coarse fiber broom.

B. Other Concrete: Provide as required to achieve appearance indicated on structural and architectural drawings and related sections.
   1. Repair surface defects, including tie holes, immediately after removing formwork.
   2. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
   3. Exposed Form Finish: Finish concrete to match forms. Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
      a. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
      b. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
      c. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.
   4. Intermediate joint and score marks and edges: Tool smooth and flush unless otherwise indicated or as directed by the Architect.
   5. Use steel tools of standard patterns and as required to achieve details shown or specified. All exposed corners not specified to be chamfered shall have radiused edges.

~~3.10~~3.11 TOLERANCES

A. Minimum Flatwork Tolerances: Measure flatness of slabs with in 48 hours after slab installation in accordance with ACI 302.1R and ASTM E1155 and to achieve the following FF and FL tolerances:

1. Exterior surfaces: 1/8 inch minimum per foot where sloped to drain. Level otherwise. FF20 and FL15.
2. Interior surfaces not otherwise shown or required: Level throughout. FF25 and FL20
3. Interior surfaces required to be sloped for drainage: 1/8 inch in 10 ft.
4. Finish concrete to achieve the following tolerances:
   a. Under Glazed Tile on Setting Bed: FF30 and FL20.
   b. Under Resilient Finishes: FF35 and FL25.
   c. Flooring manufactureer and pertainent section of Division 9.

B. Formed Surface Tolerances:
1. Permanently Exposed Joints and Surfaces: Provide maximum differential height within two feet of, and across construction joints of 1/16 inch.
2. Vertical Elevations: Elevation of surfaces shall be as shown or approved.

~~3.11~~3.12 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

B. Place required dividers, edge strips, reinforcing, and other items to be cast in.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.

E. Place concrete floor toppings to required lines and levels. Place topping in checkerboard panels not to exceed 20 feet in either direction.

F. Screed toppings level, maintaining surface tolerances per above.

~~3.12~~3.13 CONCRETE CURING

A. Curing - General: Cure in accordance with ACI 308. Maintain concrete water content for proper hydration and minimize temperature variations. Begin curing immediately following finishing.

B. Protection During Curing: Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. The General Contractor is responsible for the protection of the finished slab from damage.
1. Avoid foot traffic on concrete for minimum of 24-hours after placement.
2. Protect concrete from sun and rain.
3. Maintain concrete temperature at or above 50 degrees F. during the first 7 days after placement. See Article ENVIRONMENTAL REQUIREMENTS.
4. Do not subject concrete to design loads until concrete is completely cured, and until concrete has attained its full specified 28-day compressive strength or until 21 days after placement, whichever is longer.
5. Protect concrete during and after curing from damage during subsequent building construction operations. See Article PROTECTION.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
1. Normal concrete: Not less than 7 days.
2. High early strength concrete: Not less than 4 days.

D. Begin curing immediately following finishing.

E. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

F. Surfaces Not in Contact with Forms:
1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than 3 days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
2. Begin final curing after initial curing but before surface is dry.
a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.
b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

G. Flatwork on Grade: Cure by one of the following methods:
1. Water Cure (Ponding): Maintain 100 percent coverage of water over floor slab areas, continuously for minimum 7 calendar days.
2. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
3. Moisture-Retaining Film or Paper: Lap strips not less than 6 inches and seal with waterproof tape or adhesive; extend beyond slab or paving perimeters minimum 6 inches and secure at edges; maintain in place for minimum 7 days.
4. Absorptive Moisture-Retaining Covering: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides and extend beyond slab or paving perimeters 6 inches minimum; maintain in place for minimum 7 days.
5. Liquid Membrane-forming Curing Compound: Provide only when subsequent concrete treatments or finish flooring specified in related sections will not be affected by cure/sealer. Apply curing compound in accordance with manufacturer's instructions at the maximum recommended application rate in two coats, with second coat applied at right angles to first.

H. Elevated Flatwork: Cure by one of the following methods.
1. Moisture-Retaining Sheet: As specified for Flatwork on Grade above.
2. Water Cure: As specified above for minimum 14 days.
3. Apply Membrane Curing Compound as specified above after initial curing period.

I. Flatwork on Metal Decking: Moisture-Retaining Sheet method as specified above.

J. Formed Concrete Members: Cure by moist curing with forms in place for full curing period.
1. Protect free-standing elements from temperature extremes.
2. Maintain forms tight for minimum 7 days. Maintain exposed surfaces continuously damp and completely covered by sheet materials thereafter.
3. Maintain all shoring in place. Refer to related sections specifying formwork.
4. Membrane Curing Compound: Apply compound in accordance with manufacturer's instructions in one coat.

K. Foundations: Apply curing compound immediately after floating.

~~3.13~~3.14 CONCRETE HARDENER

A. Apply hardener to all floor slabs not receiving other finishes after 30 days minimum curing. Clean slabs of non-compatible cure/sealers or other foreign material(s) and apply in strict accordance with the manufacturer's directions.

~~3.14~~3.15 GROUTING AND DRY PACK

A. Set steel plates on concrete or masonry with high strength grout bed, completely fill all voids; thoroughly compact in place. See Section 05 1200 or 05 1100.

B. Bolts or inserts dry packed or grouted in place shall cure for minimum 7 days before tensioning.

~~3.15~~3.16 FIELD QUALITY CONTROL

A. Testing and Inspections by Independent Testing Agency: Provided verification and inspection of concrete per CBC Table 1705A.3. Provide written reports for to Engineer, Architect, Contractor and Building Official for the following tests and inspections:

B. Testing & Inspection: Provide periodic inspection of reinforcing steel. Provide continuous inspection during placement of structural class concrete, 3000 psi or more. Non-structural class concrete with a design strength of 2500 psi or less to have periodic inspection on a 150 cubic yard basis as required to assure conformance.
   1. Provide periodic inspection of bolts in concrete prior to and during placement where so noted on the construction documents.
   2. Structural Concrete Cylinder Tests: Perform in accordance with ASTM C31.
      a. Take four standard 6 inch x 12 inch (or five 4 inch x 8 inch) cylinder specimens on the site, of each class of concrete as specified in PART 2, not less than once a day or for each 150 cubic yards or 5000 sq ft or fraction thereof placed each day.
      b. Record the location of each concrete batch in the building in a log and also note on each specimen.
      c. Perform standard compression test of cylinders in accordance with ASTM C39, one at 7 days and two (three for 4x8 cylinders) at 28 days.
      d. Hold fourth (fifth) cylinder untested until specified concrete strengths are attained.
   3. Structural Concrete Slump Test and Air Tests: Perform in accordance with ASTM D143 and C231 or C173 at the time of taking test cylinders, and/or at one-hour intervals during concrete placing.
   4. Measure and record concrete temperature upon arrival of transit mixers and when taking specimens. Note weather conditions and temperature.
   5. Propose adjustments to reviewed mix designs for Architect / Engineer review to account for variations in site or weather conditions, or other factors as appropriate.
   6. Water Vapor Transmission Tests: Floors receiving floor finishes specified in related sections will be tested prior to installation of flooring systems. Refer to sections specifying floor finishes for related requirements.

C. Services by Contractor:
   1. Rejection of Concrete Materials: Do not use the following without prior written approval of the Architect/Engineer;
      a. Materials without batch plant certificates.
      b. Materials not conforming to the requirements of these specifications.

~~3.16~~3.17 ADJUSTING

A. Inspect all concrete surfaces immediately upon formwork removal. Notify Architect/Engineer of identified minor defects. Repair all minor defects as directed.

B. Surface and Finish Defects: Repair as directed by the Architect/Engineer, at no added expense to the Owner. Repairs include all necessary materials; reinforcement grouts, dry pack, admixtures, epoxy and aggregates to perform required repair.
   1. Repair minor defective surface defects by use of drypack and surface grinding. Specific written approval of Architect/Engineer is required. Submit proposed patching mixture and methods for approval prior to commencing work.
   2. Slabs-on-Grade, Elevated Slabs and on Slabs on Metal Deck: Review for "curled" slab edges and shrinkage cracks prior to installation of other floor finishes. Grind curled edges flush, fill cracks of 1/16 inch and greater with cementitious grout.
   3. Grind high spots, fins or protrusions caused by formwork; Fill-in pour joints, voids, rock pockets, tie holes and other void not impairing structural strength. Provide surfaces flush with surrounding concrete.

3.173.18 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required compressive strength, lines, details, dimensions, tolerances, finishes or specified requirements; as determined by the Architect/Engineer.

B. Repair or replacement of defective concrete will be determined by the Architect/Engineer who may order additional testing and inspection at his option. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

C. Specific Defects:
   1. "Low-Strength"; Concrete Not Meeting Specified Compressive Strength after 28 days:
      a. Concrete with less than 25% Fly Ash as cementitious material: Test remaining cylinder(s) at 56 days. If strength requirements are met, concrete strength is acceptable.
      b. Concrete with 25% or more Fly Ash as cementitious material: Test remaining cylinder(s) at 70 days. If strength requirements are met, concrete strength is acceptable.
   2. Excessive Shrinkage, Cracking, Crazing or Curling; Defective Finish: Remove and replace if repair to acceptable condition is not feasible.
   3. Lines, Details, Dimensions, Tolerances: Remove and replace if repair to acceptable condition is not feasible.
   4. Slab sections not meeting specified tolerances for trueness/flatness or lines/levels: Remove and replace unless otherwise directed by the Architect/Engineer. Minimum area for removal: Fifteen square feet area unless directed otherwise by the Architect/Engineer.
   5. Defective work affecting the strength of the structure or the appearance: Complete removal and replacement of defective concrete, as directed by the Architect/Engineer.

3.183.19 CLEANING

A. Maintain site free of debris and rubbish. Remove all materials and apparatus from the premises and streets at completion of work. Remove all drippings; leave the entire work clean and free of debris.

B. Slabs to Receive Floor Finishes Specified in other sections: Remove non-compatible cure/sealers or other foreign material(s) which may affect bonding of subsequent finishes. Leave in condition to receive work of related sections.

3.193.20 PROTECTION

A. Protect completed work from damage until project is complete and accepted by Owner.

B. Construction Loads: Submit engineering analysis for equipment loads (including all carried loads) specified in article submittals.

C. Keep finished areas free from all equipment traffic for a minimum of 4 additional days following attainment of design strength and completion of curing.

D. Protection of Drainage Systems:

E. Care shall be taken not to introduce any foreign material into any specified drainage, piping or duct system.

F. Cost of work to repair or clean drainage system as a result of failure to comply with this requirement will be back charged to the contractor.

G. Cover traffic areas with plywood sheets or other protective devices; maintain protection in place and in good repair for as long as necessary to protect against damage by subsequent construction operations.

END OF SECTION 03 3000

SECTION 03 3500 – CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Concrete finishes and concrete surface repairs.

B. Intent of this Specification is to require forms, mixtures of concrete, fabrication, and installation so that concrete surfaces will require no patching, except for plugging of tie holes.

1.3 RELATED SECTIONS

A. Section 03 ~~1100~~ 1000 – ~~Concrete Formwork~~ Concrete Forming and Accessories: Formwork requirements for architectural, exposed concrete.

B. Section 03 2100 - Concrete Reinforcing.

C. Section 03 3000 - Cast-In-Place Concrete: Placing requirements for architectural, exposed concrete.

D. Section 32 1316 - Decorative Concrete Paving.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 SYSTEM DESCRIPTION

A. Formwork Design and Tolerance: As specified in Section 03 1000 and as follows:
   1. Provide formwork for Architectural Grade concrete with the intent to provide a smooth, glossy finish, upon removal of the form, with no patching, stoning, or other form of repair; wash only.
   2. Finish shall match required approved job mock-up.
   3. Tolerance standards shall be as set out in Quality Assurance Article here in, and ACI 117.

~~1.5~~1.6 ACTION SUBMITTALS

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

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

3. For priming and sealing coatings, including printed statement of VOC content and chemical components.

~~1.6~~1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain each specified material from one source and from a single manufacturer.

~~B. Mockups: Before finishing existing concrete surfaces, build mockups to verify selections made under sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of fabrication and installation.~~
~~1. Build mockup of size directed by Architect.~~
~~2. Obtain Architect's approval of mockups before proceeding with finishing existing concrete.~~
~~3. Sample may be placed as part of the final construction of the project, but must be removed and replaced if rejected as a sample. Sample will serve as the standard for the balance of the work and shall be protected against damage until final approval of the entire installation.~~

~~1.7~~1.8 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Conference shall be attended by Contractor, Owner, Architect, stain applicator subcontractor and his foreman, and manufacturer's representative. Review procedures, materials, techniques, and coordinate related work and shutdowns.

B. Pre-Installation Conference: Prior to initiating concrete ~~floor polishing~~finishing operations, conduct conference at Project site. Conduct this pre-installation conference at the same time as conference required in Section 03 1000.
1. At least 35 days prior to submitting formwork drawings and materials, conduct a meeting to review detailed requirements and procedures for satisfactory concrete operations. Review requirements for submittals and status of coordinating work.
2. Require representatives of each entity directly concerned with cast-in-place architectural grade concrete to attend, including the following:
~~1. Required Attendees:~~
   a. Owner.
   b. Architect.
   c. Contractor, including supervisor.
   d. Structural Engineer.
   ~~d. Concrete finisher and his foreman.~~
   ~~e. Technical representative of liquid applied product manufacturers.~~
   e. Independent testing agency responsible for concrete design mixtures.
   f. Ready-mix concrete manufacturer.
   g. Agency responsible for field quality control
   h. Cast-in-place architectural concrete subcontractor.
   i. Formwork fabricator
~~2. Determine at what stage in construction floors are to be finished.~~
3. Review procedures, materials, techniques, and coordinate related work and shutdowns.
   a. Tour mock-up and representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of procedures, and other preparatory work performed by other installers.
   b. Review Contract Document requirements.
   c. Review approved submittals.

4. Review concrete finishes and finishing, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural grade concrete.

C. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

D. Mock-up: Before casting architectural concrete, provide samples to demonstrate representative typical joints, surface finish, texture, tolerances and standard of fabrication and installation. Samples shall comply with the following requirements, using materials indicated for the completed Work: Sample shall demonstrate all typical conditions
1. Size: Each representative sample dimensions to be 8 ft. x 8 ft., or equivalent area.
2. Include the following typical items:
   a. Forming, including form joints, corners, and rustications.
   b. Form ties.
   c. Reinforcing of same complexity as job requirements.
   d. Form coating and its application.
   e. Concrete mix, including placing techniques, i.e., pumping.
   f. Method of placing and vibrating concrete.
   g. Curing of concrete.
   h. Form removal.
   i. Snapping off for ties.
   j. Surface finish and color.
3. Locate samples at construction site as directed by Architect. Samples shall remain accessible throughout the concrete installation and during continuing construction activities.
4. Contractor is responsible for all required supporting structure for placement of mockup.
5. Demonstrate methods of erection, placing, curing, cleaning, finishing, sealers, and coatings, and contraction joints, as applicable, using same procedures as proposed for the Work.
6. Include all embedded items detailed to be installed in concrete construction.
7. In presence of Architect demonstrate techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
8. Obtain Architect's approval of samples before casting architectural concrete.
9. Accepted sample(s) establish minimum standard of quality, fabrication, and installation for special concrete finishing.
10. Maintain samples during construction in an undisturbed condition as a standard for judging the completed Work.
11. Demolish and remove field sample panels when directed.

~~1.8~~1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened containers with legible manufacturer’s identification and information.

B. Store specified products in conditions recommended by the manufacturer.

C. Deliver materials in manufacturer's original containers, with seals unbroken, bearing manufacturer's labels indicating brand name, batch/lot numbers and directions for storage.

D. Dispense special concrete finish materials from factory numbered and sealed containers. Maintain record of batch/lot numbers.

E. Submit record of batch/lot numbers to liquid surface treatment manufacturer for validation and issuance of warranties at the conclusion of the applications.

~~1.9~~1.10 PROJECT CONDITIONS

A. Coordinate the work so as not to delay other work in progress.

B. Maintain the immediate work areas clear of other trades, pedestrian traffic and disturbances immediately prior to and during polishing operations.

C. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to receive textured finishes.

D. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid-applied product application.
   1. Dispose of used or diluted liquid surface treatment chemicals and wash water according to applicable Governmental standards.

E. Environmental Conditions: Maintain an ambient temperature of between 50° and 90° F during liquid product application and at least 48 hours after application.

F. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100-mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100-mile radius of the project site.

B. VOC Content: Coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 PERFORMANCE REQUIREMENTS

A. Provide smooth concrete surfaces at exposed cast-in-place concrete, utilizing steel, fiberglass or plastic coated forms or any other kind of material that will impart no pattern to concrete and so that a minimum of the following will be evident when the concrete is subject to imposed loads, temperatures and weather conditions including:
   1. Damage of any kind.
   2. Cracking.
   3. Adjoining concrete elements out of alignment.
   4. Incorrect profiles.

B. Pour joints of cast-in-place concrete shall align with reveals, rustication joints and/or control joints as indicated on the Drawings.

2.3 MATERIALS

A. Concrete Formwork for Architectural, Exposed Concrete: See Section 03 1100.
   1. High Quality Forms: Meeting ACI A347R, Class A.

a. Concrete Formwork, General: Rigid forms such as plastic, high density overlay (HDO), or smooth metal designed to provide uniform smooth finish to impart a smooth, glossy finish, upon removal of the form, with no patching, stoning, or other form of repair, and resulting in uniform finished concrete free of patterns from formwork.

B. Concrete Reinforcing: See Section 03 2100.

C. Cast-In-Place Concrete: See Section 03 3000.

D. Curing Compound: ASTM C309, and shall conform with all applicable air pollution regulations.

E. Form Ties: See Section 03 1000.

F. Formwork Liners: Stainless steel or plastic.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting application of subsequent finishes.

B. Do not proceed with application until unsatisfactory conditions have been corrected.

3.2 FORMWORK FOR "ARCHITECTURAL APPEARANCE GRADE" EXPOSED TO VIEW ARCHITECTURAL CONCRETE – SMOOTH SURFACES

A. Construct forms using materials specified to achieve surface finish and in accordance with manufacturer's instructions.

B. Use only new ~~MDO plywood~~ specified formwork for all exposed to view architectural concrete wall surfaces indicated on the Drawings requiring the best visual appearance and matching sample panels or site mockup sample approved by Architect.

C. Form all concrete walls using plastic cone ties where form tie holes are exposed to view.

D. Arrange all ties in symmetrical, aligned, vertical and horizontal rows in accordance with reviewed and approved shop drawing layout.

E. Plug, tape and seal all cracks, holes, slits and gaps in forms to withstand pressure and remain completely watertight.

F. Design forms to permit removal without damaging the architectural finish. Use only wooden wedges for removal.

G. Clean and recondition formwork before each use. Repair any damage to formwork during placing, removal or storage. Do not use formwork with repairs or patches which would result in adverse effects to the architectural concrete finish.

H. After removal of plastic cone ties, patch and seal all cone holes with appropriate precast cement cone plugs for protection from weathering and future rust staining.

I. Remove forms in a regular sequence so that the time elapsed between concrete placing and removal of forms remains the same for all pours in the same wall planes. Similarly, do not expose coated forms to air for different time periods. These procedures must be followed to ensure color consistency.

3.3 ARCHITECTURAL, EXPOSED CONCRETE FINISH

A. Architectural, Exposed Concrete Finish: Match approved mockup to satisfaction of Architect.
   1. Exposed concrete shall be left exactly as it is formed, wash only. No patching, cutting, wire brushing, sandblasting, bush hammering, acid etch, will be allowed.
   2. Occasional small rock pockets and small voids shall not be cause for rejection. Surface defects including visible cracks, large and/or clustered rock pockets and voids, leakage of mortar paste, stains and other discolorations that cannot be removed satisfactorily by cleaning will be rejected and shall be removed and replaced at no extra cost to the Owner.
   3. Snap off form ties close to surface. Sand form ties so that they are flush with concrete surface within the reveal. Take care to not mar concrete surface.

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.

~~3.3~~3.4 FINISHING FORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

~~A.~~B. Steel trowel slab surfaces which are scheduled to be exposed.

~~B.~~C. Horizontal Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, pavers and other bonded applied cementitious finish flooring material, and where indicated.
   1. After placing slabs, finish surface to tolerance not exceeding 1/2-inch in 10-feet when tested with a 10-foot straight edge, or to tolerance of F_F not less than 15 (floor flatness) and F_L not less than 13 (floor levelness) measured according to ASTM E1155. Slope surfaces uniformly to drains where required.
   2. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

~~C.~~D. Horizontal Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, or as otherwise indicated.
   1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units.
   2. Check and level surface plane to a tolerance not exceeding 5/16-inch in 10-feet when tested with a 10-foot straightedge or to tolerance of F_F not less than 20 (floor flatness) and F_L not less than 15 (floor levelness) measured according to ASTM E1155.
   3. Cut down high spots and fill low spots. Uniformly slope surfaces to drains.

4. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Provide square corners in slab depressions.

~~D.~~E. Horizontal Trowel Finish: Apply a hard trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, thin set ceramic or paver or thin film finish coating system.
1. After floating, begin first trowel finish operation using a power-driven trowel.
2. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.
3. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 3/16-inch in 10-feet when tested with a 10-foot straightedge or to tolerances of not less than F_F 30 (floor flatness) and F_L not less than 20 (floor levelness) measured according to ASTM E1155.
4. Grind smooth any surface defects that would telegraph through applied floor covering system.

~~E.~~F. Roof Slabs: Screed, float or trowel to provide smooth surface free from angular irregularities and suitable for application of insulation, roofing materials or membranes as applicable.

~~F.~~G. Concrete Pads and Supports for Mechanical and Electrical Equipment: Furnish only where such items are indicated to be poured monolithically with slab.

~~G.~~H. Smooth-Formed Finish for Vertical Surfaces: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm).
1. Apply to concrete surfaces exposed to public view.

~~H. Refer to Section 03 3000 for additional concrete finishing and curing requirements.~~

~~3.4 FINISHING SLAB SURFACES~~

~~A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.~~

~~B.~~I. Related Slab 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.

~~C.~~J. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
1. Do not further disturb surfaces before starting finishing operations.

~~D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.~~

~~E.~~K. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F.L. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

M. Refer to Section 03 3000 for additional concrete finishing and curing requirements.

3.5 NON-ARCHITECTURAL CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Review any area of exposed concrete that appears to require patching with Architect before proceeding. Repair and patch defective areas smaller than 1/2-inch with cement mortar only when acceptable to Architect.

1. "Sack and patch", or any other form of surface remediation of areas larger than 1/2-inch will not be allowed; all vertical exposed architectural concrete surfaces are to be "as formed".

B. Mix dry-pack mortar, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

C. Cut out honeycombs, rock pockets, voids over 1/4-inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1-inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

D. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas 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.

3.6 REPAIRING NON-ARCHITECTURAL FORMED SURFACES

A. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Owner's Representative. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with precast cement cone plugs secured in place with bonding agent.

B. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

3.7 REPAIRING NON-ARCHITECTURAL UNFORMED SURFACES

A. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

B. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01-inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

C. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14-days.

D. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

E. Repair defective areas, except random cracks and single holes not exceeding 1-inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

F. Repair isolated random cracks and single holes 1-inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72-hours.

G. Perform structural repairs in accordance with Section 03 3000.

H. Repair methods not specified herein may be used, subject to acceptance by Architect.

3.8 DEFECTIVE WORK, ARCHITECTURAL, EXPOSED CONCRETE

A. Defective Concrete: Where concrete is not in accordance with the Contract Documents and is deemed defective as judged solely by the Architect, the Architect will require removal and replacement of the defective material by the Contractor's to achieve compliance with the Contract Documents at no additional cost or time. Defects include the following:
1. Work that is under strength, out of line, is not formed as shown or not true to alignment or not plumb or level, or not true to the grades and level;
2. Appearance of concrete that shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement.
3. Work that has voids, air bubbles, or rock pockets.
4. Work that has fins and other projections on the surface.
5. Work with color and texture irregularities.
6. Work that has sawdust, wood or debris embedded in it.
7. Work that is not true to line and plane.
8. Work that is not thoroughly troweled and surfaced as specified.
9. Work that has stains and other discolorations that cannot be removed by cleaning.
10. Work which does not meet specified tolerances or does not connect accurately to adjoining work.

~~3.8~~3.9 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

~~3.9~~3.10 PROTECTION

A. Restore finishes damaged during installation and construction so that no evidence remains of correction work.

B. Protect finished Architectural, Exposed Concrete surfaces from subsequent damage during construction including temporary enclosures or panels. Protect all surface corners from damage.

C. Restore finishes damaged during installation and construction so that no evidence remains of correction work.

D. Maintain control of chips, dust, and debris in each area of work.

E. Do not apply field survey marks, erection marks or other writing to Architectural Grade Concrete surfaces.

F. Clean marks, debris and dirt from exposed surfaces on a daily basis.

G. Protect completed finishes from damage during remainder of construction period.

END OF SECTION 03 3500

SECTION 03 3544 – POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Polished stained concrete slabs.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical data sheets and installation instructions for each product specified including the following:
   1. Liquid surface treatment.
   2. Floor polish.

B. Samples for Initial Selection: Manufacturer's color charts showing full range of stain colors available.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
   3. For priming and sealing coatings, including printed statement of VOC content and chemical components.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For firms indicated in "Quality Assurance" Article, including lists of completed projects with project names and addresses, names and addresses of architects, owners, and other information specified.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Include manufacturer's instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
   2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.7 QUALITY ASSURANCE

A. Static Coefficient of Friction: Achieve not less than 0.5 for level floor surfaces as determined by quality control testing according to ANSI/NFSI B101.1.

B. Walkway Auditor: Certified by NFSI to test polished floors for static coefficient of friction according to ANSI/NFSI B101.1.

C. Mockups: Before finishing concrete floors designated for polishing, build mockups to verify selections made under sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of fabrication and installation. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups of 100 square feet in size in a room scheduled for finished flooring directly adjacent to area to be polished as directed by Architect.
   2. Build mockups of typical concrete slab area including polishing and joints.
   3. Polish concrete to demonstrate finished result obtainable without staining.
      a. Polish up to specified finish grit.
      b. Interrupt polishing after completion of 400 grit polish to allow evaluation of gloss level prior to proceeding to specified finish grit.
   4. Demonstrate preparation, cleaning, and protecting of concrete, finishes, cracks, and contraction joints, as applicable.
   5. Produce mock up with the same workers who will stain and polish the concrete.
   6. 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 damage and surface blemishes to match adjacent undamaged surfaces.
      a. Include an area that has been damaged and repaired.
   7. Obtain Architect's approval of mockups before proceeding with finishing existing concrete floors.

D. Polisher Qualifications:
   1. Experience: Company experienced in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.
   2. Supervision: Maintain competent supervisor who is at Project during times specified work is in progress, and is currently certified as Craftsman or Master Craftsman by CPAA.
   3. Manufacturer Qualification: Approved by manufacturer to apply liquid applied products.

E. Liquid Surface Treatment Applicator Qualifications:
   1. Provide letter of certification from manufacturer stating that the applicator is an approved applicator of the product system, is in good standing, and is familiar with the proper manufacturer's procedures and installation requirements.
   2. Provide a list of a minimum of 5 projects performed of similar type, size and complexity.

F. Ensure slab surface is protected from equipment scrapes, impact abrasions, etc.

G. Source Limitations: Obtain each specified material from one source and from a single manufacturer.

H. Sample may be placed as part of the final construction of the project, but must be removed and replaced if rejected as a sample. Sample will serve as the standard for the balance of the work and shall be protected against damage until final approval of the entire installation.

1.8 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Prior to initiating concrete floor polishing operations, conduct conference at Project site.
   1. Required Attendees:
      a. Owner.
      b. Architect.
      c. Contractor, including supervisor.
      d. Concrete finisher and his foreman.
      e. Concrete polisher and his foreman.
      f. Technical representative of liquid applied product manufacturers.
      g. Walkway auditor.
   2. Determine at what stage in construction floors are to be finished.
   3. Review patching requirements and relationship to polishing operations for existing floor penetrations.
   4. Review procedures, materials, techniques, and coordinate related work and shutdowns.
      a. Tour mock-up and representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of procedures, and other preparatory work performed by other installers.
      b. Review Contract Document requirements.
      c. Review approved submittals.
      d. Review procedures, including, but not limited to:
         1) Details of each step of grinding, honing, and polishing operations.
         2) Application of liquid applied products and stage in the polishing operations they should be applied.
         3) Protecting concrete floor surfaces until polishing work begins.
         4) Protecting polished concrete floors after polishing work is completed.

B. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened containers with legible manufacturer’s identification and information.

B. Store specified products in conditions recommended by the manufacturer.

C. Deliver materials in manufacturer's original containers, with seals unbroken, bearing manufacturer's labels indicating brand name, batch/lot numbers and directions for storage.

D. Dispense special concrete finish materials from factory numbered and sealed containers. Maintain record of batch/lot numbers.

E. Submit record of batch/lot numbers to liquid surface treatment manufacturer for validation and issuance of warranties at the conclusion of the applications.

1.10 SITE CONDITIONS

A. Coordinate the work so as not to delay other work in progress.

B. Maintain the immediate work areas clear of other trades, pedestrian traffic and disturbances immediately prior to and during polishing operations.

C. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
   1. Inspect and Diaper all hydraulic powered equipment to avoid staining of the concrete.
      a. Ensure vehicles and equipment used on slabs have tires that will not leave marks.
   2. Prohibit vehicle parking over concrete surfaces to be polished.
      a. If necessary to complete their scope of work, place drop cloths under vehicles at all times.
   3. Prohibit pipe cutting and threading operations over concrete surfaces to be polished.
   4. Prohibit ferrous metals storage over concrete surfaces to be polished.
   5. Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment working over concrete surfaces to be polished.
   6. Protect from acids and acidic detergents contacting concrete surfaces to be polished.
   7. Protect from painting activities over concrete surfaces to be polished.

D. Close areas to traffic during polishing operations and, after completion of polishing, for time period recommended in writing by manufacturer.

E. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.
   1. Dispose of used or diluted liquid surface treatment chemicals and wash water according to applicable Governmental standards.

F. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. VOC Content: Coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 81 13 - Sustainable Design Requirements.
   1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MANUFACTURERS

A. Basis-of-Design Product: The design for the floor polishing system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Basis-of-Design: RetroPlate System.
   2. L & M Construction Chemicals.
   3. Nox Crete.
   4. Consolideck by PROSOCO, Inc.

2.3 STAIN MATERIALS

A. Basis-of-Design Product: The design for the water-based reactive stain is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: L & M Construction Chemicals; Vivid Concrete Dye.
2. L.M. SCOFIELD COMPANY; LITHOCHROME Tintura Stain.
3. PROSOCO, Inc.; Consolideck GemTone Stain
4. Superior Decorative Concrete Systems, PRO Patina Stains.

B. Stain Color: To be selected from manufacturer's full range of standard colors.

C. Finish: Match sample at Architect's offices.

D. Water: Potable.

E. Sealer: As recommended by manufacturer; compatible with stain product; clear.

2.4 EQUIPMENT

A. Field Grinding and Polishing Equipment:
1. Variable speed, machine with planetary/counter rotating concrete grinding heads, walk-behind machine with not less than 600 pounds of down pressure on grinding or diamond polishing pads.
2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments.
3. Areas over 6,000 square feet are considered large projects and machines with a 32 inch grinding area are recommended. Smaller project recommend a heavy 21 inch or comparable planetary/counter rotating head machine.

B. Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.

C. Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.

D. Metal Bonded Pads: Grinding pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.

E. Resin Bonded Pads: Polishing pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.

F. Burnishing Pads: Maintenance pads for use with high speed burnishing equipment.

2.5 POLISHING MATERIALS

A. Liquid Densifier: Odorless, non-hazardous, silicate that penetrates concrete to react with free lime and calcium hydroxide to produce permanent chemical reaction that hardens and densifies concrete surface.

B. Grout Material: Clear modified silicate sealant, containing no pore clogging latex, when mixed with dust salvaged from grinding process forms a paste that reacts with calcium hydroxide in concrete that hardens when surface imperfections are filled.

C. Polish Guard: Non-film forming, stain resistant, food resistant, chemical stain resistant, impregnating sealant designed to be used on concrete surfaces previously densified.

D. Protective Cover: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.

E. Water: Potable.

PART 3 - EXECUTION – NOT USED

3.1 EXAMINATION, GENERAL

A. Verification of Conditions: Examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected

B. Remove coatings, water repellents, previously applied adhesives, and curing membranes by sandblasting; small spots of paint may be removed with a scraper and a commercial paint stripper.

C. Do not use acid washing as a cleaning procedure.

3.2 EXAMINATION FOR POLISHING

A. Acceptance of Surfaces and Conditions:
1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance.
2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.3 PREPARATION FOR POLISHING

A. Correct cracks and abrupt changes in surface profile. Remove fins and projections.

B. Remove all curing compounds and sealers.

C. Examine slab surface prior to starting work, with liquid surface treatment applicator present, for any conditions affecting the Applicator's ability to properly apply the liquid surface treatment. Do not proceed until unsatisfactory conditions are corrected.

D. Prior to application, verify that floor surfaces are free of laitance.

E. Do not allow vehicular traffic on the slab.

F. Report in writing surfaces left in improper condition by other trades.

G. Commencement of finishing procedures will constitute applicators acceptance of conditions.

3.4 POLISHING

A. Sequence of Polishing: Perform polishing after partition studs are erected, but before gypsum board is installed.

B. Examination and Preparation:
   1. Immediately prior to starting work, verify that surfaces conform to product manufacturer's requirements for substrate conditions.
   2. Vacuum and clean saw cut joints and surrounding area so that no dust remains to react with liquid surface treatment material.
   3. Prior to application, verify floor is free of latent salts, curing membrane, bond-breaker, laitance and any other residues that are detrimental to achieving surface appearance requirements.
   4. Beginning of liquid surface treatment application indicates acceptance of existing conditions.

C. Treating Surface Imperfections:
   1. Mix patching compound and grout material with dust created by grinding operations to match color of adjacent concrete surface.
   2. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids.
   3. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.

D. Liquid Densifier Application:
   1. Apply products to substrates in accordance with manufacturer’s instructions, and application procedures.
   2. Apply to clean, dry, and properly prepared surfaces approved by the Architect.
   3. Do not dilute or alter product. Apply as packaged.
   4. Do not apply to painted surfaces.
   5. Allow applied material to remain on the surface for reaction for time period recommended by manufacture. If the material puddles on surface, move applied material around with a micro fiber pad to achieve uniform coverage. Do not apply additional material.
   6. Allow applied material on surface to dry, approximately 30 to 60 minutes before polishing to next level. If white residue appears on surface after drying, material will be removed with additional polishing steps.

E. Comply with flooring system manufacturer’s recommendations and instructions regarding preparation and mixing of materials and application of each component of floor finishing system.
   1. Employ methods to ensure concrete surface is not damaged during application, including discoloration.
   2. Apply liquid surface treatment in accordance with latest manufacturer's published instructions.
   3. Whitening of concrete by over-application or inadequate removal of liquid surface treatment may be cause for rejection.

F. Grout Grinding:
   1. Use grinding equipment and appropriate grit grinding pads.
   2. While applying fresh grout material prior to, grind concrete in direction perpendicular to initial grinding to remove scratches.
   3. Vacuum floor using squeegee vacuum attachment after each pass.

G. Honing:
   1. Use grinding equipment with resin bonded grinding pads.
   2. Grind concrete in one direction starting with 50 grit pad and make as many sequential passes required to remove scratches, each pass perpendicular to previous pass, up to 400 grit pad reaching maximum refinement with each pass before proceeding to finer grit pads.

3. Auto scrub or vacuum floor using squeegee vacuum attachment after each pass.

H. Polishing:
1. Use polishing equipment with resin bonded polishing and burnishing pads.
2. Begin polishing in one direction starting with 60 grit pad.
3. Make sequential passes with each pass perpendicular to previous pass using finer grit pad with each pass, up to grit required for each gloss specified.
4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
5. Auto scrub or vacuum floor using squeegee vacuum attachment after each pass.
6. Continue polishing until gloss appearance, as measured according to ASTM E430, matches approved field mock-ups.
7. Ensure that there are no visible “disc marks” on polished concrete finished floor.

I. Polish Guard: Uniformly apply and remove excessive liquid according to manufacturer’s instructions.

J. Final Polish: Using burnishing equipment and finest grit burnishing pads, burnish to uniform sheen matching approved mock-up.

K. Final Polished Concrete Floor Finish:
1. Class B – Fine Aggregate (Salt and Pepper) Finish: Remove not more than 1/16 inch of concrete surface by grinding and polishing resulting in majority of exposure displaying fine aggregate with no, or small amount of, medium aggregate at random locations.
2. Level 1 – Low Gloss Appearance:
   a. Procedure: Not less than 4 step process with full refinement of each diamond pad up to 400 grit resin bonded pad with one application of densifier.
   b. Gloss Reading: Not less than 40 according to ASTM E430 before polish guard application.
3. Level 2 – Medium Gloss Appearance:
   a. Procedure: Not less than 5 step process with full refinement of each diamond pad up to 800 grit resin bonded pad with one application of densifier.
   b. Gloss Reading: Not less than 55 according to ASTM E430 before polish guard application.
4. See Drawings for locations of each gloss specified.

3.5 APPLICATION – WATER-BASED STAIN

A. Concrete surfaces shall be dry and properly prepared as specified and as recommended by manufacturer. Protect surrounding areas from over-spray, run-off and tracking. Divide surfaces into small work sections using wall, joint lines, or other stationary breaks as natural stopping points.
1. Do not apply stain to surfaces that have received liquid curing compounds.

B. Apply water-based stains at the recommended dilution and coverage rate as recommended by the manufacturer and use application equipment described in the manufacturer’s printed technical literature.

C. Apply water-based stain to the substrate with an airless sprayer or HVLP sprayer.

D. Apply second and third coats, if required after the prior coat has dried sufficiently and can be walked on without damage, 30-60 minutes after application depending on temperature and humidity. Apply the second and third coats at 90 degrees to the direction of the prior coat.

E. High speed burnish the floor to remove any excess color residue off of the surface.

F. Proceed to application of hardener/densifier per the manufacturer's recommendations.

G. If necessary continue to polish the floor up to the desired level of gloss finish.

H. Protect stained surfaces from damage until they are sealed.

3.6 SEALING STAINED CONCRETE

A. Concrete substrate shall be completely dry.

B. After the final stain application has dried sufficiently, normally 8-24 hours at 75 deg F (24 deg C) and 50% relative humidity, remove all contaminates from the surface by dry mopping if required.

C. Apply sealer according to manufacturer's written instructions. Two coats are required.
1. Maintain a wet edge at all times.
2. Allow sealer to completely dry before applying additional coats.
3. Apply second coat of sealer at 90 deg to the direction of the first coat using the same application method and rates.
4. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.
5. If using Consolideck LSGuard burnish the floor with approximately 3,600 rpm (engine speed) machine equipped with Consolideck HEAT pad or diamond pad to achieve a heat reading on the floor of 92 degrees F or higher.

D. Thoroughly inspect all sealed surfaces to verify and approve installation and safety, including wet and dry slip resistance, before the area is opened to traffic.

E. Drying: Allow coated concrete to dry for a minimum of 8-12 hours. Do not open surfaces to foot traffic before dryness is obtained. Maximum surface hardness should develop within 7-10 days.

3.7 FIELD QUALITY CONTROL

A. Field Testing: Engage a qualified walkway auditor to perform field testing according to ANSI/NFSI B101.1 to determine if polished concrete floor finish complies with specified static coefficient of friction.

3.8 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

B. Covering: After completion of polishing, protect polished floors from subsequent construction activities with protective covering.

3.9 DEMONSTRATION

A. Maintenance Training: CPAA Master Craftsman shall train Owner's designated personnel in proper procedures for maintaining polished concrete floor.

3.10 PROTECTION

A. Restrict foot traffic for a minimum of 72-hours after final application of sealer.

B. Do not permit marking of the finished floor, even with pencil. Do not apply chemicals of any kind.

C. Do not permit spills of any kind from coming in contact with finished floors as they will be impossible to remove without damaging the finish.

D. Leave finished work and work area in a neat, broom-clean condition without evidence of spillovers onto adjacent areas.

E. Follow all protection requirements specified in Quality Assurance Article.

F. Architect and Owner will review protection procedures to approve their adequacy.

END OF SECTION 03 3544

SECTION 04 2000

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: All labor, material and equipment and perform all operations required to complete all masonry work as indicated on the drawings and specified.

B. Additional work included in this section: Provision of concrete grout and installation of items provided by other trades that are embedded in and/or attached to masonry work; providing forms at block-outs and formed concrete grout.

C. Related Sections:

1. Pertinent Sections of Division 01 specifying Quality Control and Testing Agency services.

2. Pertinent sections of other Divisions specifying formwork, reinforcement, concrete, masonry, steel, and rough carpentry.

3. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete work.

1.2 REFERENCES AND STANDARDS

A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 19A Concrete, Chapter 21A Masonry

B. TMS 402 / ACI 530 / ASCE 5 “Building Code Requirements for Masonry Structures”.

C. TMS 602 / ACI 530.1 / ASCE 6 “Specification for Masonry Structures”.

D. ASTM A615 “Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement”.

E. ASTM C90 “Load-Bearing Concrete Masonry Units”.

F. ASTM C144 “Aggregate for Masonry Mortar”.

G. ASTM C270 “Mortar for Unit Masonry”.

H. ASTM C404 “Aggregates for Masonry Grout”.

I. ASTM C476 “Grout for Masonry”.

1.3 SUBMITTALS

A. Submit in accordance with Division 01 specifying submittal procedures. The General Contractor shall review and approve submittals prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review.

B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.

C. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.

D. Contractor Submittals:

1. Mix design for all grout and mortar, prepared by a qualified testing laboratory, per TMS 602 section 1.5. Show conformance of mix to proportion specification of ASTM C270 for mortar and ASTM C476 for grout. Alternatively, provide test results and show conformance of mix to property specification of ASTM C270 for mortar and ASTM C476 for grout. Mix shall conform to all requirements herein.

2. Material certificates for all materials used in mixes.

3. Submit shop drawings for all shapes and sizes of concrete unit masonry shown and scheduled on the drawings. Submit shop drawings detailing and locating all masonry reinforcement.

4. Certificate of compliance and test data by concrete unit masonry supplier showing conformance to specified material strengths and properties.

5. Samples: Laid up sections of masonry walls for the Architect's approval of size, texture and color of block, mortar and joint pattern.

6. Layout of vertical control joints in masonry walls coordinated with structural and architectural drawings.

7. Submit cold and/or hot weather construction procedures when ambient temperature is below 40°F or above 90°F. See PART 3.

1.4 QUALITY ASSURANCE

A. For requirements of the Authority Having Jurisdiction, refer to pertinent sections of Division 01 and CBC Chapter 17A.

B. All tests shall be performed by an approved Testing Agency as specified in pertinent sections of Division 01.

C. Testing and Inspection: Tests and inspections performed by approved Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL and the Testing & Inspection Form. Duties and limitations of approved Testing Agency, test costs and test reports in conformance with pertinent sections of Division 01.

D. General: Provide reports to Architect/Engineer and Authorities Having Jurisdiction (AHJ) indicating results of tests and inspections.

E. Concrete Unit Masonry

1. All testing of concrete unit masonry by the approved Testing Agency shall comply with the requirements of CBC Chapters 17A and 21A.

2. Approved Testing Agency shall provide Level C Quality Assurance Program per TMS 602 and CBC Chapter 17A by an approved inspector of masonry construction.

F. Contractor shall provide adequate materials for sampling and shall patch core holes made by the approved Testing Agency using non-shrink, high- strength grout.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged material in original containers with seals unbroken and labels intact until time of use.

B. Unload masonry units carefully and store on raised platform protected from weather.

C. Protect cementitious materials against exposure to moisture. Use of cementitious or other materials that have become caked and hardened from absorption of moisture will not be permitted.

1.6 JOB CONDITIONS

A. Environmental Conditions: Do not place concrete unit masonry when temperature is below 40 degrees Fahrenheit or above 90 degrees Fahrenheit unless the Contractor provides means for preventing damage due to freezing or high-temperatures before and after placement and the Architect/Engineer approves. See Section PART 3.

B. Protection: Protect surrounding work as required against damage from masonry work. Clean satisfactorily or otherwise correct damage to surrounding work resulting from masonry work. See PART 3.

1.7 SCHEDULING AND SEQUENCING

A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the approved Testing Agency.

B. Provide schedule and sequence information to approved Testing Agency in writing upon request. Update information as work progresses.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hollow Load-Bearing Concrete Masonry Units:

1. General: All concrete masonry units shall be double open end wherever possible (single open end otherwise).

2. Concrete masonry units shall be medium or light weight and shall conform to ASTM C90. Minimum compressive strength shall be 2000psi.

3. Concrete masonry units exposed to view shall be 8x8x16 unless otherwise noted on the construction drawings. Concrete masonry caps shall be 2x8x16 (nominal) standard grey unless otherwise noted on the construction drawings.

B. Portland Cement: ASTM C150, Type II, low alkali

C. Aggregates

1. For Mortar: ASTM C144.

2. For Grout: ASTM C404.

D. Hydrated Lime: ASTM C207, Type S

E. Quick Lime: ASTM C5, high calcium

F. Reinforcing Steel: ASTM A615 (or A706) grade 60 (except bars #3 and smaller may be grade 40).

G. Water: Clean and potable, free from impurities detrimental to mortar and grout.

H. Grout Aid: “Grout Aid” by Sika Corporation.

I. High Strength Grout: Conform to CRD-C621 and ASTM C1107. Non-shrink, non-ferrous, minimum compressive strength at 28 days to be 7000 psi (when placed in a fluid state). Meet or exceed BASF “Master Flow 928”.

J. Preformed Expansion Joint Filler: ASTM D994.

K. Flexible Sealant: ASTM C920.

L. Mortar Color: Submit to Architect for approval.

2.2 FABRICATION

A. Reinforcement: Conform to requirements of Section 03 2000, Concrete Reinforcing.

2.3 MIXES AND MIXING

A. General Mixing Requirements:

1. Measure materials accurately. Shovel measurements will not be permitted.

2. Use mechanical mixer of at least one sack capacity.

3. Mix for minimum of three minutes and in no case less than time required for securing uniform mass and workable consistency.

4. Completely empty drum before charging succeeding batch of materials.

5. Exercise extreme care in measuring ingredients for partial batches.

B. Mortar

1. Type M or S per ASTM C270. Minimum compressive strength at 28 days: 1800 psi (Type S), 2500 psi (Type M). Admixtures not allowed. Otherwise conform to CBC Section 2103A.2.1.

2. Use and place mortar in final position within 2-1/2 hours after mixing. Mortars that have stiffened due to evaporation of water may be retempered with water as frequently as required to restore required consistency during this time period.

3. Provide integrally colored mortar to match block. Colors to be submitted to Architect for approval. Add mortar colors in accordance with manufacturer's recommendations. Ensure uniformity of mix and coloration.

C. Concrete Grout

1. General:
   a. Six sacks (94 pounds per sack) of cement per cubic yard minimum. Concrete masonry grout compressive strength to attain 2000 psi minimum after 28 days
   b. One pound “Sika Grout Aid” per sack of cement (6 pounds maximum per cubic yard).
   c. Slump: 10 to 11 inches.

2. Otherwise conform to CBC Section 2103A.3.

2.4 SOURCE QUALITY CONTROL

A. An approved Testing Agency will perform source quality control tests and submit reports, as specified in pertinent section of Division 01 and CBC Chapter 17A and 21A.

B. Test materials per CBC Chapter 17A and CBC Section 2105A.1 unit strength method or prism test method.

PART 3 - EXECUTION

3.1 INSPECTION BY CONTRACTOR

A. Examine areas to receive masonry and verify following per TMS 602:

1. Foundation surface is level to permit bed joint within range of 1/4 to 3/4-inch.

2. Edge is true to line to permit projection of masonry to less than 1/4-inch.

3. Projecting dowels are free from loose scale, dirt, concrete or other bond-inhibiting substances and properly located.

4. Built-in items are properly sized and located.

B. Do not begin work before unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean concrete surfaces to receive masonry. Remove laitance or other foreign material lodged in surface by sandblasting or other means as required. Roughen foundation bed to expose aggregate; remove loose particles and saturate before laying units.

B. Ensure masonry units are clean and free from dust, dirt or other foreign materials before laying.

3.3 REINFORCEMENT

A. Place bars where noted in accordance with drawings and SP-66 “ACI Detailing Manual”. Do not disturb after start of masonry placement.

B. Splice bars with dowels cast in concrete; lap bars per drawings. Bars shall not be "stabbed" after grout placement. All reinforcing shall be tied in place with wire prior to grout placement. The use of approved bar spacers is acceptable.

3.4 PLACEMENT

A. General Requirements

1. Masonry construction shall conform with TMS 602.

2. Ensure masonry units are sound, clean and free of cracking at time of placement.

3. Accurately cut and fit units as required using masonry saws to accommodate work of other sections.

4. Lay masonry units plumb, true to line with level courses accurately placed. Maximum tolerance 1/4" in 8'-0".

5. Adjust unit to final position while mortar is soft and plastic.

6. Align vertical cells accurately.

7. Remove units disturbed after stiffening of mortar, clean joints and relay unit with fresh mortar.

8. Do not attach construction supports to walls.

9. Install anchor bolts and other embedded items accurately as work progresses. Use templates as necessary to meet required tolerance of other's work.

10. Brace walls adequately until supporting structure is complete.

11. Do not place conduit, pipes, wire, etc. in cells containing reinforcing steel.

B. Joints:

1. Fill joints; ensure full coverage of face shells in both horizontal and vertical joints and on webs.

2. Tool (concave) and finish joints as specified to achieve solid, smooth, watertight compacted joint.

3. Immediately fill holes made by line pin with mortar when pin is withdrawn.

4. Remove surplus mortar from joints.

5. Provide vertical control joints at 1.5 times the wall height (but not greater than 25'-0”) and as detailed on the structural drawings.

C. Cold Weather Requirements

1. When ambient temperature is below 40 degrees Fahrenheit, submit cold weather protection plan per TMS 602 Section 1.8C and CBC 2104A.1. Ensure reinforcing, masonry units, etc. contacting mortar and grout are free of frost.

D. Hot Weather Requirements

1. When ambient temperature exceeds 90 degrees, submit hot weather protection plan per TMS 602 Section 1.8D and CBC 2104A.1.

E. Protection

1. Protect face materials against staining.

2. Remove misplaced grout or mortar immediately.

3. Protect sills, ledges, off-sets and similar items from mortar drippings or other damage during construction.

4. Cover top of unfinished work to protect it from weather and debris.

F. Concrete Masonry Units

1. Bond: Running bond unless specifically noted otherwise.

2. Joint Thickness: 3/8-inch both vertically and horizontally.

3. Joint Treatment:
   a. Typical exterior and interior walls; tool joint for weather tightness.
   b. Construction joints to be sealed with joint sealant, flexible firestop or high strength grout as noted on the drawings.

4. Use proper units to provide for doors, bond beams lintels, etc. in order to minimize cutting.

5. Do not wet units.

6. Align vertical cells to provide continuous, unobstructed opening for grouting.

7. Corners: Provide standard masonry bond by overlapping units.

8. Provide mechanical cleanout methods as needed. To facilitate cleanout were pour height exceeds 5 feet 4 inches, provide inverted bond beam units at the bottom of each pour and provide cleanouts in these courses as necessary, not exceeding 32 inches on center. Locate cleanouts to minimize visual impact. Verify with Architect/Engineer.

3.5 GROUTING

A. General Requirements

1. Conform to requirements of TMS 602.

2. A pour is defined as the height of grout to be placed in one day. The height of masonry unit placement at the time of grouting shall not exceed the pour height. Masonry shall have cured minimum 4 hours before grout placement. Maximum pour height is 24 feet, or less, as determined by the contractor. Maximum individual lift height is 12 feet 8 inches, or less, as determined by the contractor. Allow time between lifts for initial water loss of grout to occur. Do not allow grout to cure

between lifts. Contractor is responsible for adequate cleaning and prevention of blowouts.

3. Grout void between wythes and cells of concrete block.

4. Ensure grout flows into voids and completely surrounds reinforcing steel.

5. Stop grout approximately one and a half inches below top of last course except at top course without a concrete cap.

6. Grout from a non-exposed face of masonry wherever possible.

7. Where necessary to stop longitudinal run, provide suitable dam to retain grout in place.

8. Clean all cells of pour space prior to grouting. Remove all loose mortar, etc.

9. Consolidate grout with a mechanical vibrator with a 3/4" head.

10. Slushing with mortar will not be permitted.

11. Use grout pump, hopper or bucket to place grout.

12. Do not wet down grout spaces prior to grouting.

3.6 FIELD QUALITY CONTROL

A. The approved Testing Agency will perform field quality control tests, as specified in pertinent sections of Division 01 and CBC Chapters 17A and 21A.

B. The approved Testing Agency will provide inspections per the requirements of CBC Section 1705A.4.

C. Concrete masonry shall have an assumed 28 day prism strength of 2000psi.

3.7 POINTING AND CLEANING

A. Point holes or defective mortar joints upon completion of work; where necessary, cut out and repoint defective joints.

B. At end of workday, fiber brush new surfaces to remove mortar splotches, clean with mild detergent or enzymes, and rinse with clean water.

C. When ordinary methods are not adequate, employ sandblasting, chipping or other special methods.

D. Do not use acid solution to remove green stain or efflorescence resulting from vanadium salts. Follow recommendations of manufacturer for removal of such stains.

E. Clean all surfaces upon completion of erection, leave free of grime and dirt. Remove unused materials, tools, equipment and debris from the premises and leave surfaces broomed clean.

F. Protect work from damage by subsequent operations.

3.8 ADJUSTING

A. Replace all defective work at Contractor's expense.

B. Replace defective or damaged work with conforming work.

C. Architect/Engineer shall review all proposals for the repair or replacement of damaged, defective, or missing work.

D. Contractor to pay expenses incurred by Owner for Architect/Engineer's costs for (re-) design and obtaining approvals of Authorities Having Jurisdiction necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work, as specified in pertinent sections of Division 01.

E. Pay expenses due to re-testing and re-inspection necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work, as specified in pertinent sections of Division 01.

END OF SECTION 04 2000

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SECTION 04 5413 – FIRE BRICK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. True masonry fire brick for the following applications:
1. Dry-set at floors
2. Thin-set on walls.

1.3 RELATED SECTIONS

A. Section 05 5000 – Metal Fabrications: Steel lintels.

B. Section 07 9200 – Joint Sealants: Backer rod and sealant at control and expansion joints.

1.4 PRODUCTS INSTALLED, BUT NOT FURNISHED, UNDER THIS SECTION

A. Section 05 1200 - Structural Steel Framing: Placement of steel anchors for lintels.

B. Section 05 5000 - Metal Fabrications: Placement of loose steel lintels.

1.5 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.6 DEFINITIONS

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

B. Refractory Brick: Masonry built primarily to withstand high temperature, with a low thermal conductivity for greater energy efficiency.

1.7 ACTION SUBMITTALS

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

B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

C. Samples for Verification: For each type and color of the following:
1. Special brick shapes.
2. Fire brick.
3. Accessories embedded in masonry.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C270, for mortar mixes required to comply with property specification.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
1. Masonry units.
a. Include material test reports substantiating compliance with requirements.
b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
2. Cementitious materials. Include brand, type, and name of manufacturer; and test reports.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

C. Manufacturer's Certificates: Certification that products meet or exceed specified requirements.

1.9 QUALITY ASSURANCE

A. Installer: Mason contractor specializing in performing the Work of this Section with minimum 5 years documented experience.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Accept brick units on site. Inspect for damage.

B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.11 SITE CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls.

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 FIRE BRICK UNITS

A. Fire Brick: ASTM F1312, size as indicated on Drawings.

B. Manufacturers:
   1. Foundry Service & Supplies, Inc.: www.foundryservice.com.
   2. Harbison-Walker International: www.thinkhwi.com.
   3. Sheffield-Pottery: www.sheffield-pottery.com.

C. Brick: Fired clay hard fire refractory brick with minimum 36% Alumina (high-alumina) content.
   1. Unit Size: 9 inch long by 4-1/2 inch wide by 2-1/2 inch thick.
   2. Surface Finish: Smooth.
   3. Pyrometric Cone Equivalent (ASTM C24):
      a. Orton Standard Cones: 33 - 34
      b. Temperature Equivalent: 3187 deg. F (1753 deg. C).
   4. Density (ASTM C20): 142 lb/cu ft minimum.
   5. Cold Crushing Strength (ASTM C133): 6000 psi minimum.
   6. Modulus of Rupture (ASTM C133): 1350 psi minimum.
   7. Apparent Porosity (ASTM C20): 16% max.
   8. Basis of Design:
      a. "Clipper DP" Super Duty Fireclay Brick.
      b. "KX-99" Super Duty Fireclay Brick.
      c. "LVA70"

2.2 MASONRY TIES

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
   1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82; with ASTM A153/A153M, Class B-2 coating.
   2. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Corrugated Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from stainless-steel sheet not less than 0.053 inch (1.3 mm) thick. Ties made from galvanized steel sheet may not be used in interior walls, unless otherwise indicated.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C150/C150M, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.

B. Aggregate for Mortar: ASTM C144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

C. Refractory Mortar Mix: Hydraulic-setting refractory mortar; non-water-soluble, calcium aluminate, high-alumina refractory mortar that passes ASTM C199 test; and acceptable to authorities having jurisdiction.

D. Water: Potable.

2.4 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Verify that field conditions are acceptable and are ready to receive work.
2. Verify items provided by other Sections of work are properly sized and located.
3. Verify that built-in items are in proper location, and ready for roughing into masonry work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 PREPARATION OF SUBFLOOR

A. Sweep subfloor to remove dirt, dust, debris, and loose particles.

3.4 INSTALLATION, GENERAL

A. Do not use bricks with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in the finished Work.

B. Mix bricks from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut bricks with motor-driven masonry saw to provide clean, sharp, unchipped edges. Hammer cutting is not acceptable. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.

D. Joint Pattern: As indicated on Drawings.

E. Spaced Joint Widths:
1. Floors: Hand tight.
2. Walls: Provide nominal 1/4-inch joint width with variations not exceeding plus or minus 1/16-inch.

3.5 FIRE BRICK INSTALLATION, WALLS

A. Before starting the firebrick lay out the first course of the firebrick and double check all dimensions on the plan. Check brick sizes and variations to adjust bond if needed.

B. Establish lines, levels, and coursing indicated. Protect from displacement.

C. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

D. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

G. Lay-up walls “brick to brick” with refractory mortar between them on a bed of refractory mortar.

H. Build walls using standard 9-inch firebrick, laid as “shiner” (on edge), with refractory mortar and 1/4-inch maximum joints.

I. Fully seal all joints and intersections at changes in plane with heavy-duty refractory mortar.

J. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

K. Remove excess mortar as Work progresses.

L. Interlock intersections and external corners.

M. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

N. Cut mortar joints flush.

3.6 WALL TOLERANCES

A. Maximum Variation from Unit to Adjacent Unit: 1/32 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.7 FIRE BRICK FLOORING, INSTALLATION, DRY-SET

A. Set brick flooring with a minimum joint width of 1/32 inch and a maximum of 1/16 inch (3 mm. Use string lines to keep straight lines. Gaps between units that exceed 1/16-inch are not permitted.

B. Finished-Surface Tolerances: Do not exceed 1/32-inch brick-to-brick offset from flush (lippage) nor 1/16 inch in 24 inches and 1/8 inch in 10 feet from level, or indicated slope, for finished surface of brick flooring.

C. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide joint filler as backing for sealant-filled joints where indicated. Install joint filler before setting brick flooring. Sealant materials and installation are specified in Section 07 9200 "Joint Sealants."

D. Hand-Tight Joints: Set brick with hand-tight joints. Do not grout units in place.

3.8 CUTTING AND FITTING

A. Cut and fit for chases, pipes, sleeves and beams. Coordinate with other Sections of work to provide correct size, shape, and location.

B. Obtain Architect/Engineer approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.9 CLEANING

A. Remove excess mortar and mortar smears.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.10 PROTECTION

A. Protect finished installation from damage from ongoing construction activities.

B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION 04 5413

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SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: All labor, materials, equipment and operations required to complete structural and miscellaneous metals in shapes and configurations indicated; including:

1. Structural steel columns, beams, bracing, base plates, bolts, joist hangers, and stud bolts welded to structural steel.

2. Miscellaneous structural steel and connections; fabricated connectors and hangers installed by related sections.

3. Anchor bolts and steel inserts embedded in concrete or masonry, installed by related sections.

4. Fabricated steel items embedded in concrete or masonry installed by related sections.

5. Supervision of anchor bolt setting, leveling and elevations to insure required fit of steel work.

6. Shop priming and field touch-up, galvanizing.

7. Bracing, Shoring, Fabrication and Erection.

B. Related Sections:

1. Pertinent sections of Division 01 specifying Quality Control and Testing Agency services.

2. Pertinent Sections of other Divisions specifying concrete reinforcement, formwork, concrete, structural and miscellaneous metal fabrications, steel joists, metal decking, cold-formed metal framing, rough carpentry.

1.2 REFERENCES

A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 22A Steel.

B. American Institute of Steel Construction (AISC) 303 “Code of Standard Practice for Steel Buildings and Bridges”.

C. AISC 341 “Seismic Provisions for Structural Steel Buildings”.

D. AISC 358 “Prequalified Connection for Special and Intermediate Steel Moment Frames for Seismic Applications”.

E. AISC 360 “Specification for Structural Steel Buildings”.

F. American Welding Society (AWS) D1.1 “Structural Welding Code - Steel”.

G. AWS D1.8 “Structural Welding Code - Seismic Supplement”.

H. Research Council on Structural Connections (RCSC) “Specification for Structural Joints Using High-Strength Bolts”.

I. Underwriters Laboratories (UL) FRD “Fire Resistance Directory”.

1.3 SUBMITTALS

A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review.

B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.

C. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.

D. Shop drawings: Submit each building as a complete unit. Do not mix components from multiple buildings or units of work in a submittal. Include all of the following;

1. Profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

2. Fabrication tolerances for all steel.

3. Connections: All, including type and location of shop and field connections.

4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths, type, size, and sequence. Designate demand critical welds.

5. Designation of Seismic Force Resisting System (SFRS) members and connections. Locate and dimension protected zones. Brace frame gusset plates shall be drawn to scale.

6. Cross-reference all shop drawing detail references to contract document detail references.

7. Secure all field measurements as necessary to complete this work prior to submitting shop drawings for review.

8. Provide holes, welded studs, etc. as necessary to secure work of other sections.

9. Provide the following as separate submittals for each building or unit of work:
   a. Bolt and anchor setting plans.
   b. Layout, fabrication and erection drawings.

E. Certifications:

1. Steel Materials: Submit the following for identified materials.

a. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
b. Mill Test Reports: Indicate structural strength, destructive test analysis, and non-destructive test analysis.
c. Contractor's affidavit certifying that all identified steel materials provided are of the grades specified and match the certificates supplied.

2. High-Strength Bolting: Certify all materials provided are the grades specified.

3. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification per AWS D1.1.

F. Samples: Provide samples to the Testing Agency as specified in Article SOURCE QUALITY CONTROL, at no additional costs.

1.4 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies, refer to pertinent sections of Division 01 and CBC Chapter 17A.

B. All tests shall be performed by a recognized testing agency as specified in pertinent sections of Division 01.

C. Certification and Identification of Materials and Uses: Provide Testing Agency with access to fabrication plant to facilitate inspection of steel. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection and all material identification/test information listed below.

1. Test all steel as required by ASTM A6.

2. Provide manufacturer's Mill Test Reports for all materials. Include chemical and physical properties of the material for each heat number manufactured. Tag all fabricated materials with heat number.

3. Provide letter certifying all materials supplied are from heat numbers covered by supplied mill certificates. Include in letter the physical location of each material type and/or heat number in the project (i.e. walls, braced frames etc.).

4. Unidentified Material Tests: Where identification of materials by heat number or mill tests cannot be made, Owner's Testing Agency shall test unidentified materials.

5. Provide all certification, verifications, and other test data required to substantiate specified material properties at no additional cost to the Owner.

D. Testing and Inspection: Tests and Inspections performed by Independent Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and test reports in conformance with pertinent sections of Division 01.

E. The following standards are the minimum level of quality required. Provide higher quality work as specifically indicated in the Contract Documents.

1. Workmanship and details of structural steel work shall conform to the CBC and AISC 360.

2. The quality of materials and the fabrication of all welded connections shall conform to AWS D1.1 and D1.8.

3. Comply with Section 10 of AISC 303 for architecturally exposed structural steel.

F. The Testing Agency will review all submittals and testing of materials.

G. All re-inspections made necessary by non-conforming work shall be at the Contractor's expense.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in bundles marked with durable tags indicating heat number, mill, member size and length, proposed location in the structure and other information corresponding with markings shown on placement diagrams.

B. Handle and store materials above ground to prevent damage, contamination or accumulation of dirt or rust.

1.6 SCHEDULING AND SEQUENCING

A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the Testing Agency.

B. Provide schedule and sequence information to Testing Agency in writing upon request. Update information as work progresses.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel W Shapes: ASTM A992 Gr. 50 or ASTM A572 Gr. 50.

B. Structural Steel Plates: ASTM A36 or ASTM A572 Gr. 50 or ASTM 529 Gr. 50

C. Structural Steel Channels, Angles: ASTM A36 or ASTM A572 Gr. 50.

D. HSS (Hollow Structural Sections):

1. Round: ASTM A500, Gr. B.

2. Rectangular or Square: ASTM A500, Gr. B.

E. Pipe: ASTM A53, Grade B.

F. Bolts and Washers: See FINISHES section for galvanization, where required.

1. Machine Bolts and Washers: Bearing and shear connections (denoted as “MB”); ASTM A307, Grade A.

2. High Strength Bolts, Nuts, and Hardened Washers: Bearing and shear connections (denoted as “HSB”); ASTM F3125 Grade A325, ASTM A563 and ASTM F436, respectively.
   a. HSB-N: For use in a snug tight (ST) and pretensioned joints (PT) conforming to the RCSC Specifications.

b. HSB-X: For use in a slip critical (SC) connections conforming to the RCSC Specifications requiring a Type A faying surface (including coatings). All galvanized surfaces shall be Type C and hand wire brushed and roughened.
c. Use of ASTMF3125 Grade F1852 (twist off assemblies) is permitted conforming to requirements of RCSC Specifications.
d. Use of ASTM F959 Load Indicator Washers is permitted conforming to the requirements of RCSC Specifications.

G. Headed Stud Type Shear Connectors: ASTM A108.

H. Deformed Bar Anchors: ASTM A496.

I. Anchor Bolts/Rods:

1. ASTM F1554 Gr. 36 or 55

2. ASTM A449 where indicated on plans
a. Gr. 90 (Diameter range 1.75” through 3”).
b. Gr. 105 (Diameter range 1.125” through 1.5”).
c. Gr. 120 (Diameter range .25” through 1”).

3. No upset thread allowed.

J. Arc-Welding Electrodes: AWS Standards E70 or equivalent, except no E70T-4 allowed. Additionally, welding electrodes to be used in the welding of seismic force resisting system to conform to AISC 341 and AWS D1.8.

K. Other Welding Materials: AWS D1.1; type required for materials being welded.

2.2 ACCESSORIES

A. High Strength Grout: ASTM C1107, non-shrink, premixed compound consisting of aggregate, cement, and water reducing plasticizing agents.

1. Minimum Compressive Strength at 48 hours: 2400 psi.

2. Minimum Compressive Strength at 28 days: 7000 psi, placed in a “fluid” state.

3. Provide only non-metallic grout at exposed work.

4. Meet or exceed properties of BASF "Master Flow 928" mixed to fluid consistency. Other acceptable manufacturers: The Burke Company and W.R. Meadows, Inc.

B. Building Structural Steel Primers: Comply with local VOC limitations of authorities having jurisdiction and the California Green Building Code. Verify compatibility with finish coats specified in other sections. Follow manufacturers printed instructions. Apply one coat unless otherwise directed.

1. Type A: Self-Crosslinking Hydrophobic Acrylic passing 1942 hours ASTM D4585 & D1654. “Series 115 Uni-Bond DF” by Tnemec (2.0 to 4.0 mils DFT).

2. Type B: Organic Zinc-Rich Urethane passing 10,000 hours ASTM B117 & G85. “Series 90-97/H90-97 Tneme-Zinc” by Tnemec (2.5 to 3.5 mils DFT) or “Series 94-H20 Hydro-Zinc” by Tnemec (2.5 to 3.5 mils DFT).

3. Type C: MIO-Zinc Filled Urethane passing 10,000 hours ASTM B117. “Series 394

PerimePrime" by Tnemec (2.5 to 3.5 mils DFT).

C. Galvanizing: ASTM A153 and A123.

D. Touch-Up Primer for Galvanized Surfaces: Type B primer.

2.3 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind welds smooth where exposed to view and where noted on drawings.

C. Fabricate connections for bolt, nut, and washer connectors.

D. Protect all materials, before and after fabrication, from rust, corrosion, dirt, grease, and other foreign matter.

E. Fabricate framing members free from twists or bends. Form holes, cut and sheared edges neatly without kinks, burrs, or warped edges.

F. Exposed Steel: Straight, smooth, free of nicks, scars or dents.

G. Gas Cutting: Gas cutting of holes in a member shall not be permitted.

H. Splicing of members: Members requiring splicing due to length requirements may be spliced using full penetration butt welds when such welds and procedures are inspected and certified by the Testing Agency, in conformance with AWS and AISC standards. The location of splices shall be approved by the Architect/Engineer in writing prior to fabrication.

I. Welding: Welding of structural steel connections shall be performed by qualified welders in accordance with AWS Standards. All weld sizes shall match those shown on the drawings.

1. Preparation: Clean all surfaces free of rust, paint and all foreign matter. Remove paint or scale by brushing, chipping or hammering as required. Chip clean and wire brush burned or flame cut edges before welding. Space and alternate welds, clamping as necessary to prevent warp or misalignment.

2. Sequence Welding: When welds enclose, or partially enclose, the perimeter or portion of the surface of a member, make weld bead in sequence, or staggered. Minimize internal stresses. Weld groups of members occurring in a single line in staggered sequence to minimize distortion of the structural frame.

3. Faulty and Defective Welding: Welds failing to meet AWS standards and the Contract Documents shall be rejected and remade at Contractor expense. All welds showing cracks, slag inclusion, lack of fusion, bad undercut or other defects, ascertained by visual or other means of inspection shall be removed and replaced with conforming work.

4. Minimum Weld Strengths: All welds shall match the minimum weld sizes recommended by AISC. Details of fabrication not specifically shown shall match similar details which are specifically shown. All bevel and groove welds shall be full penetration unless size is noted otherwise.

5. Threaded studs, headed studs, and deformed bar anchors shall be full-fusion welded conforming to ASW D1.1.

J. Camber: Fabricate all beams cambered as indicated on the drawings.

1. Fabricate beams without camber for installation with any "natural" crown up.

2. Exception: Fabricate cantilever beams with "crown" down.

K. Grinding: Grind smooth the following structural steel and connections;

1. Exposed cut ends of structural and fabricated shapes.

2. All welds exposed to view.

3. Mitered and fit-up corners and intersections.

L. Back-Up Bars: Required for all complete penetration welds. See requirements of AISC 358.

M. Bolt Holes: Edge, end distances and spacing shall conform to dimensions shown on the drawings, and as follows;

1. Round: Size indicated and 1/16 inch maximum oversize

2. Slotted: At locations specifically noted on the drawings, provide size indicated and 1/16 inch by 1/4 inch oversize slotted in direction perpendicular to applied loads.

3. Holes in base plates for anchor bolts may be 1/8 inch oversize.

2.4 FINISHES

A. Steel exposed to inclement atmospheric conditions or weather (such as coastal moisture or seasonal rain) shall be sufficiently primed or otherwise protected against corrosion. If condition of steel is suspect due to weathering/corrosion, Contractor shall bear cost of inspection to determine if excessive corrosion is present and if steel member(s) requires repair or replacement. Contractor shall bear cost of repair or replacement.

B. Prepare and finish structural and miscellaneous steel component surfaces as follows, unless a higher standard-of-care is determined necessary per item A:

1. Unpainted, interior, dry exposure surfaces need not be primed.

2. Finished painted, interior, dry exposure surfaces:
   a. Surface Preparation: SSPC-SP2 Hand-Tool or SP3 Power-Tool Cleaning. Where jobsite exposure is expected to exceed 6 months, SSPC-SP6 Commercial Blast-Cleaning is required.
   b. Apply Primer Type A. Field touchup with Type A or Type B.

3. Finish painted surfaces with exterior exposure, interior exposure subject to wet conditions or fumes, finish painted surfaces with slip critical bolted connections, or surfaces to receive high performance finish coatings (for example epoxy or urethane for use at frequently abraded surfaces).
   a. Surface Preparation: SSPC-SP6 Commercial Blast-Cleaning. For severe (immersion) exposure, SSPC-SP10 Near-White Blast-Cleaning is required.
   b. Apply Primer Type B. Field touchup with Type B.

4. Surfaces to be fire proofed need not be primed unless required by the fireproofing manufacturer or if jobsite exposure is expected to be inclement per item A. Where unprimed steel is to receive fireproofing, prepare steel surface as required by fireproofing manufacturer. If fireproofed surfaces are to be primed, provide primer as follows (note, slip critical bolted surfaces may be included):
   a. Surface Preparation: SSPC-SP3 Power-Tool Cleaning.
   b. Apply Primer Type C. Field touchup with Type C.

5. Exterior exposed (unpainted) surfaces and as otherwise indicated to receive galvanizing:
   a. Galvanize per ASTM A123 Class 55 minimum. Passivation agents are not permitted on galvanized metal that is to be painted. Provide vent holes per ASTM A385 at closed sections (such as HSS). Submit proposed location of vent holes for review by Engineer.
   b. Connection hardware shall be hot-dip galvanized per ASTM A153 or F2329. Grade A325 high-strength bolt assemblies may be mechanically galvanized per ASTM B695 class 55 or hot-dip galvanized per ASTM F2329. Mating bolts and nuts shall receive the same zinc-coating process.
   c. Repair all uncoated, damaged, or altered galvanized surfaces per ASTM A780.

C. Do not prime the following surfaces unless otherwise indicated:

1. Connections to be field welded.

2. Steel in contact with concrete.

3. Surfaces to receive welded metal decking.

D. Slip critical bolted connection surfaces shall either be unfinished & prepared per the RCSC or primed per item B3 or B4.

E. Do not cover up work with finish materials until inspection is complete and work is approved by the Testing Agency.

2.5 SOURCE QUALITY CONTROL

A. An independent Testing Agency will perform source quality control tests and submit reports, as specified in pertinent sections of Division 01.

B. Steel Materials Testing:

1. No testing is required for materials identified in accordance with CBC Section 2203A.1 (heat number, grade stencil, etc.).

2. Unidentified steel- General: Test all structural shapes. In addition, test to verify Fy and Fu values when engineering requirements exceed Fy = 25 ksi for design.

3. Charpy V-Notch (CVN) testing requirements are per AISC 341. Heavy sections requiring CVN testing are indicated on the documents.

C. Shop Welding Inspection:

1. Testing Agency shall inspect and certify all structural welds, unless the fabricating shop has been accredited in conformance with CBC requirements. Submit certification to the Architect/Engineer for review and the Building Official for approval.

2. Welder Qualifications: Welding inspector shall verify that all the welders are properly qualified prior to steel fabrication and state the qualifications of each welder in the welding inspection report.

3. Welding Inspection: Continuous inspection required unless otherwise noted below. Comply with requirements of AWS D1.1, AWS D1.8 and AISC 341.
   a. Welding Inspector shall check all welds, materials, equipment and procedures.
   b. Welding Inspector shall provide reports certifying the welding is as required and has been done in conformity with the plans, specifications and codes.
   c. Welding Inspector shall use radiographic, ultrasonic, magnetic particle, or any other necessary aid to visual inspection to assure adequacy of welds.

4. Periodic Inspection Acceptable:
   a. Single pass fillet welds not exceeding 5/16 inch.
   b. Welding of studs to beams.

D. Bolts, Nuts and Washers: Provide samples to Testing Agency for required testing, at no additional cost.

E. High Strength Bolted Connections: Provide testing and verification of shop-bolted connections in accordance with RCSC specifications. Test all bolts at each connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.2 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Framing:

1. Erect all structural steel true and plumb.

2. Verify proper final alignment prior to making final connections.

C. Field Connections:

1. Workmanship of field bolted and welded connections shall conform in all respects to methods and tolerances specified for fabrication.

2. Field weld components indicated on shop drawings. Sequence field welds to minimize built-up stress and distortion of the structural frame. Verify sequence with Engineer. Coordinate field welding schedule with Testing Laboratory.

3. Welded Studs: Install in accordance with manufacturer's instructions and structural welding code AWS D1.1 and AWS D1.8.

D. Templates: Provide bolt setting templates for all anchor bolts. Provide instructions for the setting of anchors and bearing plates, verify these items are set correctly as work progresses.

E. Column base plates: Set level to correct elevations, support temporarily on steel wedges, shims, or leveling nuts where shown, until the supported members are plumbed and base plate is grouted.

1. Grout solid the full bearing area under base plates prior to installation of floor and/or roof decks.

2. Comply with manufacturer's instructions for high strength grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

F. Bolting - General:

1. Inspect mating surfaces to insure that bolt head and nut will have full bearing and that metal plies will mate flush between bolts.

2. Install bolts in matching holes. Do not distort metal or enlarge holes by drifting during assembly. Remake mismatched components to achieve tolerances indicated.

3. Holes mismatched in excess of 1/8 inch will be rejected.

4. Holes mismatched less than 1/8 inch may be reamed to the next larger size bolt.

5. Do not enlarge holes by flame cutting or air/arc (“plasma“) cutting.

6. Provide flat washer(s) at over-size holes.

7. Provide washers for all conditions per RSCS Section 6 and under nuts to connected parts less than ¼ inch thick.

8. Provide ASTM F436 beveled washers when the slope of the surfaces of parts in contact with the bolt head or nut is greater than 1:20.

9. Do not install bolts with damaged threads.

10. Threads shall commence outside of the shear plane.

G. Bolting - Specific:

1. Machine Bolts (MB): Install and tighten to a snug condition (ST) such that laminated surfaces bear fully on one another, using an impact wrench or “full effort” of an installer using a standard spud wrench.

2. High Strength Bolts in Bearing/Shear or Static Tension joints snug tight (ST):
   a. Provide a hardened washer at the head/nut at slotted holes
   b. Install and tighten as per Machine Bolts (MB) snug tight (ST) and other requirements of RCSC specification Section 8.
   c. Use ASTM F436 washer only in snug tight connections with static tension loads.

3. High Strength Bolts in Pretensioned joints (PT):
   a. Provide ASTM F436 washer per requirements of RCSC Section 6.
   b. Install and tighten in accordance with the requirements of RCSC Section 8.
   c. Install bolts in all holes of the joint and compact the joint until the connected plies are in firm contact prior to pretensioning.
   d. The following tightening methods and bolt type are acceptable for PT joints:
      (a) Turn-of-the-nut pretensioning method

(b) Calibrated wrench pretensioning method
(c) Twist-off-type tension-control bolts
(d) Direct-tension-indicator washer pretensioning method.

4. High Strength Bolts in Slip Critical (SC) joints:
   a. Provide tensioning for High Strength Bolts (PT) per above.
   b. Faying surfaces to be prepared per RCSC Section 3 and PART 2.

H. Supports, Shoring and Bracing: Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing. Conform to requirements of all applicable laws and governing safety regulations. Resist imposed loads, including those of stored materials and equipment.

1. Provide all temporary supports, shoring and bracing necessary to achieve work of tolerances indicated.

2. Provide all necessary temporary flooring, planking and scaffolding required for erection of steel, and support of erection machinery.

3. Construction Loading: Do not overload the structure or temporary supports with stored materials, equipment or other loads.

4. Maintain temporary bracing and shoring until work is complete, and longer as required to ensure stability and safety of structure.

I. Do not make final connections until structure is aligned to meet specified tolerances.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. The independent Testing Agency will perform field quality control tests, as specified in pertinent sections of Division 01.

B. Field Welding Inspection: Conform to all requirements of section SOURCE QUALITY CONTROL.

C. High Strength Bolting: Provide testing and verification of field-bolted connections in accordance with RCSC Section 9.

1. Inspect mating surfaces.

2. Test all materials prior to use. Use only materials meeting specified requirements.

3. Inspector shall review installation and verify “full effort” with installers for ST joints and shall randomly manually verify “full effort” on 10 percent of installed bolts.

4. Inspector shall verify installation for 100% of SC and PT joints.

5. Review installation procedures for all types of HSB joints and verify installation of

"Twist-off" and load-indicator type bolts.

6. If any bolt fails testing, all bolts at the joint shall be loosened and re-tightened. Exception: Galvanized bolts shall be replaced prior to re-testing.

D. Welded Studs: Test headed studs electro-magnetically welded through metal deck to directly to steel members as follows:

1. Install minimum of two trial studs.

2. Testing Agency shall bend studs with a hammer to minimum 30 degrees out of axis.

3. Any failure shall require new studs be welded for another test and welding apparatus adjusted.

3.5 ADJUSTING

A. Touch-up damaged finishes with compatible specified primer.

B. Replace defective or damaged work with conforming work. Replace all defective work at Contractor's expense.

C. Straighten materials by means that will not injure the materials.

D. Replace defective or damaged work which cannot be corrected in the field with new work, or return defective items to the shop for repair.

E. Architect/Engineer shall review all proposals for the repair or replacement of damaged, defective, or missing work.

F. Pay expenses incurred by Owner for Architect/Engineer's costs for (re-)design and obtaining approvals of Authorities Having Jurisdiction (AHJ) necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work, as specified in pertinent sections of Division 01.

G. Pay expenses due to re-testing and re-inspection necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work, as specified in pertinent sections of Division 01.

3.6 CLEANING AND PROTECTION

A. Clean all surfaces upon completion of erection; leave free of grime and dirt. Remove unused materials, tools, equipment and debris from the premises and leave surfaces broomed clean.

B. Protect work from damage by subsequent operations.

END OF SECTION 05 1200

SECTION 05 1250

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements regarding the appearance and surface preparation of Architecturally Exposed Structural Steel (AESS).

Refer to Division 05, Section 'Structural Steel' for all other requirements regarding steel work not included in this section.

This section applies to any members noted on Architectural and Structural drawings as AESS and in the areas defined as AESS below (See AESS Fabrication and Erection Matrix at the end of this section for applicable specification sections based on category):

1. Category 1: High profile conditions that are within reach to touch and can be viewed in close proximity (pre-set)
   a. Hospitality AESS at or below the T.O.S. of channel headers (approximately 9'-2").
   b. Offices AESS at or below the T.O.S. of HSS headers (approximately 8'-6").
   c. Employee lounge AESS at or below the T.O.S. of HSS headers (approximately 8'-6").
   d. Fermentation exterior west elevation sectional door and storefront AESS at or below the T.O.S. of HSS headers (approximately 8'-6").

2. Category 2: High profile conditions that are out of reach to touch and can be viewed in close proximity within 20 feet (pre-set).
   a. Hospitality AESS above the T.O.S. of channel headers.
   b. Offices AESS at above the T.O.S. of HSS headers (approximately 8'-6").
   c. Employee lounge AESS above the T.O.S. of HSS headers (approximately 8'-6").
   d. Fermentation exterior west elevation sectional door and storefront AESS above the T.O.S. of HSS headers (approximately 8'-6").

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

1. Pertinent sections of Division 01 specifying Quality Control and Testing Agency services and administrative requirements.

2. Pertinent Sections of other Divisions specifying structural and miscellaneous metal fabrications, steel joists, metal decking, cold-formed metal framing.

3. Pertinent Sections of other Divisions specifying "Special Coatings" for finish coat requirements and coordination with primer and surface preparation specified in this section.

1.2 REFERENCES

A. AISC 360- Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; AISC, Inc.

C. ANSI/AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.

D. AWS D1.8/D1.8M Structural Welding Code – Seismic Supplement.

E. California Building Code, CBC, California Code of Regulations, Chapter 22A, latest edition.

F. Research Council on Structural Connections (RCSC): Specification for Structural Joints Using ASTM A325 or A490 Bolts, June 30, 2004.

G. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.

1.3 SUBMITTALS

A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review.

B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.

C. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.

D. Shop drawings detailing fabrication of AESS components: Submit each building as a complete unit. Do not mix components from multiple buildings or units of work in a submittal. Include all of the following;

1. Provide erection drawings clearly indicating which members are considered as AESS members.

2. Include details that clearly identify all of the requirements listed in sections 2.03 “Fabrication“ and 3.03 “Erection” of this specification. Provide connections for exposed AESS consistent with concepts shown on the architectural or structural drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.

4. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Indicate to which direction bolt heads should be oriented.

5. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.

6. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.

7. Qualification data for firms and persons specified in the 'Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects names and address, names and addresses of architects and owners, and other information specified.

8. Cross-reference all shop drawing detail references to contract document detail references.

9. Secure all field measurements as necessary to complete this work prior to submitting shop drawings for review.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: In addition to those qualifications listed in Division 05 Section 'Structural Steel,' engage a firm experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the Work.

B. Erector Qualifications: In addition to those qualifications listed in Division 05 Section 'Structural Steel,' engage an experienced Erector who has completed AESS work similar in material, design, and extent to that indicted for this Project and with a record of successful in-service performance.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC "Code of Standard Practice," latest edition, Section 10 as amended herein.

D. Mockups: At least four weeks prior to fabricating AESS, the contractor shall construct mockups to demonstrate aesthetic effects as well as qualities of materials and execution. A mockup for each of the following elements shall be constructed:

Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate mockups on-site or in the fabricator's shop as directed by Architect. Mockups shall be full-size pieces unless the Architect approves smaller models.

2. Notify the Architect one week in advance of the dates and times when mockups will be available for review.

3. Demonstrate the proposed range of aesthetic effects regarding each element listed under the fabrication heading below.

4. Mockup will have finished surface (including surface preparation and paint system).

5. Obtain Architect's approval of mockups before starting fabrication of final units.

6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
   a. Approved mockups in an undisturbed condition at the time of Substantial completion may become part of the completed work.

E. Pre-installation Conference: The General Contractor shall schedule and conduct conference at the project site to comply with requirements of Division 01 Section “Project Meetings.” As a minimum, the meeting shall include the General Contractor, Fabricator, Erector, the finish-painting subcontractor, and the Architect. Coordinate requirements for shipping, special handling, attachment of safety cables and temporary erection bracing, touch up painting and other requirements for AESS.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver AESS to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

C. Erect pre-painted finish pieces using padded slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning member’s frames. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Architect during the pre-installation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Architect prior to erection.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.7 COORDINATION

A. Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the project site in time for installation. [Anchorage concepts shall be as indicated on drawings and approved on final shop drawings.]

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Meet requirements Division 05 Section ‘Structural Steel’ as amended below.

B. High-Strength Bolts, Nuts, and Washers: Per section 051200 heavy hex heads and nuts [Provide rounded bolt heads with twist-off bolts]. Provide standard carbon steel [Cadmium plated] [Mechanically galvanized] finish.

2.2 NOT USED

2.3 FABRICATION

A. Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Architect. Detail AESS assemblies to minimize field handling and expedite erection.

B. Fabricate AESS with exposed surfaces smooth, square and of surface quality consistent with the approved mock up. Use special care in handling and shipping of AESS both before and after shop painting.

C. In addition to special care used to handle and fabricate AESS, employ the following fabrication techniques.

1. Fabrication Tolerance: Fabricate steel to one half the normal tolerance as specified in the Code of Standard Practice Section 10.

2. Demonstrate Welds ground smooth: Fabricator shall grind welds of AESS smooth. For groove welds, the weld shall be made flush to the surfaces each side and be within +1/16”, -0” of plate thickness.

3. Contouring and blending of welds: Where fillet welds are indicated to be ground-contoured, or blended, oversize welds as required and grind to provide a smooth transition and to match profile on approved mock-up.

4. Continuous Welds: Where welding is noted on the drawings and all steel at building envelope, provide continuous welds of a uniform size and profile.

5. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.

6. Coping and Blocking Tolerance: Maintain a uniform gap of 1/8” ± 1/32” at all copes and blocks.

7. Joint Gap Tolerance: Maintain a uniform gap of 1/8” ± 1/32”.

8. Piece Marks Hidden: Fabricate such that piece marks are fully hidden in the final structure or made with such media to permit full removal after erection.

9. Mill Mark Removal: Fabricator shall deliver steel with no mill marks (stenciled, stamped, raised etc.) in exposed locations. Mill marks shall be omitted by cutting of mill material to appropriate lengths where possible. Where not possible, the fabricator can fill and/or grind to a surface finish consistent with the approved mock up.

10. Grinding of sheared edges: Fabricator shall grind all edges of sheared, punched or flame-cut steel to match approved mockup.

11. Rolled Members: Member specified to be rolled to a final curved shape shall be fully shaped in the shop and tied during shipping to prevent stress relieving. Distortion of the web or stem, and of outstanding flanges or legs of angles shall be visibly acceptable to the Architect from a distance of 20’ under any lighting condition determined by the Architect. Tolerances for the vertical and horizontal walls of rectangular HSS members after rolling shall be the specified dimension +/- ½”.

12. Seal weld open ends of round and rectangular hollow structural section with 3/8” closure plates. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.

PART 3 - EXECUTION

3. 1 EXAMINATION

A. The erector shall check all AESS members upon delivery for twist, kinks, gouges or other imperfections which might result in rejection of the appearance of the member. Coordinate remedial action with fabricator prior to erecting steel.

3.2 PREPARATION

A. Provide connections for temporary shoring, bracing and supports only where noted on the approved shop drawings. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Architect. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through the process of erection.

3.3 ERECTION

A. Set AESS accurately in locations and to elevations indicated, and according to AISC specifications referenced in this Section.

B. In addition to the special care used to handle and erect AESS, employ the following erection techniques:

1. AESS Erection tolerances: Erection tolerances shall meet one half the normal tolerance as specified in the Code of Standard Practice Section 10.

2. Welds ground smooth: Erector shall grind welds smooth in the connections of AESS members. For groove welds, the weld shall be made flush to the surfaces of each side and be within + 1/16”, -0” of plate thickness.

3. Contouring and blending of welds: Where fillet welds are indicated to be ground contoured, or blended, oversize welds as required; grind to provide a smooth transition and to match profile on approved mock-up.

4. Continuous Welds: Where noted on the drawings, provide continuous welds of a uniform size and profile.

5. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.

6. Bolt Head Orientation: All bolt heads shall be oriented as indicated on the contract documents. Where bolt-head alignment is specified, the orientation shall be noted for each connection on the erection drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.

7. Removal of field connection aids: Run-out tabs, erection bolts and other steel members added to connections to allow for alignment, fit-up, and welding in the field shall be removed from the structure. Field groove welds shall be selected to eliminate the need for backing bars or to permit their removal after welding. Welds at run-out tabs shall be removed to match adjacent surfaces and ground smooth. Holes for erection bolts shall be plug welded and ground smooth.

8. Filling of weld access holes: Where holes must be cut in the web at the intersection with flanges on W shapes and structural tees to permit field welding of the flanges,

they shall be filled. Filling shall be executed with proper procedures to minimize restraint and address thermal stresses in group 4 and 5 shapes.

C. Field Welding: Weld profile, quality, and finish shall be consistent with mock-ups approved prior to fabrication.

D. Splice members only where indicated.

E. Obtain permission for any torch cutting or field fabrication from the Architect. Finish sections thermally cut during erection to a surface appearance consistent with the mock up.

F. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.

3.4 FIELD CONNECTIONS

A. Bolted Connections: Install bolts of the specified type and finish in accordance with Division 05 section “Structural Steel.”

B. Welded Connections: Comply with AWS D1.1 for procedures, and appearance. Refer to Division 05 section “Structural Steel” for other requirements.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.

2. Obtain Architects approval for appearance of welds in repaired or field modified work.

3.5 FIELD QUALITY CONTROL

A. Structural requirements: The Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports. Refer to Division 05 section “Structural Steel” for detailed bolt and weld testing requirements.

B. AESS acceptance: The Architect shall observe the AESS steel in place and determine acceptability based on the mockup. The Testing Agency shall have no responsibility for enforcing the requirements of this section.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint shall be completed to blend with the adjacent surfaces of AESS. Such touch up work shall be done in accordance with manufacturer’s instructions as specified in Division 09, Section “Painting.”

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

AESS FABRICATION AND ERECTION MATRIX

Specification Section (Fabrication)	Specification Section (Erection)	PROCESS	CATEGORY 1	CATEGORY 2
2.3	3.3	SPECIAL CARE IN PROCESSING AESS	X	X
2.3.C.1	3.3.B.1	TOLERANCES: ONE-HALF STANDARD	X	
2.3.C.2	3.3.B.2	WELDS GROUND SMOOTH	X	X
2.3.C.3	3.3.B.3	WELDS CONTOURED & BLENDED	X	X
2.3.C.4	3.3.B.4	CONTINUOUS WELDS*	X	
2.3.C.5	3.3.B.5	WELD SHOW THROUGH MINIMIZED	X	X
2.3.C.6	---	COPING AND BLOCKING TOLERANCES MINIMIZED	X	
2.3.C.7	---	JOINT GAP TOLERANCES MINIMIZED	X	
2.3.C.8	---	PIECE MARKS HIDDEN	X	X
2.3.C.9	---	MILL MARKS REMOVED	X	
2.3.C.10	---	GRINDING OF SHEARED EDGES	X	
2.3.C.11	---	ROLLED MEMBERS: MINIMIZE DISTORTION	X	X
2.3.C.12	---	SEAL WELDS TO CLOSE OPEN GAPS**	X	
---	3.3.B.6	BOLT HEAD ORIENTATION DICTATED	X	X
---	3.3.B.7	FIELD WELDING AIDS REMOVED	X	X
---	3.3.B.8	CLOSE WELD ACCESS HOLES AT FULL PEN WELDS	X	X

*Continuous welds required at all building envelope locations.
**Seal welds required at all steel exposed to weather.

END OF SECTION 05 1250

SECTION 05 3000

METAL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: All material, labor, equipment and services necessary for the fabrication, erection, and completion of all metal decking as noted on drawings, including all supports for erection. The work shall include, but not necessarily be limited to the following:

1. Furnish metal decking, supports at structural steel, closures, flashing, weld plates, and necessary accessories, complete and ready to receive concrete or roofing.

2. Install metal decking including cutting, fitting, and welding.

3. All cutting and reinforcing of openings as required, and as laid out by other trades.

B. Related Sections:

1. Pertinent Sections of Division 01 Specifying Quality Control and Testing Agency Services

2. Pertinent Sections of Division 03 Specifying Concrete Construction

3. Pertinent Sections of Division 05 Specifying Structural Steel

1.2 REFERENCES

A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 19A Concrete, Chapter 22A Steel.

B. American Iron and Steel Institute (AISI) S100 "North American Specification for the Design of Cold-Formed Steel Structural Members".

C. Steel Deck Institute (SDI) “Design Manual for Composite Decks, Form Decks and Roof Decks”.

D. International Code Council (ICC) “Acceptance Criteria (AC) 43 – Steel Deck Roof and Floor Systems”.

E. American Society for Testing and Materials (ASTM):

1. ASTM A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”.

2. ASTM A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”.

3. ASTM A1003 “Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members”.

4. ASTM A1008 “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable”.

5. ASTM C1513 “Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections”.

F. American Welding Society (AWS) “D1.3 Structural Welding Code – Sheet Steel”.

1.3 SUBMITTALS

A. Shop drawings shall indicate all details of layout, fabrication and installation, location and dimension of openings, reinforcing and accessories, metal closures and flashing and type, size and location of all welds, and electromagnetically welded studs. Submit shop drawings before the start of fabrication. All details must reference detail callouts on the construction documents. Submittals that do not meet these requirements will be returned for correction without review.

B. Current ICC reports indicating design values.

C. Obtain reviewed structural steel shop drawings and verify all conditions before preparing shop drawings for metal decking; show all members required for support of metal decking on shop drawings for metal decking.

D. The Contractor shall review and approve shop drawings prior to submittal. The Architect's review is of a general nature only and all responsibility for conformance with drawings and specifications and for dimensions shall remain with the Contractor.

1.4 QUALITY ASSURANCE

A. All work under this section shall be fabricated and installed in strict accordance with the incorporated documents. Refer to pertinent sections of Division 05, Structural Steel.

B. Decking shall be installed in the field by an approved steel deck applicator with at least five years demonstrated successful experience in this type work.

C. All installation and welding shall be done by qualified, experienced workmen skilled in their trade, in conformance with established standards of good practice and the manufacturer's recommendations. All welders shall be AWS certified.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protection: Steel decking sheets shall be covered and protected from weather during transit and during storage at the job site. Sheets shall not be in contact with the ground and are to have a waterproof covering.

1.6 JOB CONDITIONS

A. Coordination: The Contractor shall secure all field measurements necessary for the completion of this work. The Contractor shall be responsible for all errors of detailing and fabrication and for the correct fitting of all metal decking to each other and to their supports. Provide holes and reinforcement for mechanical and electrical penetrations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Deck shall be of type and by manufacturer as specified on the drawings or approved equal. All equals must meet or exceed ICC approved design values of specified decking.

B. Steel decking and flashing shall be formed from steel sheets conforming to ASTM A653, A1003, or A1008 with a minimum yield strength of 40,000 psi. Before forming, the steel shall receive a protective metal coating of zinc conforming to ASTM A653 G60 wiped coating.

C. Deck Sections

1. Deck units shall be supplied in lengths to span over at least 3 supports where layout permits. All single span units shall have temporary mid-span shoring.

2. All deck units shall be provided with either an interlocking side lap or a lapping type side lap.

3. Venting Devices: Unless noted otherwise, all deck sections to receive cementitious fill shall be vented using individual separating clips of type, style and spacing recommended by deck manufacturer (space no more than 48" o.c. or a two per deck span) or built-in venting-slot formed as an integral part of deck profile. Venting slots are required only in non-cellular deck. Tabs shall be turned up into deck so that they cannot be used for hangers. Provide three rows of slots at 2'-0" on centers in three foot wide deck sections.

4. Flashing and Closure Plates: Provide 16 gauge zinc coated continuous flashing for deck units as detailed, or as required, at ends and sides, at openings and at deck perimeter to contain fill. Flashing shall be detailed and installed to prevent concrete leakage.

5. Reinforcing at openings and penetrations: Provide reinforcing at all openings and penetrations per PART 3.

6. Galvanization Coating Repair: Zinc dust-zinc oxide primer, ASTM A780.

D. Headed welded studs and deformed bar anchors: See section 05 1200 or 05 1100.

E. Painted Finish: Where painted finish is specified it shall be Manufacturer’s standard; baked on, rust inhibitive, applied to chemically cleaned surface.

F. Welding Electrodes: AWS Standard E60 or equivalent or E70 or equivalent, or as specified by AWS D1.3 and Manufacturer’s recommendation.

2.2 FABRICATION

A. All fabrication bevel cuts, etc. shall be done in the shop, and shall be equal to a high standard of workmanship. All deck units shall be shipped to the field in standard widths and in precut lengths so that end joints occur over supporting members.

B. Deck section shall be cut to fit all openings, which are required. Dimensions of openings and holes required for the work of other trades will be provided by respective trades for cutting of deck.

C. Misalignment of deck sections and cuts, short lengths, and poor workmanship shall be cause for rejection. All rejected work shall be replaced at the Contractor's expense.

2.3 SOURCE QUALITY CONTROL

A. An independent testing agency will perform source quality control tests and submit reports as specified in pertinent sections of Division 01.

B. Steel Materials Testing:

1. No Testing Required for Materials as follows:
   a. Materials identified in accordance with CBC 2203A.1 and ASTM A6. (heat number, grade stencil, etc.)
   b. Materials accompanied by certified mill test reports for all members, and Contractor’s affidavit confirming that all materials used in the fabrication and shipped to the job are from the grades specified and match the certificates supplied.

2. Unidentified steel: Where identification of materials by heat number or mill reports cannot be made, testing agency shall test unidentified deck.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The steel deck units shall be placed on the supporting framework, aligned, and adjusted to final position before being permanently fastened. Each unit shall be brought to proper bearing on the supporting beams. If the supporting beams are not properly aligned or sufficiently level to permit proper bearing of the steel units, the Contractor shall notify the Architect prior to taking corrective action to insure properly aligned work.

B. Deck units shall be placed in straight alignment for the entire length of run with close registration of the cells of one unit with those of abutting and adjoining units. Provide a minimum of 2 inch end bearing at abutting deck units. Continuous deck units shall be provided with a minimum of 3” bearing, all butt joints shall be “tight” (no gap).

C. Deck units shall not be placed on supporting members until all structural steel is completely installed, plumbed, and connections are completed.

D. Welding:

1. Steel deck units shall be fastened to the steel framework by the arc welding process. Welds shall be free of sharp points or edges.

2. All welding shall be done by competent experienced welders, thoroughly familiar with the metal to be welded, and certified for welding of light gauge metal.

3. Deck sheets shall be welded to the supporting member and to each other with welds as listed below unless otherwise noted on the drawings.
   a. End and intermediate support perpendicular to deck flutes: 3/4" diameter spot weld at each flute.
   b. Side joints between individual deck units with side interlock joint: 1-1/2" top or side seam weld at 12" on center. Button punch at 36" on center before welding to draw units together.

c. Side joints between individual deck units where concrete is placed on the metal deck is to be button punched at 36” on center.
d. Boundary deck units to parallel supports and interior deck units to parallel framing supports 3/4" diameter spot weld or 3/8" x 1-1/4" arc seam weld at 12" on center.

4. Weld all closure angles and plates with 3/4" diameter spot weld or 3/8"x 1-1/4" arc seam welds at 18" apart.

5. Headed welded studs and deformed bar anchors: See section 05 1200 or 05 1100.

E. Screw Attachment: When called for on the drawings, painted roof deck is to be attached with galvanized #12 hex head metal screws with neoprene washers at flutes and at 24” on center at side laps and at 12” on center at perimeter side laps. Screws and metal washers shall be painted to match deck color where decking is a painted finish surface.

F. Decking shall be installed in a continuous operation to avoid delays in the construction.

G. Opening reinforcement shall be as detailed on the drawings. Cutting of holes other than those detailed on the drawings shall be done only as specifically approved by the Architect. Holes not shown on structural drawings shall be cut and reinforced in accordance with details on drawings. In general, reinforcing is not required for holes less that 4" in diameter. Holes at column penetrations shall be reinforced as any other hole. See details on drawings for other requirements.

H. Leave slag in place at welds to be covered by concrete. Elsewhere, remove slag to bright metal and touch up all welds and field cut edges with galvanization repair primer.

I. Field Finishing:

1. Permanently exposed galvanized surfaces requiring welding shall be thoroughly cleaned by wire brushing after welding and then touched up with galvanization repair primer.

2. After erection all damaged surfaces shall be primed.

3. Painted deck shall be touched up with primer and matching paint.

3.2 FIELD QUALITY CONTROL

A. Welding Inspection:

1. Testing Agency shall inspect and certify all structural welds. Submit certification to the Architect/Engineer for review and the Building Official for approval.

2. Welder Qualifications: Welding inspector shall verify that all the welders are properly qualified prior to steel fabrication and state the qualifications of each welder in the welding inspection report.

3. Welding Inspection:
a. Welding Inspector shall check all welds, materials, equipment and procedures.
b. Welding Inspector shall provide reports certifying the welding is as required and has been done in conformity with the plans, specifications and codes.
c. Periodic inspection per CBC is acceptable.

3.3 DEFECTIVE WORK

A. All work not in conformance with these specifications and/or generally accepted standards of the trade, will be deemed defective by the Architect and will be rejected. All work that is defective shall be corrected or replaced as directed by the Architect. Corrections redesign, and replacement of defective work shall be at Contractor's expense.

3.4 CLEANING

A. After erection, all surfaces shall be cleaned and left free of all grime and dirt. Decking shall be cleaned with solvents, if necessary to provide a surface, which will readily bond with concrete fill and direct-to-steel fireproofing. Remove unused materials, tools, scaffolding and debris from the premises and leave the area broom clean.

END OF SECTION 05 3000

SECTION 05 4000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. All design and other services, material, labor and equipment as necessary for the fabrication, erection and completion of all cold formed metal framing including all bracing and shoring required for erection, miscellaneous metal, and related work.

B. Related Sections:

1. Pertinent Sections of Division 01 Specifying Quality Control and Testing Agency Sections

2. Pertinent Sections of Division 05 Specifying Structural Steel.

1.2 REFERENCE STANDARDS

A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 22A Steel.

B. American Iron and Steel Institute (AISI) S100 “North American Specification for the Design of Cold-Formed Steel Structural Members”.

C. AISI S200 “North American Standard for Cold-Formed Steel Framing – General Provisions”.

D. AISI D100 “Cold-Formed Steel Design Manual.

E. American Welding Society (AWS) D1.3 “Structural Welding Code – Sheet Steel”

F. American Society for Testing and Materials (ASTM):

1. ASTM A307 “Stand Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength”.

2. ASTM A606 “Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance”.

3. ASTM A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”.

4. ASTM A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”.

5. ASTM A1003 “Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members”.

6. ASTM A1008 “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable”.

7. ASTM A1011 “Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength”.

8. ASTM C645 “Standard Specification for Nonstructural Steel Framing Members”.

9. ASTM C754 “Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products”.

10. ASTM C955 “Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases”.

11. ASTM C1007 “Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories”.

12. ASTM C1513 “Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections”.

G. The Society for Protective Coatings (SSPC) SSPC-Paint20 “Zinc-Rich Coating (Inorganic or Organic)”.

1.3 SUBMITTALS

A. Shop Drawings

1. Show size and locations of all framing members in conformance to the criteria shown on the drawings.

2. Shop and field assembly details, including cuts and connections. All details must reference detail callouts on the construction documents.

3. Type and location of shop and field welds, screws, bolts, and fastening devices.

4. General Contractor shall review and approve shop drawings prior to submittal.

5. Shop drawing submittals that do not meet these requirements will be returned for correction without review.

B. Manufacturer's Literature:

1. Descriptive data illustrating cold-formed framing system components including framing members, fasteners, and accessories, including ICC-ES reports.

2. Erection instructions containing sequence of operations.

C. Samples: Provide adequate samples of unidentified material to the Owner's Testing Laboratory for testing purposes.

1.4 QUALITY ASSURANCE

A. Erector Qualifications:

1. Minimum of three years successful experience on comparable cold-formed metal framing projects.

2. Welders qualified in accordance AWS D1.3.

B. Cold form carbon and low alloy steel used for structural purposes shall be identified per CBC Section 2203A.1.

C. Welding inspections shall conform to AWS D1.3 and CBC 1705A.2.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Members of the "Steel Stud Manufacturers Association (SSMA)" with products meeting ICC-ES ESR-3064P. Members of the "Certified Steel Stud Association (CSSA)" with products meeting ICC-ES ESR-3016.

2.2 MATERIALS

A. Steel Framing System:

1. All stud and/or joist framing members shall be of the type & size as shown on the plans and reviewed shop drawings.

2. All runner and end tracks, bridging, and non-load bearing studs shall be of the type & size shown on the plans.

3. All studs, joists, and tracks 54 mils or greater in thickness shall be formed from steel that corresponds to the requirements of ASTM A1003 (Grade ST50H or ST50L) with a minimum yield of 50,000 psi.

4. All studs, joists, track, bridging, U-channel, (hat) furring (F) channels, and accessories 43 mils or thinner in thickness shall be formed from steel that corresponds to the requirements of ASTM A1003 (Grade ST33H or ST33L) with a minimum yield of 33,000 psi.

5. All stud and joist components shall be formed from steel having a minimum G-60 galvanized coating (equivalent coatings such as “G60e” are not acceptable), unless noted otherwise, or shall be primed with paint meeting the performance requirements SSPC-Paint20, where noted.

6. Welding Electrodes: Shall conform to AWS D1.3. Touch up all welds with zinc-rich paint in compliance with ASTM A780.

7. Primer: SSPC-Paint20.

B. Screws shall be per ASTM C1513.

C. Machine bolts shall be per ASTM A307.

D. Powder Driven Pins (PDP): Hilti X-U, ICC ESR-2269. For use only where specified by the drawings.

E. Accessories: Cold-formed metal framing manufacturer's standard.

2.3 FABRICATION

A. Form members to manufacturer's standard shapes meeting design criteria.

B. Cut right angle connections of framing components to fit squarely against abutting members.

C. Prime un-galvanized steel to 1.5 mil (0.038) minimum dry film thickness.

PART 3 - EXECUTION

3.1 ERECTION

A. Clean surfaces that will be in contact after assembly.

B. Position members plumb, square and true to line.

C. Seat studs squarely in track with stud web and flange abutting track web with maximum 1/8 inch gap.

D. Connect members together by welding and/or fasteners in accordance with the drawings.

E. Do not splice studs. Provide "headers" and "trim studs" at openings as required. Studs shall be securely attached to tracks at all exterior walls except as noted below.

F. Provide for expansion and contraction between floors at solid wall sections of two stories or more by providing a slip joint between stud and track at one end. This connection shall be capable of transmitting lateral loads to the structure.

G. Provide and install bridging, fire blocking, etc. per manufacturer's recommendations, the plans, and code requirements.

H. Perform welding in accordance with AWS D1.3

I. Remove erection bolts and screws used in welded construction.

J. Do not use gas cutting for field correction of fabrication without concurrence of Architect/Engineer.

K. Touch-up field connections and breaks in shop coating with same primer used for shop priming.

3.2 DEFECTIVE WORK AND MATERIALS

A. Work found to be defective, missing or damaged shall be immediately replaced with proper work. Such replaced work and the inspection for same shall be at the expense of the Contractor.

B. Straightening of any materials, if necessary, shall be done by a process and in a manner that will not injure the materials, and which is approved by the Architect. Sharp kinks or bends shall be cause for rejection. Heating will not be allowed.

C. If defects or damaged work cannot be corrected in the field, the material shall be returned to the shop or new parts furnished, as the Architect directs; the Contractor shall replace all work at his own expense.

3.3 CLEANING

A. After erection, all surfaces shall be cleaned and left free of all grime and dirt. Remove unused materials, tools, equipment and debris from the premises and leave broom clean.

END OF SECTION 05 4000

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SECTION 05 4160

SURE-BOARD SERIES 200/200W/200S PANEL FOR SHEAR AND SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. All design and other services, material, labor and equipment as necessary for the fabrication, erection and completion of all cold formed metal framing including all bracing and shoring required for erection, miscellaneous metal, and related work.

2. The extent of SURE-BOARD® shear panel/sheathing is shown on the drawings, including basic layout, gypsum, non-combustible or combustible sheathing materials to be laminated to the steel sheet, fastener type, spacing for attachment of Series 200/200W and Series 200S Sure-Board® that may be required for interior and exterior use.

B. Related Sections:

1. Pertinent Sections of Division 01 Specifying Quality Control and Testing Agency Sections

2. Pertinent Sections of Division 05 Specifying Cold formed Metal Framing - 05 4000.

1.2 REFERENCE STANDARDS

A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 22A Steel.

B. American Iron and Steel Institute (AISI) S100 “North American Specification for the Design of Cold-Formed Steel Structural Members”.

C. AISI S200 “North American Standard for Cold-Formed Steel Framing – General Provisions”.

D. AISI D100 “Cold-Formed Steel Design Manual.

1.3 QUALITY ASSURANCE

A. Annually Inspected/Approved Manufacturing:

1. Sure-Board® Shear Panel Quality Assurance Manual.

1.4 PERFORMANCE REQUIREMENTS

A. Shear wall shear capacity:

1. The gage for framing and attachment of the Sure-Board® Shear panel is designed by the EOR (engineer of record) to provide a panel shear capacity in accordance with IAPMO-ES evaluation report number ER-126/ER-185/DSA IR A-5

2. No other similar materials, stated load capacities or methods of attachment to framing studs/track/plates other than those stated on these approvals for Sure-Board® products will be acceptable as an equal.

B. Fire Rated Use:

1. Sure-Board® Series 200/200W and 200S Sure-Board® panels have been fire tested/reported by ITS Intertek Testing Laboratories and Fire-Stance certified to be used on 1 and 2 hour fire rated, load bearing and non-load bearing CFS Framed assemblies for interior and exterior use.

1.5 SUBMITTALS

A. Shop Drawings

1. Shear wall layout, framing and supports, with dimensions and sections.

2. Shear wall/Diaphragm load tables using Sure-Board® Series 200/200W/200S panels, fastener size/type and spacing will be attached to designed shear walls that define the size of required collector posts for shear, along with required wall framing hardware, size or gage and on center stud/joist spacing for Vertical/Diaphragm and concentrated loads as well as lateral load resistance that have been engineered.

3. Details of proprietary or non-proprietary components if included.

B. Manufacturer's Literature:

1. Descriptive data illustrating cold-formed framing system components including framing members, fasteners, and accessories, including ICC-ES reports.

2. Erection instructions containing sequence of operations.

C. Samples: Provide adequate samples of unidentified material to the Owner's Testing Laboratory for testing purposes.

1.6 QUALITY ASSURANCE

A. Erector Qualifications:

1. Minimum of three years successful experience on comparable cold-formed metal framing projects.

2. Welders qualified in accordance AWS D1.3.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Sure-Board® panel:

1. All Sure-Board® panels shall be packaged and handled to prevent damage during shipping and unloading.

2. Cover Sure-Board® panels with waterproof material and ventilate to avoid condensation before installation.

3. Store Sure-Board® off ground with one end elevated for moisture drainage.

4. Do not bend sheet steel or break/mar gypsum board sheet while handling. If damage to panel should occur, repair of panel may be approved by manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS, FASTENERS, ADHESIVE AND FINISHED PANELS

A. Galvanized Steel:

1. No.22 gage 0.027-inch (0.686mm) base-metal thickness minimum per ASTM A 653 CS Grade 33/hot dipped galvanized G40 minimum per ASTM A 924.

B. Wallboard/Fiber Cement Sheathing Compliance:

1. Wallboard complies with ASTM C 1325, C 1369, C 1177, C 1278, C 1288 and C 1186 including MgO Sheathing.

C. Fasteners:

1. The fasteners used to fasten the Sure-Board® Series 200/200S Structural Panels to the steel framing are self-drilling/self-tapping pilot point flat head screws, #8 minimum diameter 0.138-inch (3.5 mm), with a minimum 0.3145-inch (8.0 mm) head diameter, 1.5-inch (31.7 mm) long, and a 3/8-inch minimum drill tip, complying with SAE J78, ASTM C 1513 and ASTM C 954. ESR-1271 by John Grabber & Assoc. or equal. Series 200S should use #8 X 1-5/8" lg. Winged Driller Grabber Super Drive LOX drive screws or equal. See ICC-ES Report ESR-1271. Series 200W Structural Panels when fastened to steel framing are attached with #10 X 3/4" minimum self-drilling/self-tapping pan-head screws.
D.

D. Adhesives:

1. The non-structural adhesive used to attach the steel to the gypsum wallboard or other non-structural sheathing shall be a water soluble, non-combustible type adhesive.

E. Finished Sure-Board® Sheet Steel Panels:

1. The sheet steel is No. 22 gage /0.027 inch (0.686 mm) minimum base-metal thickness complying with ASTM A 653 CS, Grade 33, and is provided with a G40 minimum hot-dipped galvanized coating conforming to ASTM A 924. Available width of 48 inches (1219 mm) and lengths of 4feet through 12 feet (2438 through 3658 mm). Note: Special cut lengths are available upon request.

F. Finished Sure-Board® Panels

1. Sure-Board® Series 200 Structural Panels:

G. Each panel consist of 1/2, 5/8 or 3/4 inch (12.7, 15.9 or 19.1 mm) thick square or tapered-edge Type X or Type C Fire Rated gypsum wallboard or water resistant core sheathing complying with ASTM C 1369, fiber reinforced cement board complying with ASTM C 1325 as well as glass mat gypsum substrate complying with ASTM C 1177 and fiber reinforced gypsum panels complying with ASTM C 1278, laminated with water soluble adhesive to steel sheet. The steel sheet is No. 22 gage /0.027 inch (0.686 mm) minimum base-metal thickness, complying with ASTM A 653 CS, Grade 33, and is provided with G40 minimum hot- dipped galvanized coating conforming with ASTM A 924. Available width of 48 inches

(1219 mm) and standard lengths of 8 through 12 feet (2438 through 3658 mm). Note: Custom lengths of 8 through 12 feet (2438 through 3658 mm) available on request.

PART 3 - EXECUTION - INSTALLATION/FASTENERS/CUTTING/REPAIRING SURE-BOARD®

3.1 Installation and Cutting Sure-Board® Series 200/200W/200S

A. Condition of Material Pre-Installation Sure-Board® Series 200/200W and 200S

1. Always install Sure-Board® Series 200 when conditions and material are dry. If the Sure-Board® Series 200 panels are not covered or stored in a dry location, and should get wet due to inclement weather conditions, allow them to air dry before installing. We suggest, as with all gypsum products, you keep materials dry at all times, before installation. All gypsum panels are different in their physical composition and are manufactured for specific uses. Follow all appropriate manufacturers recommendations for storage, handling and installation of your Sure-Board®. The steel sheet is always attached against the framing studs to accomplish resistance capacities stated in Manufacturers tables for lateral force resistance.

B. Fasteners and Application for installing Sure-Board® Series 200/200W and 200S

1. Installing Sure-Board® Series 200 only requires the use of standard electric gypsum screw guns, if you intend to use hand fed screws. Use of a collated screw gun, is acceptable as well.

2. A requirement when installing Sure-Board® Series 200/200W and 200S, is to install the screws into the studs/joist or rafters at the approved spacing, per approved construction drawings, and use suggested #8 minimum diameter screws in the required length (per project specific conditions and approved plans). The Series 200 screws must have a longer drill tip (minimum 3/8” long), to avoid the “jacking” of the sheet steel from the stud and track during installation. The longer drill tip screws and a list of many other important tools and fasteners that are suggested for use with Sure-Board® are available at www.sureboard.com and at www.sureboardtools.com. Fastener heads shall be installed flush to the panel face material or just below the surface at the field and perimeter edges, and a minimum of 3/8” setback from all edges of the panel. Sure-Board® may have screws added where necessary, if some of the fasteners are over-screwed below the surface of the panel. Note: If unintentional over-screwing occurs in excess as defined by EOR, additional screws between the existing screws may need to be added When Handling, Cutting and Installing, it is recommended that installers wear approved eye and hand protection as well as approved dust mask to prevent personal injury and irritation. For questions regarding Sure-Board products and their use please contact their Technical Support at (866) 469-7432.

C. Installation of Series 200/200W Panels in Vertical and Horizontal Orientation

Recommended Installation of Structural Strapping on the Surface of the Sure-Board® Series 200/200W Panels in lieu of beneath the Sure-Board® Steel Sheet. See Manufacturers recommendations for cutting panels.

1. For installation of Sure-Board® Series 200 and 200W in the Perpendicular or Horizontal Orientation to the framing you must include either blocking or a minimum 1 ½ inch wide flat strapping that is the same gage as the framing materials installed at all horizontal or vertical joints of all panels. Note: When Panels are installed either in the Vertical or Horizontal Orientation to the framing studs, there is No Structural Requirement that the

"Butt End" joints of the Sure-Board® Panels Must be Staggered in each Adjoining row to maintain Stated Structural Capacities in our Evaluation Report. Where indicated in approved drawings, screw attached surface applied vertical or horizontal strapping shall be applied over the Sure-Board® Series 200 sheet steel, instead of behind the Sure-Board® directly to the studs. The installation of the straps and fasteners under the Sure-Board® Series 200 panels may cause unsightly bulges in the finish surface. The Sure-Board® sheet steel shall be installed flush to the stud surface. Installing the straps over the Sure-Board® Series 200 steel panels may be accomplished by first hanging and fastening the Sure-Board® Series 200 panels to the studs. After installation is complete, using a drywall knife or router, score the drywall and remove the screws in the Sure-Board® panels as necessary to allow for the removal of the unwanted gypsum where the strap is to be installed. Attach the strap over the Sure-Board® sheet steel and re-attach the sheet steel of the Sure-Board® panel into new holes with the appropriate self-tapping pan head fasteners into the provided studs or backing through the Sure-Board® sheet steel. This method allows the Sure-Board® Series 200 panel to be attached flush and the strap to be recessed into the gypsum panel and attached directly to the stud flange surface with no visual effect to the finish. After the inspection, the gypsum patch is easily installed and finished. (Note: The gypsum sheet is not a structural component, once the Sure-Board® Series 200 panel has been installed.)

3.2 DEFECTIVE WORK AND MATERIALS

A. Work found to be defective, missing or damaged shall be immediately replaced with proper work. Such replaced work and the inspection for same shall be at the expense of the Contractor.

B. Repairs on Field Damaged Gypsum on Sure-Board® Series 200

1. There are isolated situations where the gypsum panel is damaged during construction by field staff, weather conditions, etc. In those cases, the repair of the damaged Sure-Board® panels may be completed using the following method: 1.) Identify the damaged piece of gypsum. 2.) Score the gypsum panel with a drywall knife or router (set to depth of gypsum sheet). 3.) Remove existing bugle-head fasteners in the damaged portion and re-fasten the sheet steel at the prescribed spacing with a minimum #8 x ¾" self-tapping pan-head fasteners into new holes in the Sure-Board® sheet steel and the studs. 4.) After completing this operation, the Sure-Board® panel is secure. Reinstall gypsum board patch and screw off only as necessary to accommodate the taping process. The gypsum patch need only be screwed to the sheet steel of the Sure-Board® to accommodate this process.

C. Straightening of any materials, if necessary, shall be done by a process and in a manner that will not injure the materials, and which is approved by the Architect. Sharp kinks or bends shall be cause for rejection. Heating will not be allowed.

D. If defects or damaged work cannot be corrected in the field, the material shall be returned to the shop or new parts furnished, as the Architect directs; the Contractor shall replace all work at his own expense.

3.3 CLEANING

A. After erection, all surfaces shall be cleaned and left free of all grime and dirt. Remove unused materials, tools, equipment and debris from the premises and leave broom clean.

END OF SECTION 05 4000

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SECTION 05 5000 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Shop fabricated ferrous metal items, galvanized and prime painted.

B. Fabricated steel items including the following:
1. Rough hardware.
2. Elevator pit ladders.
3. Elevator machine beams.
4. Support angles for elevator door sills.
5. Ladders.
6. Ladder safety cages.
7. Pipe bollards, concrete filled.
8. Loose bearing and leveling plates.
9. Loose steel lintels.
10. Miscellaneous framing, supports and trim.
11. Shelf and ledger angles.
12. Steel weld plates and angles for casting into concrete not specified in other Sections.
13. Trash enclosure gates.
14. Metal grating.
15. Slotted channel framing.

C. Products furnished, but not installed, under this Section include the following:
1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

D. Manufactured trench drains and fiberglass manhole covers.

E. Stainless steel corner guards.

F. Metal wall base at Reception.

1.3 RELATED SECTIONS

A. Section 12 3640 – Countertops: Stainless steel countertops.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel

sheet and the uncoated base metal of metallic-coated steel sheets. Metal thicknesses indicated below correspond to former gage thicknesses:

1. 20 Gage: 0.032-inch- (0.8-mm-).
2. 18 Gage: 0.042-inch- (1.0-mm-).
3. 16 Gage: 0.053-inch- (1.3-mm-).
4. 14 Gage: 0.067-inch- (1.7-mm-).
5. 12 Gage: 0.093-inch- (2.3-mm-).

1.6 SCHEDULING AND SEQUENCING

A. Ensure timely fabrication of items to be embedded or enclosed by other work.

B. Furnish information and assistance required for locating embedded items and be responsible for proper locations.

1.7 ACTION SUBMITTALS

A. Shop Drawings: Show a large scale construction of various parts, methods of joining, thickness of metals, profiles of surfaces, reinforcing, anchorage, and structural supports. Include information regarding concealed and exposed joints, welds, and fastenings. Where welded connectors and concrete inserts are required to receive work, show size and locations required.

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
   4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

C. Deferred-Approval Submittal: Approval of shop drawings and calculations by DSA is required.
   1. Contract shall submit engineered shop drawings for this specific project; wet-stamped and signed by a qualified professional engineer licensed in the State of California, showing layouts, elevations, attachments to structure, component attachments, and component properties.
   2. Provide 2 sets of drawings, full size, including DSA-specific signature block for drawings to be accepted by the Design Professional in general responsible charge but prepared by others.
   3. Contractor shall submit engineering calculations indicating code compliance of the system depicted in the Shop Drawings, 2 sets, wet-stamped and signed.
   4. No components of the system may be installed until Shop Drawings and calculations are approved by DSA. Contractor shall allow a minimum of 6 weeks in their schedule for DSA review and approval (not including review time for Architect specified in Division 1). Contractor shall allow for one re-submittal specifically to address DSA comments (not including Architect’s review of comments which may have been provided previously).

1.8 INFORMATIONAL SUBMITTALS

A. ICC-ES Reports: Submit ICC-ES reports for expansion bolts, demonstrating acceptability of expansion bolts to authorities having jurisdiction over the Work.

1.9 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of aluminum entrances and storefront systems that are similar to those indicated for this Project in material, design, and extent.

B. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

C. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Design Criteria:
1. Work shall be designed to support normally imposed loads and conform to AISC requirements.
2. Built-up parts shall not exhibit warp.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.

B. Discharge materials carefully and store on clean concrete surface or raised platform in safe, dry area.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
1. Structural Steel: Average recycled content of hot-rolled steel to be a minimum 70 percent post-consumer recycled content.

B. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Adhesives, sealants, paints, welding, and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MATERIALS

A. Steel Materials:
1. Structural Steel Shapes: ASTM A36/A36M, conforming to AISC specifications.
2. Architectural and Miscellaneous Steel Items: ASTM A283/A283M.
3. Steel Sheets: ASTM A36/A36M.
4. Steel Pipe: ASTM A53/A53M, Grade A, Schedule 40.
5. Steel Bars: ASTM A36/A36M.
6. Steel Tubing: ASTM A500/A500, Grade A.
7. Steel Plate: ASTM A36/A36M.
8. Galvanized Steel: ASTM A653/A653M, with minimum G90 (Z275) coating unless noted otherwise.

B. Slotted Channel Framing: Unistrut, Inc.; P-100 Series or equal; cold-formed metal channels with continuous slot complying with MFMA-3.
1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
2. Material: Galvanized steel complying with ASTM A653/A653M, structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.
3. Material: Steel complying with ASTM A1008/A1008M, structural steel, Grade 33; 0.0528-inch (1.35-mm) minimum thickness; hot-dip galvanized after fabrication.

2.3 STEEL LADDERS

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3 and CFR 29 1910.27; where conflicts occur, comply with the more stringent requirements.

B. For elevator pit ladders, comply with ASME A17.1.

C. Steel Ladders:
1. Space siderails 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-) diameter steel bars spaced no greater than 12-inches (305 mm) oc and uniform throughout the length of the ladder.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide non-slip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Individual metal rungs embedded in concrete which serve as access to pits and other areas under floors, should have a minimum diameter of 1-inch (25 mm).
7. Galvanize pit ladder, including brackets and fasteners.

D. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" (1.5 m) oc by means of welded or bolted brackets made from same metal as ladder, unless otherwise indicated.
1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7-inches (178 mm).
2. Extend side rails 42-inches (1.1 m) above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, gooseneck the extended rails back to the structure to provide secure ladder access.

2.4 LADDER SAFETY CAGES

A. General: Fabricate ladder safety cages to comply with requirements of ANSI A14.3 and CFR 29 1910.27; where conflicts occur, comply with the more stringent requirements. Assemble safety cages by welding.

B. Primary Hoops: Steel bars, 3" x 1/4" (76 mm x 6.4 mm), for top, bottom, and for cages longer than 20 feet (6.1 m), intermediate hoops spaced not more than 20'-0" (6.1 m) oc.

C. Secondary Intermediate Hoops: Steel bars, 2" x 1/4" (51 mm x 6.4 mm) hoops spaced not more than 4'-0" (1.2 m) oc between primary hoops.

D. Vertical Bars: Steel bars, 1-1/2- x 1/4-inch (38.1 mm x 6.4 m), secured to each hoop, spaced at intervals not more than 40 deg (0.7 rad) oc around the circumference of the cage, maximum spacing of approximately 9-1/2-inches (241 mm) oc.

E. Fasten assembled safety cage to ladder rails and adjacent construction as indicated.

2.5 TRENCH DRAINS

A. Basis-of-Design: Zurn #Z-882-GDF-U4 "Perma Trench Drain System" or accepted equivalent.
1. Description: Pre-sloped trench drain, complete with 12" wide galvanized ductile iron slotted grate, P-trap, and 1/2" trap primer connection.

2.6 FIBERGLASS GRATES

A. Manhole Cover at Building 7: LF Manufacturing Company, Giddings, TX, 800.237.5791 or accepted equivalent.
1. Description: 36-inch diameter, pedestrian load rated with bolted securing assembly.

2.7 CORNER GUARDS

A. Stainless Steel: Type 304.
1. Thickness: Minimum 0.0625 inch (1.6 mm).
2. Finish: Directional satin, No. 4.

B. Surface-Mounted, Metal Corner Guards: Fabricated from 1-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
1. Wing Size: 3-1/2 by 3-1/2 inches (90 by 90 mm).
2. Height: 4’-0” from top of wall base.

2.8 METAL WALL BASE

A. Material: Steel bar or plate, with height as indicated on Drawings.

B. Finish: Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
1. Powder-coat wall base in shop before delivery to Site.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

2.10 MISCELLANEOUS FRAMING, SUPPORTS AND TRIM

A. Miscellaneous Framing and Supports: Provide steel framing and supports for applications indicated which are not a part of structural steel framework, as required to complete work.
   1. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   2. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
      a. Except as otherwise indicated, space anchors 24-inches (61 cm) oc and provide minimum anchor units in the form of steel straps 1-1/4" wide x 1/4" x 8" long (31.8 mm x 6.4 mm x 203 mm).

B. Miscellaneous Steel Trim: Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination for assembly and installation with other work.

2.11 SHELF AND LEDGER ANGLES

A. Fabricate shelf and ledger angles from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4-inch (19.1 mm) bolts, spaced not more than 6-inches (152 mm) from ends and not more than 24-inches (0.61 m) oc, unless otherwise indicated.

B. Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in-place concrete.

2.12 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe, concrete filled.
   1. Size: 6-inch diameter by 48-inch above finished grade.

B. Galvanize metal bollards after fabrication.

2.13 SPECIALTY FABRICATED PRODUCTS

A. Preparation:
   1. Coordinate with other work supporting or adjoining miscellaneous metal and verify requirements for cutting out, fitting, and attaching.
   2. Verify sizes, designs, and locations of items; do so at site whenever construction progress permits.

B. General Requirements:
   1. Fabricate items from materials noted and make true to profiles shown. Obtain the Architect's approval of proposed variations.
   2. Miter corners and angles of frames and moldings unless otherwise noted.

3. Perform cutting, shearing, drilling, punching, threading, tapping as required for items or their adjacent work.
4. Drill or punch holes; do not use cutting torch.
5. Ensure shearing and punching leaves true lines and surfaces.
6. Items to be Galvanized: Fabricate in accordance with recommended practices of ASTM A385/A385M and A123/A123M unless specifically noted otherwise.
7. Fabricate exterior items for assembly and installation on site without field welding of joint.
8. Ensure metal thickness and assembly details provide ample strength and stiffness.
9. Size sleeves for approximately 1/4-inch clearance all around.

C. Fastening:
1. Provide fasteners and anchor assemblies required for complete fabrication, field assembly, and erection.
2. Conceal fastenings wherever practicable.
3. Size internally threaded diameters to accommodate galvanized threaded bolts where galvanizing is required.
4. Permanent connections in Ferrous Metal Items: Employ welding wherever practicable; avoid bolts and screws.

D. Welding:
1. Use electric shielded-arc process according to AWS D1.1.
2. Maintain shape and profile of item welded.
3. Prevent heat blisters, run-throughs, and surface distortions.
4. Welds Normally Exposed to View in Finished Work: Make uniform and grind smooth.
5. Exposed Welds: Remove burrs, flux, welding oxide, air spots and discoloration; grind smooth, polish, or otherwise finish to match material welded.

E. Bolted and Screwed Connections:
1. Use bolts for field connections only, and then only as noted. Countersink heads; finish smooth and flush.
2. Provide washers under heads and nuts bearing on wood.
3. Draw nuts tight and prevent loosening of permanent connections by nicking threads.
4. Use beveled washers where bearing is on sloped surfaces.
5. Where necessary to use screws for permanent connections in ferrous metal, use flat head type, countersink, fill screw slots, and finish smooth and flush.
6. Evenly space exposed heads.

2.14 PRIMER FINISHES

A. Preparations of Surfaces:
1. Thoroughly clean ungalvanized ferrous-metal surfaces of mill scale, rust, dirt, grease, oil, and other foreign matter from ferrous metal prior to galvanizing, hot phosphate treatment or painting.
   a. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
2. Where hand-cleaning methods are not adequate, and unless specified otherwise, clean in accordance with SSPC-SP 1, SSPC-SP 2, or SSPC-SP 7 as required.
3. Completely eliminate burrs, rough spots and pitting from normally exposed ferrous metal items.

B. Galvanizing:
1. Galvanize items after fabrication in largest sections practicable unless otherwise permitted or recommended by ASTM A384/A384M and A385/A385M.
2. Where galvanizing is removed by welding or other assembly procedures, touch up abraded areas with molten zinc or zinc-rich paint.

3. Where ferrous metal item is noted to be galvanized, perform galvanizing in accordance with following standards as applicable to item, using a minimum of 2.0 ounces per square foot:
   a. Hardware Items Including Fasteners: ASTM A153/A153M.
   b. Items Both under 1/8-inch Thickness and Fabricated from Rolled, Pressed, and Forged Shapes, Plates, Bars, and Strips: ASTM A123/A123M.
   c. Other Fabricated Items: ASTM A123/A123M.

C. Finish Schedule: Unless noted otherwise in Materials or Standard Catalog Products Articles.
1. Ferrous Metal, Interior Items:
   a. Concealed: Clean, chemically etch, and shop-apply one prime-coat.
   b. Exposed: Clean, treat with hot phosphate, chemically etch, and shop-apply one prime-coat.
2. Ferrous Metal, Exterior Items:
   a. Concealed: Clean and hot-dip galvanize in accordance with galvanizing standards.
   b. Exposed: Clean, then hot-dip galvanize in accordance with galvanizing standards, chemically etch, and shop- apply one prime-coat.
3. Special Ferrous Metal Items as Noted Below: Clean and hot-dip galvanize in accordance with galvanizing standards. Do not prime coat.
4. Items Noted as Chrome-Plated: Same as US26D finish.
5. Hardware Including Fasteners (Bolts, Nuts, Washers, Etc.):
   a. Finish to match items fastened.
   b. Where galvanizing is required, hot-dip galvanize according to ASTM A153/A153M.

2.15 ACCESSORIES

A. General: Provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade and class required.

B. Typical Unfinished Bolts, Nuts, and Washers: Low carbon steel standard fasteners, externally and internally threaded, ASTM A307 Grade A; malleable washers.

C. Expansion Bolts: FS FF-S-325, Group II, Type 4.

D. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

E. Washers: ANSI B18.22.1; flat round washers.

F. Anchor Bolts: ASTM F1554, Grade 36.

G. Grout: Non-shrink, non-metallic grout, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete Fill: Comply with requirements in Section 033000 for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

I. Primer: Zinc-chromate type.

J. Zinc for Galvanizing: ASTM B6.

K. Welding Electrodes: E-70XX.

2.16 SOURCE QUALITY CONTROL

A. Test and Inspections: The Owner will engage a testing laboratory to inspect welds per CBC Chapter 17A, AISC 360, and AISC 341.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive work and verify that setting conditions and dimensions are correct to receive items.

B. Do not start installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install work plumb, true, rigid, and neatly trimmed out.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. 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.

D. 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.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

G. Do not tighten fastener through finish alone without spacer washers.

H. Provide concrete inserts or predrilled expansion bolts in fastening items into concrete.

I. Protect dissimilar metals from contact with each other or with other materials causing corrosion.

J. Fasten work tightly to prevent rattle or vibration except where expansion-contraction tolerances are required.

K. Use non-shrink grout mixed in accordance with manufacturer's direction for setting frames, plates, sills, bolts and similar items.

L. Set items shown or required to be installed in sleeves with quick setting anchor cement unless otherwise noted.

M. Protect metal from damage to surface, profile and shape.

3.3 INSTALLING METAL BOLLARDS

A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

C. Backfill: The backfill in the annular space around bollards not embedded in poured footings shall be by the following methods:
1. Clean excess soil from hole. Do not leave loose soil at bottom of hole.
2. Backfill: Concrete with an ultimate strength of 3,000 pounds per square inch (210.92 kgs/sq cm) at 28 days. The hole shall not be less than 4-inches (101.6 mm) larger than the diagonal dimension of a round, square or rectangular bollard.

3.4 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING

A. Touch-Up Painting of Steel Items: Immediately after erection, clean field welds, bolted connections, abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
1. Apply by brush or spray to provide a minimum dry film thickness of 3.0 mils (0.076 mm).

3.6 CLEANING

A. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780/A780M.

B. Clean exposed surfaces or stainless steel countertops promptly after installation of components, exercising care to avoid damage of finish.

C. Remove protective devices only when items will be safe from other construction operations or removal is required to permit related work.

D. Clean prime-coated items as required for finish painting.

E. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 05 5000

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SECTION 05 5113 – METAL PAN STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Concrete-filled steel pan stairs and landings.

B. Installation of railings.

1.3 RELATED SECTIONS

A. Section 03 3543 – Polished Concrete Finishing: Building 1 feature stair tread finish.

B. Section 05 1250 – Architecturally Exposed Structural Steel: Building 1 feature stair steel.

C. Section 05 5000 – Metal Fabrications.

D. Section 05 5213 – Pipe and Tube Railings.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 COORDINATION

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

B. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

1.6 SCHEDULING AND SEQUENCING

A. Ensure timely fabrication of items to be embedded or enclosed by other work.

B. Furnish information and assistance required for locating embedded items and be responsible for proper locations.

1.7 ACTION SUBMITTALS

A. Product Data: For metal stairs and the following:
   1. Prefilled metal-pan stair treads.

B. Shop Drawings: For the fabrication and erection of all assemblies of steel stair work, elevations, and details of sections and connections, including all welds. Show anchorage, fasteners and accessory items.
   1. Include setting drawings and templates for location and installation of miscellaneous items and anchorage devices.
   2. Take field measurements prior to preparation of shop drawing and fabrication, where possible. Allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work.

C. Samples for Verification: For the following products, in manufacturer's standard sizes:
   1. Precast concrete treads.
   2. Abrasive nosings.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
   4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

1.8 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.

1.9 QUALITY ASSURANCE

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
   1. Preassembled Stairs: Commercial class.

B. Design Criteria:
   1. Work shall be designed to support normally imposed loads and conform to AISC requirements.
   2. Built-up parts shall not exhibit warp.

C. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver in time to avoid delays in the Work, while minimizing job site storage time.

B. Store off the floor or ground, out of the weather, or protect by waterproof coverings, out of the way of other work and traffic.

C. Protect from racking, distortion, stress, damage, and soiling at all times.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
   1. Steel: Average recycled content of hot-rolled steel to be a minimum 70 percent post-consumer recycled content.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Welding and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MANUFACTURERS

A. Acceptable Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
   1. Prefabricated Stairs:
      a. American Stair, Inc.
      b. Worthington Metal Fabricators (formerly Sharon Companies Ltd.).

2.3 STEEL MATERIALS

A. Steel Materials: See Section 05 1200.

B. Provide steel surface treads and risers:
   1. Tread Surface: Metal pan for concrete fill.
   2. Risers: Closed steel.
   3. Minimum Tread Thickness: 12 gage.

C. Stair Stringers: Steel channel.

2.4 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements for Section 03 3000 for normal weight, ready-mix concrete with minimum 28-day compressive strength of 3000 psi (21 MPa), unless higher strength indicated.

B. Nonslip Aggregate Finish (Non-Feature Stairways): Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

C. Building 1 Feature Stair: Polished concrete treads in conformance with Section 03 0543 and where indicated on Drawings.

2.5 TREAD PLATES

A. Fabricate raised pattern tread plates from aluminum-alloy rolled tread plate in pattern and thickness as indicated. See ASTM B632/B632M for pattern illustrations.

B. Abrasive Surface Floor Plate: Manufacturer's standard abrasive granules, rolled into surface of aluminum plate, where indicated.

C. Include aluminum angle stiffeners and fixed and removable sections as indicated.
1. Provide 2 aluminum bar drop handles for lifting plates, one at each end of each removable section.

2.6 ABRASIVE METAL NOSINGS

A. Basis-of-Design Product: The design for abrasive metal nosings is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: American Safety Tread Co., Inc., Style 801.
2. AMSTEP Products, division of American Safety Technologies, Inc.
3. Balco Inc.
4. Safe-T-Metal Co., Inc.
5. Wooster Products Inc.

B. Cast-Metal Units: Cast aluminum, with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
1. Nosings: Cross-hatched units, custom width as indicated with 1/4-inch lip, for casting into concrete steps.
2. Color of Abrasive Finish: As selected by Architect.

C. Fabricate units of material, sizes, and configurations indicated. If not indicated, provide cast-iron units with integral abrasive finish. Furnish in lengths as required to accurately fit each opening or conditions.
1. Cast units with an integral abrasive grit consisting of aluminum oxide, silicon carbide, or a combination of both.

D. Cast-In Anchorage: Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

E. Apply bituminous paint to concealed bottoms, sides, and edges of cast-metal units set into concrete.

2.7 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

2.8 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.9 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
1. Join components by welding, unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Prefabricated Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. 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 true to line and level with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously, unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

I. Provide stairs and landings, at all locations indicated on Drawings.

J. Provide hand railings for all stairs as specified in Section 05 5213.

K. Provide anchors and fasteners required for complete installation.

L. Provide approved standard steel railings, at stairs and handrails at walls.

2.10 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Conform to NAAMM commercial and architectural class.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
1. ASTM A123/A123M, for galvanizing steel and iron products.
2. ASTM A153/A153M, for galvanizing steel and iron hardware.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
1. Exterior Stairs (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

E. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces and conditions receiving or affecting the work. Do not proceed until unsuitable conditions have been corrected.

B. Verify dimensions and location of preset anchorages.

3.2 ERECTION

A. General: Erect stair work to line, plumb, square, and true with runs registering level with floor and platform levels.

B. Center nosings on tread widths with noses flush with riser faces and tread surfaces.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

D. Cutting, Fitting and Placement:
1. Cut, drill and fit as required for the installation of the work.
2. Set the work accurately in location, alignment and elevation, plumb, level and true and free of rack, measured from established lines and level.
3. Provide temporary bracing or anchors in formwork for items, which are to be built into concrete, masonry or similar construction.
4. Fit exposed connections accurately together to form tight hairline joints. Weld connections, which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch up shop paint coat.

E. Field Welding: Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

F. Touch-up Painting:
1. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint, and paint all exposed areas with the same material as used for shop painting.
2. Apply by brush or spray.

G. Where stairs are exposed to open areas, install OSHA-approved temporary railings and any other protection devices as may be required until permanent railings can be properly installed.

H. Place and finish concrete fill for treads and platforms to comply with Section 033000 Cast-in-Place Concrete.
1. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

3.3 INSTALLING STEEL TUBE RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
1. Anchor posts to steel by welding directly to steel supporting members.
2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets in accordance with requirement of Section 05 5213. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.4 ADJUSTING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

3.5 CLEANING

A. Clean prime-coated items as required for finish painting.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.6 PROTECTION

A. Remove protective devices only when items will be safe from other construction operations or removal is required to permit related work.

END OF SECTION 05 5113

SECTION 05 5213 – PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Steel pipe and tube handrails and fittings.

B. Metal pipe guardrails at interior and exterior.

C. Definitions in ASTM E985 for railing-related terms apply to this Section.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 COORDINATION

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

1.5 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

1.6 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's literature for products used in metal fabrications, including paint, grout and pre-manufactured items.

B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.
   1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.

3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

D. Structural Analysis: Provide calculations demonstrating compliance of pre-engineered handrail and infill system with ADA and local building codes, including structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: From a qualified testing agency indicating handrails and railings comply with ASTM E985, based on comprehensive testing of current products.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Handrails and railings shall comply with ADA requirements and California Building Code (CBC) 11B-505.

E. Ramp handrails shall comply with CBC 11B-505.

F. Ramp guardrails shall comply with CBC 11B-505.

G. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

1.9 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.10 SITE CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Adhesives, sealants, paints, welding, and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 PERFORMANCE REQUIREMENTS

A. Comply with ASTM E985 based on Testing per ASTM E894 and E935.

B. Structural Performance: Provide handrails and guards complying with CBC 1607.7 and DSA/SS Table 1607A.1 that are capable of withstanding the effects of gravity loads at any point without damage or permanent set for railing assemblies, wall rails, and attachments, and the following loads and stresses within limits and under conditions indicated:
   1. Handrails:
      a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.

2.3 MATERIALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Pipe: ASTM A53/A53M; Type F or Type S, Grade A, standard weight Schedule 40; unless another grade and weight are required by structural loads, finish as specified.

C. Tubing: ASTM A500/A500M (cold formed).

2.4 GROUT AND ANCHORING CEMENT

A. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Grout/Anchoring Cement: Non-shrink nonmetallic grout: CE CRD-C621 or erosion-resistant anchoring cement; non-staining, non-corrosive, nongaseous; recommended by manufacturer for types of applications indicated.

C. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

A. Fabricate handrails and railings to design, dimensions, and details indicated and as required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Welded Connections: Fabricate handrails and railings by butt welding or welding with internal connectors. Cope or butt components to provide 100 percent contact. Weld connections continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Provide coped joints at tee and cross sections.
3. Obtain fusion without undercut or overlap.
4. Remove flux immediately.
5. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

D. Continuously seal joined pieces by continuous welds.

E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

F. Form changes in direction of railing members as follows:
1. By radius bends of radius indicated.
2. By mitering at elbow bends.
3. By bending.
4. By any method indicated above, applicable to change of direction involved.

G. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

I. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

J. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches (150 mm) long with inside dimensions not less than 1/2-inch (12 mm) greater than outside dimensions of post, and steel plate forming bottom closure.

K. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

L. Ease exposed edges to a radius of approximately 1/32-inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

M. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

N. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.

O. Fabricate joints that will be exposed to weather in a watertight manner.

P. Close exposed ends of handrail and railing members with prefabricated end fittings.

Q. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

2.6 PREPARATION FOR GALVANIZING (EXTERIOR RAILINGS)

A. Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

B. Hot-dip-galvanize steel and iron railings, including hardware, after fabrication.
1. Comply with ASTM A123/A123M for hot-dip galvanized railings.
2. Comply with ASTM A153/A153M for hot-dip galvanized hardware.

C. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

E. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

F. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.

G. Baked-Enamel or Powder-Coat Finish for Shop-Finished Units: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
1. Exterior Railing Finish: Powder-coated gray to match CIP concrete at Patio, steel stairs, guards and handrails.
2. Powder-coat railings in shop before delivery to Site.

H. Field-Finished Units: High-performance coating; Tnemec or accepted equivalent.
1. Color: TBD.

2.7 PREPARATION FOR SHOP PRIMING (INTERIOR RAILINGS)

A. Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
   1. Interior Railings (SSPC Zone 1A): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

B. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.8 ACCESSORIES

A. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails.

B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads. Use plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electro-deposited zinc coating.
   1. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

D. Anchors and Inserts: As required for secure anchorage of handrails and railings to concrete, masonry, and other adjoining work; non-corrosive to materials joined.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

C. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

D. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

E. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of the railing and wall is 1/4 inch or less.

G. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints and correct alignment throughout their length. Space posts at interval indicated, but not less than that required by structural loads. Plumb posts in each direction.

H. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Comply with manufacturer's recommendations for field connections of handrail and railing members.

B. Non-welded Connections: Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.

C. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in the "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

A. Anchor posts to metal surfaces with fittings designed for this purpose. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

B. Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink grout, non-metallic grout or anchoring cement mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, attached to post by set screws.

3.5 ANCHORING RAILING ENDS

A. Anchor rail ends to masonry and concrete with round flanges connected to rail ends and anchored into wall with post-installed anchors and bolts.

B. Anchor rail ends to steel-framed gypsum board assemblies with brackets on underside of rail connected to rail ends and anchored with hanger or lag bolts set into solid support backing between studs.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets and end fittings. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Use brackets with flange tapped for concealed anchorage to threaded hanger bolt.

C. Secure wall brackets to building construction as follows:
   1. For steel-framed gypsum board assemblies, use hanger or lag bolts set into solid support backing between studs using self-tapping screws of size and type required to support structural loads. Coordinate with stud installation to locate backing members.
   2. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.
   3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
   4. Stop capped end of handrails 1/2” from face of wall or as indicated on Drawings.
   5. Drill wall plate portion of the bracket to receive one bolt, unless otherwise indicated for concealed anchorage.
   6. Locate brackets at not more than 6’-0” on center.

3.7 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.8 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 5213

SECTION 06 1053 – MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Rooftop equipment bases and support curbs.

B. Wood blocking, cants, and nailers.

C. Wood furring and grounds.

D. Wood sleepers.

E. Plywood backing panels.

F. Plywood for wall protection.

1.3 RELATED SECTIONS

A. Section 06 4100 – Architectural Woodwork.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NLGA - National Lumber Grades Authority.
   2. WCLIB: West Coast Lumber Inspection Bureau.
   3. WWPA: Western Wood Products Association.

1.6 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. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.

2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
4. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as
5. Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
   a. Include statement indicating costs for each certified wood product.
6. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
   a. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Power-driven fasteners.
2. Powder-actuated fasteners.
3. Expansion anchors.
4. Metal framing anchors.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Forest Certification: Provide components made with not less than 50 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
1. Dimension lumber framing.
2. Miscellaneous lumber.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. Certified Wood: Use wood-based products made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria."

C. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 WOOD PRODUCTS

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Provide dressed lumber, S4S, unless otherwise indicated.
   2. Factory mark each piece of lumber with grade stamp of grading agency.
   3. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   4. 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.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.
   6. Grounds.
   7. Utility shelving.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For exposed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.

D. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
   1. Western woods, Standard or No. 3 Common grade; WCLIB or WWPA.

E. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. 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.

G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD BACKING PANELS

A. Telecommunications and Electrical Equipment Backing Panels: AWPA Standard C27 for Type A use and Standard DB-90 free from defects, fire-retardant treated and bearing the Underwriters Laboratories label, or stamp, attesting to the FRS rating, in size indicated or, if not indicated, not less than 8' by 4' by 3/4-inch nominal.
1. Provide kiln-dried plywood with maximum moisture content of 15 percent or less.
2. Underwriters Laboratories FRS Rating:
   a. Surface-Burning Characteristics: ASTM E84.
      1) Flame-Spread Index: 25 or less.
      2) Smoke Developed: 25 or less.
3. The fire retardant chemicals used shall be halogen and sulfate free.
4. Provide plywood that meets the surface burning characteristics testing requirements of NFPA 255.
5. Do not paint backing panels unless approved by authorities having jurisdiction.

2.5 PLYWOOD FOR WALL PROTECTION

A. Type: ACX plywood; ANSI/HPVA HP-1; veneer core material; type of glue recommended for application.
1. Formaldehyde Emission Levels: No urea formaldehyde.
2. Face Grade: Grade A.
3. Veneer: TBD.
4. Thickness: 3/4-inch.
5. Veneer Core: 5-ply.
6. Cut: Sliced-vertical grain.
7. Back Grade: Minimum Grade 2.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails: ASTM F1667.

C. Power-Driven Fasteners: NES NER-272.

D. Screws for Fastening to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A307, Grade A (ASTM A153/A153M, Property Class 4.6); with ASTM A563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in

concrete as determined by testing per ASTM E488/E488M conducted by a qualified independent testing and inspecting agency.

2.7 METAL FRAMING ANCHORS

A. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
1. Use for interior locations where stainless steel is not indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

D. Do not splice structural members between supports, unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
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) oc.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96-inches (2438 mm) oc with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96-inches (2438 mm) oc. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- (38-mm actual-) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20-feet (6 m) oc.

G. 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.

H. 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.

I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in CBC.

J. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2-inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PLYWOOD BACKBOARD INSTALLATION

A. Keep plywood dry at all times during transit, storage (on site) and installation. If plywood does become wet, either replace plywood or dry plywood to maximum 15 percent moisture content prior to installation.

B. Install plywood onto the walls using fasteners appropriate for the wall type (e.g., concrete anchors for a concrete wall).

C. Install plywood such that the fire rated symbol/marking is clearly visible.

D. Install plywood onto the walls as shown on Drawings. If not noted, then install plywood from 6 inches to 102 inches, AFF.

E. Install electrical and telecommunication outlets flush to the plywood backboard.

F. Paint plywood with a bright (white) low-gloss paint where permitted by authorities having jurisdiction. Mask the plywood’s fire rated symbol such that the symbol is still visible after painting.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 06 1053

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SECTION 06 1500 – WOOD DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Composite lumber decking.

1.3 RELATED SECTIONS

A. Section 06 1053 - Miscellaneous Carpentry: Dimension lumber items associated with wood decking.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data:
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treatment plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
      a. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before further fabrication or shipment to Project site.

B. Samples for Verification: Provide 2 12-inch long samples of composite lumber illustrating color selection.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as
   4. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
   5. Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
      a. Include statement indicating costs for each certified wood product.

6. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
   a. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of wood decking to avoid extended on-site storage and to avoid delaying the Work.

B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking with surfaces that are to be exposed in the final work protected from exposure to sunlight.

C. Composite Lumber Materials:
   1. Store on flat surface, away from heat sources and sunlight to prevent bending of the material.
   2. When stacking units, place supports at each end and space a maximum of 24-inches oc, and aligned vertically.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.

2.2 COMPOSITE LUMBER DECKING

A. Composite Lumber Decking Manufacturer: Trex.

B. Decking Material Properties:
   1. Fungus Resistance (White and Brown Rot): ASTM D1413; no decay.
   2. Static Coefficient of Friction (Dry): ASTM D2047:
      a. Sanded Surfaces: 0.53.
      b. Unsanded Surfaces: 0.55.
   3. Static Coefficient of Friction (Wet): ASTM F1679:
      a. Sanded Surfaces: 0.70.
      b. Unsanded Surfaces: 0.75.
   4. Compression Parallel: ASTM D198; 550 psi design value.
   5. Compression Perpendicular: ASTM D143: 625 psi design value.
   6. Tensile Strength: ASTM D198: 250 psi design value.
   7. Shear Strength: ASTM D143; 200 psi design value.
   8. Modulus of Rupture: ASTM D4761; 250 psi design value.

9. Modulus of Elasticity: ASTM D4761; 100,000 psi design value.
10. Thermal Conductivity: ASTM C177; 1.57 BTU-in/hr-ft @85°F.
11. Leachate: TCLP-EPA 1311; pass.

C. Composite Lumber Decking Color: To be selected.

2.3 FASTENERS AND ACCESSORY MATERIALS

A. Fasteners for Composite Lumber: Provide fasteners size recommended by composite lumber manufacturer, minimums as follows:
1. Nails: 3-inch, 10 or 11 d.
2. Screws: 3-inch, No. 7.
3. Fastener Material: Hot-dip galvanized steel.

B. Penetrating Sealer: Clear sanding sealer complying with Sections 09 9100 and 09 9313, and compatible with topcoats specified for use over it.

2.4 FABRICATION

A. Shop Fabrication: Where preservative-treated decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.

B. Smooth edges of cutouts and seal immediately with a water-resistant coating suitable for exterior applications to prevent end-checking.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and support framing in areas to receive wood decking for compliance with installation tolerances and other conditions affecting performance of wood decking.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, COMPOSITE LUMBER DECKING

A. Follow manufacturer's written instructions for handling and installing composite lumber decking.

B. Verify joists are level before installing composite lumber decking.

C. Cut composite lumber using carbide tip blades.

D. Predrill holes for fasteners using router bits before attaching to joist supports.

E. Gap composite lumber, end-to-end, width-to-width, and where abutting walls, following manufacturer's written recommendations for project environmental conditions at time of installation.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking if repairs are not approved by Architect.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Provide temporary waterproof covering to protect exposed decking before applying roofing.

END OF SECTION 06 1500

SECTION 06 4100 – ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Plastic laminate cabinets.

B. Wood veneer cabinets.

C. Custom wood lockers and benches.

1.3 RELATED SECTIONS

A. Section 06 1053 – Miscellaneous Rough Carpentry: Finished wood carpentry trims.

B. Section 12 3640 – Countertops.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Exposed surfaces include all surfaces visible when:
1. Drawers and opaque doors (if any) are closed.
2. Areas behind clear glass doors.
3. Bottoms of cabinets 42-inches or more above finished floor.
4. Top of cabinets below 78-inches above finished floor.

B. Semi-exposed surfaces include the following:
1. Open opaque doors or extended drawers.
2. Bottoms of cabinets that are more than 30-inches and less than 42-inches above finished floor.

C. Concealed surfaces include the following:
1. Surfaces not visible after installation.
2. Bottoms of cabinets less than 30-inches above finished floor.
3. Tops of cabinets over 78-inches above finish floor and not visible from an upper level.
4. Stretchers, blocking, and components concealed by drawers.

1.6 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories and finishing materials and processes.

B. Shop Drawings: Submit shop drawings for each item of architectural woodwork. Indicate dimensions, details of construction, finishes, and hardware.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

C. Samples for Verification:
   1. Veneer-faced panel products with or for transparent finish, 12 by 24 inches (300 by 600 mm), for each species and cut. Include at least one face-veneer seam and edge condition, finished as specified.
   2. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
   3. Thermoset decorative-panels, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with edge banding on 1 edge.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
   4. Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
      a. Include statement indicating costs for each certified wood product.
   5. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
   6. Product Data Sheets for each product to be used as proof that each product meets the requirements of the GREENGUARD Environmental Institute’s GREENGUARD certification.
   7. Include printed statement of VOC content and chemical components.
   8. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

1.8 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

1.9 QUALITY CONTROL

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

C. Forest Certification: Provide components made with not less than 50 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

D. NAAWS Quality Standard: Comply with the specified grade(s) of interior architectural woodwork indicated for construction, finishes, and installation, specified section(s), and applicable requirements of the current edition of the "North American Architectural Woodwork Standards – 3.0, United States Version".
   1. Provide WI-certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.
   2. Provide Seismic certificates indicating that casework is installed with all required wall blocking and that fastener size, frequency and locations requirements have been met.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Site Conditions" Article.

1.11 SITE CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

C. Field Measurements: All casework dimensions shall be field verified prior to fabrication.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. Forest Certification: Provide components made with all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

C. Certified Wood: Use wood based products made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils “Principles and Criteria.”

D. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
   1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of NAAWS's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Veneer Species and Cut for Transparent Finish: White Oak, rift-sawn fumed

C. Wood Species for Opaque Finish: Any closed-grain hardwood.

D. Hardwood and Softwood Lumber: Custom graded in accordance with NAAWS; average moisture content of 8 percent.
   1. Species: Any closed-grain hardwood. For use at concealed areas only.

E. Hardwood Plywood: ANSI/HPVA HP-1; veneer core material; type of glue recommended for application.
   1. Formaldehyde Emission Levels: No urea formaldehyde.
   2. Wood Veneer Species and Cut for Casework: White maple, plain sawn or sliced.
   3. Face Grade: Grade A.
   4. Thickness: 3/4-inch.
   5. Veneer Core: 5-ply.
   6. Cut: Sliced-vertical grain.
   7. Back Grade: Minimum Grade 2.

F. Cabinet Interiors, Shelves, and Counter Substrate: 3/4-inch Plywood.

G. Plastic Laminate:
   1. High-pressure (HPDL) decorative laminate complying with NEMA LD 3.
   2. Plastic Laminate for Exposed Surfaces: GP-50 for nonpostformed surfaces; PF-42 for postformed surfaces.
   3. Basis-of-Design Product: The design for the plastic laminates is based on the manufacturer identified below. Product requirements in this Section are based on products by the named manufacturer. Subject to compliance with requirements, provide the named product or an approved comparable system:
      a. Basis-of-Design, Cabinets: See Drawings for locations:
         1) Basis-of-Design: Nevamar Armored Protection Color: Gunmetal S6020T
         2) Pionite Chemguard Color: Black SE101N
         3) Wilsonart: Phantom Pearl Gloss Line Finish with Aeon 8211K-28
      b. Basis-of-Design, Countertops: See Drawings for locations:
         1) Basis-of-Design: Nevamar Armored Protection Smoky White S7027T
         2) Formica 3505-58 Storm Solidz Matte Finish
         3) Wilsonart: Carbon Mesh Fine Velvet Finish 4880-38
      c. Basis-of-Design, Casework Interiors:
         1) Basis-of-Design: Nevamar Armored Protection Color: Smoky White S7027T.
         2) Formica 3505-58 Storm Solidz Matte Finish
         3) Wilsonart: Carbon Mesh Fine Velvet Finish 4880-38
   4. Plastic Laminate Materials: Provide only plastic laminate materials that are GREENGUARD Certified.

a. Individual VOC's: <0.1 TLV.
b. Total VOC's: <0.5 mg/m3
c. Formaldehyde: <0.05 ppm
d. 4-Pheylcyclohexene: <0.0065 mg/m3
e. Total Aldehydes: <0.1 ppm

5. Melamine or Low Pressure Laminate is not allowed as a replacement for High Pressure Plastic Laminate, even for cabinet interiors, drawer interiors, backing sheets or other non-visible conditions.

H. Edge Banding for Plastic Laminate Shelves: Vinyl, complying with LMA EDG-1, 3 mm thick material, with radiused edges, color and finish to match laminate exactly.
1. Supplier: HPL Contract, 510.732.0111.

I. Wall-Hung Countertop Supports: Cold rolled steel supports.
1. Angle Support Brackets:
a. Design: Straight gusset stiffener between support flanges of angle.
2. Floating Countertop Support Brackets:
a. Thickness: 1/2-inch.
b. Style: Flat.

J. Adhesive: FS MMM-A-130 contact adhesive; type recommended by laminate manufacturer to suit application.
1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
a. Wood Glues: 30 g/L.
b. Contact Adhesive: 250 g/L.

K. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

L. Bolts, Nuts, Washers, Lags, Pins, Fasteners, and Screws: Of size and type to suit application.

2.3 CUSTOM CASEWORK FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated.

E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

2.4 WOOD CABINET CONSTRUCTION

A. NAAWS Requirements:
   1. Quality Standard: Comply with NAAWS Section 10.
   2. Grade: Premium.
   3. Material: Veneer plywood, White Oak, fumed cut, as specified.
   4. Construction Style: Type A Frameless.
   5. Construction Type: Type II single-length sections to fit across openings.
   6. Door and Drawer Front Style: Flush overlay.
      a. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
      b. Matching of Veneer Leaves: Slip match.
   7. Finish: Clear, satin finish.

B. Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
   2. Drawer Sides and Backs: Hardwood.
   3. Drawer Bottoms: Hardwood.

C. Countertop Support: 3/4-inch plywood.

D. Edge Material: Same as cladding on faces.

E. Wood Veneer (backsplash, side walls and island wall under counter/stool side): Match wood cabinet species and finish.

F. Cabinet Hardware: ANSI/BHMA A156.9, see schedule at end of this Section.

2.5 PLASTIC LAMINATE CABINET CONSTRUCTION

A. Construction:
   1. Quality Standard: Comply with NAAWS Section 10.
   2. NAAWS Grade: Custom.
   3. Type: Type II single-length sections to fit across openings.
   4. Cabinet Style: Style A Frameless.
   5. Interface Style: Overlay, Figure 10-057.
   6. Door and Drawer Front Style: Flush overlay.
   7. Exposed Exterior Surfaces: HPDL as specified.
   8. Exposed Interior Surfaces: HPDL matching exposed exterior surfaces.
   9. Exposed Interior Surfaces of Door and Drawer Fronts: Covered with the same material, pattern, color and thickness as the door face.
   10. Core Material: MDF as specified.
   11. Door and Drawer Edge: Square edge with thin applied band.
      a. Edge Banding: HPDL, minimum 0.02-inch thick, color-matched to the exposed face.
   12. Shelf Thickness: As specified in Architectural Woodwork Standards (NAAWS) for a uniform load of 50-lb/sq ft.

B. Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
   2. Drawer Sides and Backs: MDF.

3. Drawer Bottoms: MDF.
4. Exposed Edges: Extruded PVC or self-edged plastic laminate

C. Colors, Patterns, and Finishes: To be selected.

D. Cabinet Hardware: ANSI/BHMA A156.9, see schedule at end of this Section.

2.6 PLASTIC LAMINATE COUNTERTOP CONSTRUCTION

A. NAAWS Requirements:
1. Quality Standard: Comply with NAAWS Section 11.
2. NAAWS Grade: Custom.
3. Type II adhesive.
4. Single length sections.
5. Intermediate support for spans over 48 inches to prevent deflection in excess of ¼ inch under a 50 pound per sq ft load.
6. Core Material: Fabricator's option.
7. Edge Treatment: As indicated on Drawings in accordance with NAAWS requirements.
8. Back Splash Profile: As indicated on Drawings in accordance with NAAWS requirements.
9. Back Splash Construction: NAAWS Assembly 2.
10. Joints: Well fit, flush, and watertight.

2.7 WOOD BENCHES AND LOCKERS

A. Doors: 3/8” overlay style.
1. Wood Veneer Door: White Oak, fumed cut.
2. Finish: Clear natural finish.
3. End match veneer on multiple door openings.

B. Panels: Exposed to view, locker end and filler panels in coordinating laminate, veneer, and solid wood panels in accordance with lockers and exposed fascia.

C. Case Substrate: 3/4 inch industrial grade particle board; interior bonded with melamine, manufacturer's standard color.

D. Case Edge: Black PVC.

E. Venting: Hold locker tops, bottoms, and shelves back 1/8 inch to allow adequate natural air flow. Provide vent holes in the rear panel for additional ventilation.

F. Side Panels: Exposed to view, locker end and filler panels to match doors.

G. Benches:
1. Material: White Oak, fumed cut.
2. Finish: Clear natural finish.

2.8 SHOP FINISHING, WOOD CABINETS

A. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Grade: Provide finishes of same grades as items to be finished.
1. Finish interior of wood cabinets to match exterior.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
   2. Remove handling marks or effects of exposure to moisture from all exposed portions of woodwork by means of a thorough, final sanding over all surfaces of the exposed portions, using appropriate grit sandpaper and clean before applying sealer or finish.

D. Transparent Finish:
   1. Grade: Custom.
   2. NAAWS Finish System 3: Score 124-T, lacquer post-catalyzed.
   3. Staining: Match approved sample for color.
   4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

2.9 LOCKER FABRICATION

A. Unit Principle: Fabricate each wood locker with an individual door and frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.
   1. Fabricate lockers to dimensions, profiles, and details indicated.
   2. Fabricate corners, end panels, and fillers as required by installation.

B. Fabricate components square, rigid, without warp, and with finished faces flat and free of scratches and chips. Accurately machine components for attachments in factory, with no chips. Make joints tight and true.
   1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
   2. Fabricate lockers with European 32 mm glue and doweled construction. Glue dowels in place.

C. Shop cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

D. Acoustical Treatment: Fabricate lockers for quiet operation with manufacturer's standard rattle-free latching mechanism and quiet closing doors.

E. Ensure exposed and semi-exposed joints are tight and true.

2.10 FACTORY FINISHES FOR WOOD LOCKERS

A. General: Finish wood lockers at factory as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparations for Finishing: Sand, fill countersunk fasteners, seal concealed surfaces, and perform similar preparations for finishing wood lockers, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of lockers. Concealed surfaces of wood lockers do not require backpriming when surfaced with thermoset decorative overlay.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Verify the adequacy and proper location of any required backing or support framing.

C. Verify that mechanical, electrical, plumbing and other building items affecting solid surfacing components are in place, complete and to receive the work of this Section.

D. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing material and backpriming.

3.2 INSTALLATION, GENERAL

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Provide and install anchorage for all casework and shelving following manufacturer's installation instructions and DSA approved details.

C. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

D. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

E. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

3.3 CABINET INSTALLATION

A. Install woodwork to comply with NAAWS Section 10 for same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.

3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) oc with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinet bases to floor using appropriate anchorages. Permanently fix countertops to wall using appropriate angles.

F. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

G. Clean casework, counters, shelves, hardware, fittings and fixtures.

H. Upon completion of installation, clean all installed items. Remove pencil and ink marks from surfaces. Leave area of work broom clean.

3.4 COUNTERTOP INSTALLATION

A. Install woodwork to comply with NAAWS Section 11 for same grade specified in Part 2 of this Section for type of woodwork involved.

B. At Base Units: Anchor securely to base units.
1. Align adjacent countertops and form seams handtight to minimize joints using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. At Walls: Permanently fix countertops to wall using appropriate angles. Secure countertops in place, square, plumb and level.

D. Carefully scribe countertops abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose. Caulking not to exceed 1/16 inch in width.

E. Equipment cut-outs indicated on plans within countertops shall be cut by countertop installer.

F. Mechanical fasteners are not allowed at exposed surfaces.

G. Upon completion of installation, clean all installed items. Remove pencil and ink marks from surfaces. Leave area of work broom clean.

H. Protect countertops after installation; do not allow other trades to use countertops as footstools or ladders to perform their work. Cover completed cabinetwork with 4-mil polyethylene film protective enclosure, applied in a manner to permit easy removal.

3.5 LOCKER INSTALLATION

A. Install lockers and accessories in accordance with approved Shop Drawings and manufacturer's installation instructions for a plumb, level rigid, and flush installation.

B. Install bases using leveled 2 x 4 Douglas Fir, placed to achieve tight fitting, neat joints.

C. Connect locker groups together with standard fasteners according to manufacturer's recommendations, with no exposed fasteners.

D. Anchor locker case to wall studs through locker back panel and to base through locker floor.

3.6 BENCH INSTALLATION

A. Place benches in location indicated on Drawings. Through bolt legs to floor using no less than two bolts per leg. Fasten securely to concrete slab below tile floor finish.

B. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches (1830 mm) apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.7 ADJUSTING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean, lubricate, and adjust hardware.

B. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.9 CABINET HARDWARE SCHEDULE

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Section 08710. Where manufacturer's name or product number is not indicated provide best quality commercially available cabinet hardware.

B. Cabinet Shelf Pilaster Standards and Rests: BHMA A156.9, all components steel, B04071; with shelf rests, B04081:
   1. Acceptable Products, Heavy-Duty Pilaster Standards:
      a. KV 255 Series.
      b. Sugatsune SPE-1820.
      c. Accepted equivalent.
   2. Acceptable Products, Shelf Rests:
      a. KV 237.
      b. Sugatsune SPF-20
      c. Accepted equivalent.

C. Adjustable Shelf Clips: BHMA A156.9, B04013:
   1. KV 346, use with 3/8-inch drilled holes and #129 rubber cushion.

A. Seismic Shelf Clips: BHMA A156.9, B04013:
   1. Hafele; 282.24.721.

B. Heavy Weight Drawer Slides: BHMA A156.9, B05091:

1. Acceptable Products:
   a. KV 8805.
   b. Accuride 3640A.
   c. Accepted equivalent.
2. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated steel ball-bearing slides.
3. Full extension slides with 1-inch overtravel, side-mount,
   a. General Purpose Drawers: 200 lb capacity.
4. Size slides in accordance with manufacturer's recommendations for drawer width.

C. Drawer and Door Pulls (Building 1, First Level Break Area only): Doug Mockett Tab Pulls.

D. Drawer and Door Pulls
1. Back-Mounted Pulls: BHMA A156.9, B02011.
2. Wire Pulls:
   a. Sugatsune
      1) DSI-120-192 at doors
      2) DSI-120-160 at drawers
      3) 304 stainless steel with satin finish
3. Location(s): FS #6 Kitchen & Bldg 2 Break Room.

E. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 110 degrees of opening, self-closing.
1. Acceptable Products:
   a. Basis-of-Design: Rockford Process Control Model 454-PC27
   b. Blum BLUMOTION.
   c. Hafele.
   d. Accepted equivalent.
2. Provide three hinges for doors over 48 inches in height.

F. Touch-Close Hardware: Blum TIP-ON and Servo-Drive. See Drawings for locations.

G. Heavy-Duty Bottom Sliders for Trash: Hafele, Rev-a-Shelf.

H. Cabinet, Sliding Door, and Drawer Locks:
1. Medeco High Security Locks.
2. Door Locks: BHMA A156.11, E07121.
3. Drawer Locks: BHMA A156.11, E07041.

I. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
3. Satin Stainless Steel: BHMA 630.
4. Satin Nickel: BHMA 646 or 670.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

END OF SECTION 06 4100

SECTION 06 4216 – WOOD BOARD PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Wood board paneling fabricated with salvaged wood flooring from existing Training Tower.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 DEFINITIONS

A. Paneling includes wood furring, blocking, and shims for installing paneling, unless concealed within other construction before paneling installation.

1.5 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including finishing materials and processes.

B. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
   1. Show details full size.
   2. Indicate dimensions, details of construction, finishes, and hardware.
   3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
   4. Apply WI-certified compliance label to first page of Shop Drawings.

C. Samples for Verification:
   1. Submit four samples of each cut and species of wood to be used.
   2. Submit 4 additional samples of what will be used by painting trade for staining samples.
   3. Board leaves representative of and selected from flitches to be used for transparent-finished paneling.
   4. Lumber with or for transparent finish, not less than 5 inches (125 mm) wide by 24 inches (600 mm) long, for each species and cut, finished on 1 side and 1 edge.
   5. Board-faced panel products with or for transparent finish, 8 by 10 inches (200 by 250 mm), for each species and cut. Include at least one face-board seam and finish as specified.

6. Panel products with shop-applied opaque finish 8 by 10 inches (200 by 250 mm), for each finish system and color, with 1/2 of exposed surface finished.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
4. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as
5. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
   a. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

1.7 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of product, signed by product manufacturer.

B. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

C. Qualification Data: For fabricator and installer.

1.8 QUALITY CONTROL

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.

B. Installer Qualifications: Fabricator of products.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling with sequence-matched wood boards.

D. Fire-Test-Response Characteristics: Provide wall panels that comply with the following requirements:
1. Surface-Burning Characteristics: Provide panels with the following surface-burning characteristics complying with ASTM E1264 for Class A materials as determined by testing identical products per ASTM E84:
   a. Flame Spread: 25 or less.
   b. Smoke-Developed Index: 450 or less.

E. NAAWS Quality Standard: Comply with the specified grade(s) of interior architectural woodwork indicated for construction, finishes, and installation, specified section(s), and applicable requirements of the current edition of the "North American Architectural Woodwork Standards – 3.0, United States Version".
1. Provide WI-certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. If paneling must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.10 SITE CONDITIONS

A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MATERIALS

A. General: Provide materials that comply with requirements of WI's quality standard for quality grade specified, unless otherwise indicated.

B. T&G Wood Boards: Use salvaged wood flooring from existing Training Tower.
1. Dimensions: 1" x 4" nominal.
2. Finish: AWI

C. Edge Trim: Aluminum, profile as indicated on Drawings, natural anodized finish.

D. Adhesive: NAAWS Type II.
1. Do not use adhesives that contain urea formaldehyde.

E. Bolts, Nuts, Washers, Lags, Pins, Fasteners, and Screws: Of size and type to suit application.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Metal Furring Strips: Hat-shaped rigid furring channels, galvanized. See Section 09 2216.

C. Fasteners: Screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

2.4 FABRICATION, GENERAL

A. Preparation of Salvaged Wood Boards:
1. Clean wood boars of mildew, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or refinishing.

B. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods such as sanding, wire brushing, or power tools except as approved by Architect, City's Project Manager, and Construction Manager.

C. Board Repairs: Where indicated, repair wood boards by limited replacement matching existing material.

D. Replace Wood Units: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.

E. Separate out salvaged boards that are warp or twisted and unsuitable for installation. Review sanding of these boards with Architect, City's Representative, and Construction Manager for possible use in the Project.

F. Seal backs of wood paneling with at least two coast of sealer.

2.5 SHOP FINISHING

A. General:
1. Shop finish transparent-finished paneling at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling.

C. Interior Transparent Finish:
1. Grade: Provide finishes of same grades as paneling to be finished.
2. NAAWS Finish System 3: Score 124-T, lacquer pre-catalyzed.
3. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify adequacy of backing and support framing.

B. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 PANELING INSTALLATION

A. Install paneling with smooth and flush joints to create a homogenous look.
   1. Pattern: Diagonal as indicated on Drawings.
   2. Align boards with existing floor joists to create “shadow” lines. Confer with Architect prior to installation in order to achieve required pattern.

B. Furr and install paneling of adequate thickness and in such a way as to avoid deflection when normal pressure is applied.

C. Set grounds plumb and true.

D. Use concealed fastening to the fullest extent possible. If exposed fastening is required to complete the installation, set fasteners in quirks where possible, countersunk, kept to a minimum and placed in such a manner as to be least visible when the installation is complete.

E. T & G Boards: Install boards with edges over framing or blocking. Leave 3/16-inch (5-mm) gap at perimeter and openings, unless indicated otherwise on Drawings.
   1. Run boards in direction indicated on Drawings.
   2. Seal butt joints at inside and outside corners and at trim locations.
   3. Conceal fasteners to greatest practical extent by countersinking and filling, by placing in grooves of board pattern.
   4. Seal butt joints at inside and outside corners and at trim locations.

F. Pay special attention to color and grain of the various boards and trim pieces to assure they are installed in compliance with NAAWS requirements.

G. Gluing with liquid nail type adhesive is not permitted.

H. Apply one coat of sealer to edges that are not finished before installation.

I. Panel Joint Tolerances
   1. Plumb within 1/16 inch in 96 inches.
   2. Warp: Free of warp exceeding 1/32 inch per lineal foot.

J. Miter outside angles and corners; cope or miter inside angles.

K. Do not install warp or twisted boards that cannot be held true by attachment.

L. Open joints, visible machine marks, cross-sanding, tears, nicks, chips, and scratches are not permitted.

3.3 CLEANING

A. Clean all installed items of pencil or ink marks.

B. Clear the work area of debris, using containers provided by the General Contractor.

C. Leave area of work broom clean.

D. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.4 PROTECTION

A. Protect installed products from damage from weather and other causes during remainder of the construction period.

B. Remove and replace paneling materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 4216

SECTION 06 6413 – FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fiberglass reinforced polyester panel system for adhesive mounting.

B. Moldings and joint sealants.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Samples for Selection: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Manufacturers' product data for construction adhesive, including printed statement of VOC content.

1.5 INFORMATIONAL SUBMITTALS

A. Maintenance Instructions: For inclusion in maintenance manual.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.
3. Testing Agency: Acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 SITE CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Adhesives, sealants, paints, welding, and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 PLASTIC SHEET PANELING

A. General: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D5319.
   1. Acceptable Manufacturers: Acceptable manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Kemlite Company Inc.
      b. Marlite.
      c. Nudo Products, Inc.
   2. Nominal Thickness: Not less than 0.09 inch (2.3 mm).
   3. Surface Texture: High-gloss, smooth.
   4. Color: As selected by Architect from manufacturer's standard selection.

B. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
   1. Color: Match panels.
   2. Base Molding: Design that simplifies installation and helps seal wall panel system, with factory made corners and splices.
   3. Borders: 4-inch (100 mm) wide decorative strips made of same material as panels.

C. Sealant: Single-component, mildew-resistant, neutral-curing silicone as recommended by panel manufacturer.
   1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Color: Clear.

D. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

E. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

F. Adhesive: As recommended by plastic paneling manufacturer.

1. VOC Content: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that backing surfaces have been properly prepared according to manufacturer's written requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

B. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

C. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

D. Protect existing surfaces from damage due to installation.

E. Lay out paneling before installing. Locate panel joints so that trimmed panels at corners are not less than 12 inches (300 mm) wide.
1. Mark plumb lines on substrate at trim accessory locations for accurate installation.
2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive.

D. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

E. Install continuous bead of silicone sealant in each joint and trim groove and between trim and adjacent construction, maintaining 1/8-inch (3 mm) expansion space.

3.4 CLEANING

A. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

B. Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION 06 6413

SECTION 07 1300 – BITUMINOUS SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Post-applied sheet membrane waterproofing at planters comprised of the following:
   1. Rubberized asphalt sheet membrane waterproofing system.
   2. Protection board.
   3. Prefabricated drainage composite.

1.3 RELATED SECTIONS

A. Section 03 1000 – Concrete Forming: One-sided foundation wall-forming system.

B. Section 03 3000 – Cast-In-Place Concrete

C. Section 07 1329 – Pre-Applied Sheet Membrane Waterproofing: Pre-applied sheet membrane waterproofing.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations. Include certification of data indicating VOC (Volatile Organic Compound) content of all components of waterproofing system.

B. Samples: Submit representative samples of the following for approval:
   1. Sheet membrane.
   2. Protection board.
   3. Prefabricated drainage composite.

1.6 CLOSEOUT SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of sheet membrane waterproofing.
   1. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.

B. Installer: A firm which has at least 3 years experience in work of the type required by this section.

C. Source Limitations: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer and are compatible with adjacent waterproofing systems.

D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

E. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.
   1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
   2. Protect mastic and adhesive from moisture and potential sources of ignition.
   3. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
   4. Protect surface conditioner from freezing.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.9 SITE CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used.

B. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.10 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.
   1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch (1.6 mm) in width.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Basis-of-Design Product: The design for the sheet waterproofing is based on the manufacturer identified below. Product requirements in this Section are based on products by the named manufacturer. Subject to compliance with requirements, provide the named product or an approved comparable system:
1. Basis-of-Design: GCP Applied Technologies; Bituthene 4000
2. Carlisle Coatings and Wateproofing, Inc. CCW MiraDRI
3. CETCO Building Materials Group; Envirosheet.
4. Meadows, WT, Inc.;' SealTight Mel-Rol
5. Pecora Corporation; Duramem 700-SM.
6. Polyguard Products; Polyguard 650.
7. Tamko Roofing Products, Inc.; TW-60
8. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps.

B. Sheet Membrane Waterproofing System: Membrane self-adhesive, cold-applied composite sheet 1.4 mm (0.056 in.) thick rubberized asphalt and 0.1 mm (0.004 in.) thick cross-laminated, high density polyethylene film for use with water-based surface conditioner.
1. Low temperature grade when dictated by temperature at time of application.
2. Compatible with water-based surface conditioner.
3. Physical Properties:
   a. Color: Dark gray-black
   b. Dimensions: 3 ft x 66.7 ft roll (200 ft2)
   c. Thickness: 60 mils (1.5 mm) nominal, ASTM D3767—method A
   d. Flexibility, 180° bend over 1 in.
   e. (25 mm) mandrel at -25°F (-32°C): Unaffected, ASTM D1970
   f. Tensile strength, Membrane, die C: 325 psi (2240 kPa) minimum, ASTM D412
   g. Tensile strength, film: 5,000 psi (34.5 MPa) minimum, ASTM D882
   h. Elongation, ultimate failure of rubberized asphalt: 300% minimum, ASTM D412
   i. Crack cycling at -25°F (-32°C), 100 cycles: Unaffected, ASTM C836
   j. Lap shear: 20 lbs (89 N) ASTM D1002
   k. Peel strength: 11 lbs/in. (1926 N/m), ASTM D903
   l. Puncture resistance, Membrane: 50 lbs (222 N) minimum, ASTM E154
   m. Resistance to hydrostatic head: 230 ft (70m) of water, ASTM D5385
   n. Permeance: <0.1 perms ASTM E96, section 12—water method
   o. Water absorption: <0.1%, ASTM D570

2.2 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side with or without a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).
1. Basis-of-Design: GCP Applied Technologies; Hydroduct 220 and 660.
2. Carlisle; CCW MiraDRAIN 6000 and CCW MiraDRAIN 6000XL.

B. Protection Board: ASTM D6506, semi-rigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
   1. Thickness: 1/8-inch, nominal for vertical applications; 1/4-inch nominal, elsewhere.
   2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

C. Waterstop: Adcor™ ES hydrophilic non-bentonite waterstop by GCP Applied Technologies for non-moving concrete construction joints.

D. Detail Strips: 90 mil thick composite rubberized asphalt membrane laminated to high-strength, heat resistant woven polypropylene mesh, with siliconized release liner to prevent sticking in the roll.

E. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of sam material and thickness as sheet waterproofing.

F. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

G. Metal Termination Bars: Aluminum bars, approximately 1” x 1/8” thick, predrilled at 9-inches oc.

H. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

I. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacture of sheed waterproofing material.
   1. Basis-of-Design: GCP Applied Technologies; Grace B2 LVC Adhesive Primer.

PART 3 - EXECUTION

3.1 EXECUTION

A. Examine conditions of substrates and other conditions under which this work is to be performed and notify the Contractor, in writing, of circumstances detrimental to the proper completion of the work.

B. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. General: Refer to manufacturer’s literature for requirements for preparation of substrates. Verify surfaces are structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions.
   1. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris.
   2. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.

B. Cast-In-Place Concrete Substrates:
   1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).

2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
3. Repair bugholes over 13 mm (0.5 in.) in length and 6 mm (0.25 in.) deep and finish flush with surrounding surface.
4. Remove scaling to sound, unaffected concrete and repair exposed area.
5. Grind irregular construction joints to suitable flush surface.

C. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.3 INSTALLATION

A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:
1. Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.
2. Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.
3. Seal daily terminations with troweled bead of mastic.
4. Apply protection board and related materials in accordance with manufacturer's recommendations.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.

B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION 07 1300

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SECTION 07 1329 – PRE-APPLIED SHEET MEMBRANE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Vertical application of membrane against soil retention system prior to placement of concrete foundation walls.

1.3 RELATED SECTIONS

A. Section 03 1000 – Concrete Formwork: One-sided foundation wall-forming system.

B. Section 03 3000 – Cast-In-Place Concrete

C. Section 07 1300 – Bituminous Sheet Waterproofing: Below-grade modified bituminous sheet waterproofing.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

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 waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.6 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

B. Qualification Data: For Installer.

1.7 CLOSEOUT SUBMITTALS

A. Warranty: Executed special warranty specified in this Section.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

1.9 QUALITY ASSURANCE

A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years' experience in the production and sales of sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.

B. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of units required for this Project.

C. Source Limitations: Obtain waterproofing materials, protection course, and molded-sheet drainage panels through one source from a single manufacturer.

D. Preinstallation Conference: Conduct conference at Project site.
1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

E. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's instructions.

B. Protect from damage from weather, excessive temperature and construction operations.

C. Remove and dispose of damaged material in accordance with applicable regulations.

1.11 SITE CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General, Membrane Composition: Integrally bonded 0.032-inch (1.0 mm) nominal thickness composite sheet membrane comprising 0.016-inch (0.4 mm) of high density polyethylene film, and layers of synthetic adhesive forming an integral and permanent bond

to poured concrete to prevent water migration at the interface of the membrane and structural concrete.

B. Pre-applied Vertical Sheet Waterproofing Membrane:
   1. Grace Construction Products; Preprufe 160R Membrane.

C. Pre-applied Horizontal Sheet Waterproofing Membrane:
   1. Grace Construction Products; Preprufe 300 Membrane.

D. Waterstops: GCP Applied Technologies; Adcor ES hydrophilic non-bentonite waterstop.

E. Tape: Preprufe, as recommended by manufacturer, for detailing at penetrations in waterproofing system.

PART 3 - EXECUTION

3.1 EXECUTION

A. Examine conditions of substrates and other conditions under which this work is to be performed and notify the Contractor, in writing, of circumstances detrimental to the proper completion of the work.
   1. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION, VERTICAL APPLICATIONS

A. Substrates shall be smooth and sound. Suitable substrates include Hydroduct Drainage Composites by Grace Construction Products or plywood.

B. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:
   1. Apply membrane with the HDPE film facing the prepared soil retention system (wood lagging, sheet piling, gunite, shotcrete, etc.). Remove the release liner and fasten membrane along uncoated edge to substrate with large head nails or to plywood with large head nails or staples.
   2. Apply succeeding sheets by overlapping the previous sheet 3-inches (75 mm) along the uncoated edge of the membrane. Side laps must be firmly rolled to ensure a tight seal.
   3. Overlap the ends of the membrane 3-inches (75 mm). Apply Preprufe Tape centered over the end lap and roll firmly to ensure a tight seal. Remove release liner.

3.3 INSTALLATION, HORIZONTAL APPLICATIONS

A. Earth and stone substrates shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions. Concrete substrates shall be smooth or broom finished and monolithic. Fill gaps or voids greater than 13 mm (0.5 in.). Remove standing water prior to membrane applications.

B. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:
   1. Apply membrane with the HDPE film facing the prepared substrate. Remove the release liner during application.
   2. Apply succeeding sheets by overlapping the previous sheet 3-inches (75 mm) along the uncoated edge of the membrane. Lap area must be firmly rolled to ensure a tight seal.

3. Overlap the ends of the membrane a minimum of 3-inches (75 mm) and apply tape centered over the lap and roll firmly to ensure a tight seal.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Protect membrane in accordance with manufacturer's recommendations until placement of concrete. Inspect for damage just prior to placement of concrete and make repairs in accordance with manufacturer's recommendations.

END OF SECTION 07 1329

SECTION 07 1413 – HOT FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Reinforced waterproofing membrane at sloped structural slabs and finished concrete work above occupied spaces.

1.3 RELATED SECTIONS

A. Section 07 1329 – Pre-Applied Sheet Membrane Waterproofing: Waterproofing sheet at elevator pit.

B. Section 07 2616 – Below-Grade Vapor Retarders: Under-slab vapor retarder.

C. Section 07 9200 - Joint Sealants: Joint-sealant materials and installation.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

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.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
   1. Include Setting Drawings showing layout, sizes, sections, profiles, and joint details of concrete pavers with paver support assemblies.

C. Samples: For the following products:
   1. 12- by 12-inch (300- by 300-mm) square of flashing sheet.
   2. 12- by 12-inch (300- by 300-mm) square of insulation.
   3. 4- by 4-inch (100- by 100-mm) square of drainage panel.
   4. Concrete roof paver, full sized, in each color and texture required.
   5. Paver pedestal assembly.

1.6 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

B. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.

1.7 CLOSEOUT SUBMITTALS

A. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

B. Warranty: Special warranty specified in this Section.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is authorized, approved, or licensed to install waterproofing manufacturer's products; and who is eligible to receive waterproofing warranty specified.

B. Source Limitations: Obtain waterproofing materials, sheet flashings, protection course, and drainage panels through one source from a single manufacturer to ensure total system compatibility and integrity.

C. Mockups: Apply waterproofing to 100 sq ft (9.3 sq m) of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality. Install pavers and paver supports to demonstrate aesthetic affects and quality of materials and execution.
   1. If Architect determines mockups do not comply with requirements, reapply waterproofing and reinstall pavers until mockups are approved.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight.

1.10 SITE CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F (minus 18 deg C).
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.11 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to repair or replace waterproofing and sheet flashings that do not comply with requirements or that do not remain watertight within specified warranty period.
   1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/8 inch (3 mm) in width.
   2. Warranty pavers will not dish or warp and will not crack, split, or disintegrate in freeze-thaw conditions.
   3. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.
   4. Warranty Period: Ten years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide the following product:
   1. American Hydrotech, Inc.; Monolithic Membrane MM 6125 FR, fabric reinforced assembly.

2.2 PERFORMANCE REQUIREMENTS

A. Provide waterproofing that prevents the passage of water and complies with physical requirements in CAN/CGSB-37.50, "Hot Applied, Rubberized Asphalt for Roofing and Waterproofing."

2.3 MEMBRANE

A. Single-component; 100 percent solids; hot fluid-applied, rubberized asphalt with the following properties measured per applicable test methods in CAN/CGSB-37.50:
   1. Flash Point: Not less than 260 deg C or not less than 25 deg C above manufacturer's maximum recommended application temperature.
   2. Cone Penetration: 98 mm maximum at 25 deg C, and 187 mm maximum at 50 deg C.
   3. Flow: 1 mm maximum at 60 deg C.
   4. Toughness: Not less than 5.5 Joules.
   5. Ratio of Toughness to Peak Load: Not less than 0.069.
   6. Adhesion Rating: Pass.
   7. Water-Vapor Permeance: 0.3 ng/Pa(s) x sq m.
   8. Water Absorption: 0.11-g maximum mass gain.
   9. Pinholing: Not more than one pinhole.
   10. Low-Temperature Flexibility: No delamination, adhesion loss, or cracking.
   11. Crack Bridging Capability: No cracking, adhesion loss, or splitting.
   12. Heat Stability: Comply with requirements for penetration, flow, low-temperature flexibility, and viscosity when heated for five hours at manufacturer's recommended application temperature.
   13. Viscosity Test: 11.0 seconds.

2.4 AUXILIARY MATERIALS

A. Primer: ASTM D41/D41M, asphaltic primer.

B. Elastomeric Flashing Sheet: 60-mil (1.5 mm) thick, uncured neoprene flashing/(heavy duty) reinforcing sheet, American Hydrotech, Inc., Flex Flash UN.

C. Sealants and Accessories: Waterproofing manufacturer's recommended sealants and accessories.
   1. Splicing Cement: Contact adhesive to bond elastomeric flashing together.
   2. Bonding Adhesive: Contact adhesive to bond elastomeric flashing to an approved substrate.
   3. Lap Sealant: Sealant to seal elastomeric flashing seam edge.

D. Protection Board: American Hydrotech, Inc., Perma-Board.

2.5 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: American Hydrotech, Inc., Hydrodrain 300; prefabricated, composite drainage panels, manufactured with a permeable geotextile facing laminated to a molded-plastic-sheet drainage core.
   1. Drainage Core: Three-dimensional, nonbiodegradable, molded-plastic-sheet material designed to effectively drain water under backfill pressure; complying with the following properties determined according to tests indicated:
      a. Compressive Strength: ASTM D1621, 30,000 lbf/sf. ft. (14.66 kg/ sq cm) minimum.
      b. Flow Rate: 7 gpm per ft. (87 L/min. per m), minimum, at hydraulic gradient of 1.0 and compressive stress of 3600 psf; ASTM D4716/4716M.

2.6 INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Dow Chemical Company (The), Styrofoam Brand Plaza Deck.

B. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C578, square edged; of type, density, and compressive strength indicated below:
   1. Type VI, 1.8-lb/cu. ft. (29-kg/cu. m) minimum density and 40-psi (276-kPa) minimum compressive strength or VII, 2.2-lb/cu. ft. (35-kg/cu. m) minimum density and 60-psi (414-kPa) minimum compressive strength.
   2. Maximum water absorption by volume per ASTM C272/C272M, 0.1%.
   3. Water vapor permeance for 1" product per ASTM E96/E96M, 1.0 perm (max.) (63 ng/Pa/s/m2).
   4. Insulation shall have an R value of 5.0 F ft2 h/Btu/in. (0.88 K m2/W) of thickness when tested at 75°F (23.9°C) mean temperature in accordance with ASTM C518.
   5. Provide product free of CFC's.

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 concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and waterproofing system manufacturer's written instructions.
   1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D4258.
   2. Embed reinforcing fabric into a layer of hot, rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches (150 mm) on each side of joints and cracks and beyond deck drains, corners, and penetrations.

B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric flashing sheet extended a minimum of 6 inches (150 mm) on each side of joints and adhere to substrates in a layer of hot, rubberized asphalt.

3.4 MEMBRANE APPLICATION

A. Apply rubberized asphalt according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and manufacturer's written instructions.

B. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized-asphalt waterproofing.

C. Start application with manufacturer's technical representative present.

D. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.

E. Reinforced Membrane: Apply waterproofing to substrates and adjoining surfaces indicated. Spread hot fluid-applied, rubberized asphalt to a thickness of 90 mils (2.3 mm); embed reinforcing fabric, overlapping sheets 2 inches (50 mm) with membrane between sheets; and spread another 125-mil- (3.2-mm-) thick layer to provide a uniform, reinforced, seamless membrane 215 mils (5.5 mm) thick.

F. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer. Terminate top edges of vertical applications according to manufacturer's written instructions.

G. Cover waterproofing with separator sheet with overlapped joints while rubberized asphalt is still hot and before membrane is subject to traffic.
1. Install protection course with overlapped joints over separator sheet.

3.5 INSULATION INSTALLATION

A. At Non-Planted Areas: Install one or more layers of board insulation to achieve required thickness insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's instructions. Stagger end joints and tightly abut insulation units.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels to substrate according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.7 FIELD QUALITY CONTROL

A. Owner will engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

B. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
1. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of sheet flashings.
2. Flood each area for 72 hours.
3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

3.8 CURING

A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
1. Do not permit foot or vehicular traffic on unprotected membrane.

3.9 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.10 PROTECTION

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Protect installed board insulation from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 1413

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SECTION 07 1813 – PEDESTRIAN TRAFFIC COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. This section describes the requirements for installing a liquid applied waterproof, wear surface for deck surfaces over occupied space. Its intended use is suitable for residential and commercial foot traffic, patio furniture and similar equipment. This specification is not intended for use over on grade concrete.

1.3 RELATED SECTIONS

A. Flashing and Sheet Metal: Section 07 6000

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's standard submittal package including specification, installation instructions, and general information for each waterproofing material.

B. Shop Drawings: Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.

1.6 INFORMATIONAL SUBMITTALS

A. Material Certificates: Signed by manufacturer certifying that traffic coatings comply with requirements, based on comprehensive testing of current product formulations within the last three years.

B. Applicator Qualifications: Submit current "Qualified Applicator" certificate from the specified waterproofing manufacturer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals specified in Division 1. Identify substrates and types of traffic coatings applied. Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of traffic coatings.

B. Warranty: Special warranty specified in this Section.

1.8 QUALIFICATIONS

A. Primary waterproofing materials shall be products of a single manufacturer. Secondary materials shall be recommended by the primary manufacturer. Manufacturer shall have a minimum of 10 years' experience in the manufacture of materials of this type.

B. Applicators shall have a minimum of 5 years' experience in the application of waterproofing materials of the type specified. Applicator shall possess a current "Qualified Applicator" certificate from the specified waterproofing manufacturer.

C. Source Limitations: As follows:
1. Use traffic coatings of a single manufacturer.
2. Obtain primary traffic coating materials, including primers, from traffic coating manufacturer. Obtain secondary materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended by traffic coating manufacturer.

D. Fire-Test-Response Characteristics: For traffic coatings as follows:
1. Fire-response testing was performed by UL, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Provide materials identical to those of traffic coatings tested according to ASTM E108 for deck type and slopes indicated and that comply with requirements for roof-covering Class indicated.

E. Adhesion Tests: Conduct adhesion test, as recommended by manufacturer for applicable substrate conditions. Adhesion testing shall be conducted in the presence of the manufacturer's technical representative. Submit results of test to the Architect.

1.9 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference one week prior to commencing work of this section. Conduct conference at Project site. Conference shall be attended by representatives of authorities having jurisdiction, manufacturer's technical representative, Owner, Architect, consultants, independent testing agency, and other concerned entities.

B. Agenda shall include, but not be limited to the following:
1. Requirements for waterproofing, including surface preparation specified under other Sections,
2. Substrate condition and pretreatment.
3. Minimum curing period.
4. Forecasted weather conditions.
5. Special details and sheet flashings.
6. Installation procedures.
7. Testing and inspection procedures.
8. Protection and repairs.

1.10 DELIVERY, STORAGE AND HANDLING

A. Store all coating materials in the original unopened containers at 50°F to 80°F (10°C to 27°C) until ready for use.

B. Follow the special handling or storage requirements of the manufacturer for cold weather, hot weather, etc.

C. Safety: Refer to all applicable data, including, but not limited to MSDS sheets, PDS sheets, Product labels, and specific instructions for specific personal protection requirements.
   1. When working with Part B, avoid contact with skin and eyes. If contact occurs, wash skin with water or alcohol; flush eyes immediately with large quantities of water and get medical attention. Do not smoke during mixing, application, or in the immediate area if thinners are used until all vapors have disappeared.

1.11 SITE CONDITIONS

A. Ventilation: Provide adequate ventilation to prevent the accumulation of hazardous fumes during application.

B. Environmental Requirements: Proceed with work of this section only when existing and forecasted weather conditions will permit the application to be performed in accordance with the manufacturer's recommendations.
   1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of the substrate.
   2. Rubber Mat Test: Tape rubber mat to deck on all edges; remove mat after 4-hours; surface shall be free of condensation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which traffic coating manufacturer agrees to repair or replace traffic coatings that deteriorate during the specified warranty period. Warranty does not include deterioration or failure of traffic coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new substrate cracks exceeding 1/16 inch (1.6 mm) in width, fire, vandalism, or abuse by snowplow, maintenance equipment, and truck traffic.
   1. Deterioration of traffic coatings includes the following:
      a. Adhesive or cohesive failures.
      b. Abrasion or tearing failures.
      c. Surface crazing or spalling.
      d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.
   2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Installer's Warranty: Installer's standard form in which installer agrees to repair or replace traffic coatings that fail in materials, fabrication, or installation within specified warranty period.
   1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The design is based upon roofing systems engineered and manufactured by The Garland Company or approved equals. All products shall be of a single manufacturer and from a single system to ensure longevity and integrity of the completed system as a whole.
   1. The Garland Company, 3800 East 91st Street, Cleveland, Ohio 44105
   2. Local Representative: Doug Clark, Telephone: (925) 784-6701
   3. Website: www.garlandco.com

B. Substitutions: Products proposed as equal to the products specified in this section shall be submitted in accordance with bidding requirements. Substitutions must be made by a prime bidding contractor and will be reviewed by architect and owner. Substitution requests must be made 10 days prior to bid date.
   1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation takes place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.
      a. Include proof that materials are manufactured locally in the State of California.
   2. Include a list of three (3) projects of similar type and extent, located within a 100 mile radius from job location. In addition the three projects must be 5 years old and be available for inspection by the Architect and owners representative.
   3. Equivalency of performance criteria, single component urethane, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
   4. The Owner's decision regarding substitutions will be considered final.

2.2 MATERIALS

A. Primer: Dura-Walk Primer, two-component epoxy concrete primer.
   1. Alternative Sealer/Primer used for faster cure times: Dura-Walk FC Primer, two-component 100% solids Zero VOC epoxy concrete sealer/primer.

B. Polyurethane Base Coating: Dura-Walk Base Coat, one-component polyurethane coating.

C. Polyurethane Wear Coating: Dura-Walk Wear Coat, one-component polyurethane coating used to embed the non-slip aggregate.

D. Polyurethane Top Coating: Dura-Walk Top Coat, one-component polyurethane coating.
   1. Note: Comes in eight different colors.

E. Flashing and Joint Reinforcing Fabric: Dura-Walk Polyester Tape. Neoprene sheet flashing and related materials as required for flashing drains, base angles, etc.

F. Granule: Aggregate, a hard non-crushable, non-angular, rounded 20 or 30 mesh flint shot silica unless otherwise specified.

G. Joint and Crack Sealant: Tuff-Stuff MS, single-component polyurethane hybrid joint sealant.
   1. Note: Allow additional material for rough or irregular surfaces add 2% - 3% for material loss during application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate is ready to receive work; surface is clean, dry and free of substances that could affect bond. Refer to Garland's Application Guide for complete information on the preparation of the substrate

B. Do not begin work until concrete substrate has cured 28 days, minimum.

C. Verify that the concrete meets the requirements of the coating manufacturer.

D. Verify that all other work involved with this area, done under other sections, has been completed and accepted by the architect and general contractor prior to starting the waterproofing application.

3.2 PREPARATION

A. Clean substrate to remove any and all surface contaminants. Concrete surfaces must be thoroughly clean, dry and free from any surface contaminates or cleaning residue. Acceptable methods of cleaning are sandblasting, shot blasting or mechanical grinding followed by the complete removal of any residue.

B. Mask off all adjoining areas that are not to receive the fluid applied waterproofing.

C. Provide a suitable workstation to mix the coating materials.

D. The concrete surfaces shall be of sound structural grade (3000 psi compressive strength recommended), of adequate design and thickness, and shall have a steel troweled followed by a fine broom finish, free of fins, ridges, voids or air entrained holes.

E. Concrete: Special attention should be given to smoothness of surface and freedom from contaminants including paint or previous coatings. Consult your Garland representative for alternate procedures for coating over existing paint. Such procedures are highly dependent on specific job conditions. Curing compounds if used shall be removed by sandblasting or etching. In the event specifications are not met, the following corrective procedures are recommended.
   1. Surface Contaminants: Wipe up grease or oil with a solvent and absorbent sweeping material. Disposal of this material should be in accordance with local laws and codes. Wash with solvent-alkaline cleaners diluted one part cleaner and five parts water. Rinse thoroughly with clean water. If evidence of oil film remains as indicated by water "beading," etch surface with 10% solution muriatic acid. Agitate etch with stiff bristle broom; then rinse with clean water.
      a. Remove curing compounds by etching with 10% muriatic acid and sweeping, followed by clean water rinse. Allow to thoroughly dry before applying coating. Grinding or sandblasting can remove heavy deposits of contaminants.
      b. Any residual traces of asphalt stains must be sealed with Dura-Walk Primer to avoid staining of light colored top coats. Apply primer in two coats and allow a minimum of 48 hours cure time.
   2. Fins and Projections: Grind smooth.
   3. Rock Pockets and Depressions: Commercially available concrete patching compounds can be used provided they contain no bitumen based binders. Only those patching com-pounds utilizing a binder are recommended for patching. Neat cement sacking is NOT an acceptable surface preparation for coatings.
      a. The leveling grout (below) can also be used to fill rock pockets and depressions up to two inches (5 cm) in thickness.
   4. Leveling Grout, Epoxy Sand: Use either a. or b.
      a. Leveling Grout: Use 100% solids low viscosity epoxy mix with three to four volumes of fine, dry sand (70 mesh (.21) or finer). This epoxy is usually available from masonry supply firms as a patching compound. Three volumes sand provides a semi-fluid mix, and four volumes sand is a stiffer mix. Calculate volume of fill needed on the basis of sand only.
      b. Epoxy Sand: Prime areas to be filled with Dura-Walk Primer and allow drying free of water. Usually ½ hour at 70°F (21°C) to two hours at 45°F (7°C) is adequate drying time. After primer is dry, mix Dura-Walk Primer and sand - one part A, one part B and two to three parts sand. (Two parts sand is semi-fluid and three parts sand is stiffer.) Use fine, dry sand 70 mesh (.21 mm) or finer. Do not thin with water.

1) Apply grout to level line by flat trowel and allow curing 48 hours before applying coating system.

3.3 INSTALLATION

A. Technical Advice: The installation of this waterproofing membrane shall be accomplished in the presence of, or with the advice of the manufacturer's technical representative.

B. Concrete Primer: Apply one coat of Dura-Walk Primer by roller at the rate of 1/2 gallon per 100 square feet. Allow 4 hours drying time. Drying times vary depending on weather conditions such as temperature, humidity and air movement.
1. Alternative Concrete Sealer/Primer: Apply one coat of Dura-Walk FC Primer to all surfaces to receive the fluid applied waterproofing, except areas previously caulked, flashed or fabric reinforced. Apply at a rate of 1/2 gallon per 100 sq. ft. and allow curing at least 2 hours, but no more than 3 days before applying the basecoat.

C. Metal Primer: Prime all Metal surfaces using Dura-Walk Primer

D. Taping: Apply Dura-Walk Base Coat by brush or roller in a five to six inch wide stripe coat centered over all joints, cracks and changes of plane to be taped. While this coat is still tacky, unroll the Dura-Walk Polyester Tape into the coating and apply a top coat of Dura-Walk Base Coat over the tape smoothing out wrinkles and fish mouths.
1. Allow curing a minimum of 1½ hour before proceeding to next step.

E. Polyurethane Base Coat: Apply one coat of Dura-Walk Base Coat polyurethane at a rate of 2.0 gallons per 100 sq. ft. (32 wet mils) to all areas to receive fluid applied waterproofing, including areas previously caulked, flashed or fabric reinforced. Allow the base coat to cure completely (16-24 hours minimum at 70°F (21°C)).

F. Wear Coat and Texture: Apply Dura-Walk Wear Coat (for high traffic areas apply two coats) polyurethane by roller or squeegee to secure a minimum coverage of 1.0 gallons per 100 square feet (16 wet mils). While coating is still wet, broadcast aggregate at approximately 25 pounds per 100 sq.ft. for rounded 30 mesh silica (if different aggregate is used coverage rate may change). Coat and sprinkle small areas at a time, taking care not to overlap coating and granule at edges. When wear coat is cured enough to walk on, lightly sweep away loose aggregate. If aggregate gets wet from rain allow 2 days of drying weather before proceeding with top coat.

G. Top Coat: Apply Dura-Walk Top Coat polyurethane by roller or squeegee in a coat of the desired color over the granule at the minimum rate of 1 gallon per 100 square feet. The aggregate must be totally encapsulated by this finish coat. (16 wet mils).

H. Optional Topcoat for High Traffic Areas: After finish coat has cured a minimum of 16-24 hours, apply Dura-Walk Top Coat polyurethane topcoat by roller at a minimum rate of ½ gallon per 100 square feet (8 wet mils).
1. Note: Allow 48 hours before deck is put into use. In cool temperatures, a longer curing time may be required.

3.4 FIELD QUALITY CONTROL

A. The contractor shall maintain a quality control program specifically to verify compliance with this specification. A daily log shall be kept to record actions in the field.

B. Inspections: A minimum of three inspections per work week, by an approved manufacturer's representative, will be required on all projects requiring a warranty.

C. Thickness: Minimum over all dry film thickness of the completed fluid applied waterproofing, excluding aggregate, will average 49 dry mils. Thickness including aggregate will average approximately 65 dry mils. The optional topcoat will add approximately 6 dry mils of polyurethane coating to the system.

3.5 FLOOD TEST

A. Testing: Owner will engage a qualified testing agency to perform the following field tests and inspections and prepare test reports:
1. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.

B. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D5957, after traffic coating has completely cured. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
1. Consult with structural engineer for deck loading limits before conducting a water test.
2. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm).
3. After flood testing, repair leaks, repeat flood tests, and make further repairs until traffic coating installation is watertight.
4. Retest after making repairs.

C. Final Traffic Coating Inspection: Arrange for traffic coating manufacturer's technical personnel to inspect membrane installation on completion.
1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CURING

A. Cure traffic coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.

3.7 CLEANING

A. Clean spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.8 PROTECTION

A. Protect traffic coatings from damage and wear during remainder of construction period.

END OF SECTION 07 1813

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SECTION 07 2100 – BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Insulation in batt form of the following types:
   1. Thermal glass fiber insulation.
   2. Unfaced mineral fiber insulation.

B. Building insulation in rigid board form.

C. Thermal lining insulation.

1.3 RELATED SECTIONS

A. Section 07 1413 – Hot Fluid-Applied Waterproofing: Rigid insulation installed as part of terrace deck and stair tread systems.

B. Section 07 5200 - Cold Applied Asphalt Roofing: Rigid insulation installed as part of roofing system.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of insulation product specified.

B. Shop Drawings:
   1. Thermal Insulation: Clearly show the panel layout, sub-framing system and attachment layout.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
   3. Insulation: Product Data Sheets for each product to be used as required by the U.S.G.B.C. as proof that each product meets the requirements of the GREENGUARD Environmental Institute's GREENGUARD Gold certification.
   4. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e. from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.

5. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
6. CDPH Standard Method v1.1 testing report.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.7 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
1. Surface Burning Characteristic: ASTM E84.
2. Fire Resistance Ratings: ASTM E119.
3. Combustion Characteristics: ASTM E136.

B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from fiberglass batts with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 30 percent.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. Insulation Materials: Provide only insulation materials that are GREENGUARD Certified.

D. Provide insulation materials having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. GreenGuard Gold Certified
3. Type III Environmental Product Declaration.
4. Declare Label.

2.2 MINERAL FIBER INSULATING MATERIALS

A. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

B. Insulation at Exterior Walls and Soffits: ASTM C665, Type I; "Thermal Batts"; preformed glass fiber batts conforming to the following:
   1. Batt Width: Maximum width as required for application.
   2. Facing: Unfaced; see Drawings for locations.
   3. Flame Spread Rating: Less than 25, as tested in accordance with ASTM E84.
   4. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
      a. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
      b. Low Emitting: Insulation tested according to ASTM D5116 and shown to emit less than 0.05-ppm formaldehyde.

2.3 MINERAL-WOOL BLANKET INSULATION

A. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
   1. Where slag-wool-fiber/rock-wool-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt form with thermal resistances indicated:
      a. 1-1/2-inches (38 mm) thick with a thermal resistance of 6 deg F x h x sq ft/Btu at 75 deg F (1 K x sq m/W at 24 deg C).
      b. 3-1/2-inches (89 mm) thick with a thermal resistance of 13 deg F x h x sq ft/Btu at 75 deg F (2.3 K x sq m/W at 24 deg C).
      c. 4-inches (101 mm) thick with a thermal resistance of 16 deg F x h x sq ft/Btu at 75 deg F (2.8 K x sq m/W at 24 deg C).
      d. 5-1/4-inches (133 mm) thick with a thermal resistance of 19 deg F x h x sq ft/Btu at 75 deg F (3.3 K x sq m/W at 24 deg C).
      e. 6-inches (152 mm) thick with a thermal resistance of 22 deg F x h x sq ft/Btu at 75 deg F (3.9 K x sq m/W at 24 deg C).

2.4 THERMAL LINING INSULATION

A. Basis-of-Design: Super Padgenite™ HD Insulation.

B. Engineered interior insulating system, enabling fire fighters to create repeated fires to 2000 degrees F. followed by extinguishment with the use of water without damage to either the structure or the system proposed.
   1. Insulating panels and accessories shall be free from asbestos or other harmful ingredients, and shall not produce toxic bi-products in the course of the intended use.
   2. Insulating panels and accessories shall be capable of protecting the wall and ceiling surfaces of masonry, concrete or steel room, inclusive of windows, closures and doors from damage due to enclosed fires. Insulating material shall be a heat treated minimum of: 1" thick, 77.9 PCF density, 5500 psi compressive strength, possess a “K” factor of 1.92 or less at a mean temperature of 800 degrees F., and be capable of continuous service at temperature ranges to 2000 degrees F. Sub frame system shall promote air flow behind panel to increase the thermal barrier protecting the structure.
   3. System shall withstand repeated exposure to heat and the application of water to heated surfaces without the breakdown of insulating properties. Insulating materials shall not require “drying out’ periods following the application of water nor be subject to “spalling” due to heat/moisture conditions. There shall be no restrictions placed upon use due to atmospheric conditions or ambient temperatures.
   4. Panel supplier shall pre-cut battens and treat prior to shipping. The supplier to minimize the field cutting of panels shall fabricate a majority of the remaining panels.

2.5 RIGID INSULATION

A. Polyisocyanurate Foam Insulation: ASTM C1289, Type I, Class 1 or Class 2; produced with a non-HCFC blowing agent.
   1. Product: Dow Chemical Company, Thermax Sheathing; Johns Manville AP Foil-Faced, R-max Operating, LLC, Eco-max Sheathing, or approved equal.
   2. Thermal Resistance: R-value: 21 minimum.
   3. Board Width: Maximum width as required for application.
   4. Thickness: As required to meet specified R-value.
   5. Edge: Square.
   6. Facing: Foil facers on both major surfaces.
   7. Fire Rating: Class A.
   8. Flame Spread Rating: 25 or less.

2.6 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding insulation, anchors, or substrates.

B. Adhesively Attached Pin Anchors: Perforated plate, 2-inches square, welded to projecting pin, with self-locking washer, complying with the following requirements:
   1. Plate: Zinc-plated steel, 0.106-inch thick.
   2. Pin: Copper-coated low carbon steel, fully annealed, 0.106-inches in diameter, length to suit depth of insulation indicated and, with washer in place, to hold insulation tightly to substrate behind insulation.
   3. Self-Locking Washer: Mild steel, 0.016-inch thick, size as required to hold insulation securely.

C. Staples: Steel wire; type and size to suit application.

D. Tape: Mesh reinforced, self-adhering type, 2-inch wide.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory.

B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

C. Verify mechanical and electrical services within walls have been installed and tested.

D. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness. Trim insulation neatly to fit spaces.

D. Install in exterior walls, roof, and soffit spaces where indicated, without gaps or voids.

E. Install for sound attenuation in interior walls, above toilet room ceilings, and over suspended ceilings where indicated, without gaps or voids.

3.3 INSTALLATION, BATT INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures.
   4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
   5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling paper flanges to flanges of metal studs.

C. Stuff glass fiber loose fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume (to a density of approximately 2.5 pcf).

D. Retain batt insulation in place with spindle fasteners at exterior concrete walls. Place insulation fasteners at spacing recommended by manufacturer.

E. Tape seal butt ends, lapped flanges, and tears or cuts in insulation membrane.

3.4 INSTALLATION, BOARD INSULATION

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. 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.
3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

B. Install board insulation in curtain-wall and rainscreen construction where indicated on Drawings according to curtain-wall and rainscreen manufacturers' written instructions.
1. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.
3. Rainscreen: Set mechanical fasteners inset 2" in from edge of insulation. Install using fastening system indicated on Drawings.

C. Install radiant floor rigid board insulation over substrate where indicated on Drawings.
1. Retain insulation in place as recommended by manufacturer, using fasteners spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place.

D. Install high load insulation directly over gravel subbase under radiant floor heating system at docks as indicated on Drawings.

E. Install high load insulation vertically against below-grade waterproofing and adhere in place in accordance with manufacturer's written instructions. See Section 071300.

3.5 THERMAL LINING INSULATION

A. Install Thermal Lining Insulation in accordance with all manufacturer's instructions

B. The insulating system shall be mounted to the structure using a sub framing system consisting of 18 gauge mounting channels securely attached to the building structure utilizing suitable fasteners. The framing system shall consist of the mounting channels placed at 48 ½" horizontally and 24 ½ " vertically to form the sub frame system. This sub frame will be covered with 3 ¾" strips of insulating material and attached by #6 x 1 7/8" Tek fasteners. Direct attachment of panels and battens to the building structure will not be permitted. Panels shall be attached using #8 x 3" Tek fasteners and ¼" x 1 ¼ " flat washers. The fasteners of the panels shall be tightened to allow the washer to be rotated by hand with some resistance. This is critical to allowing the panel to move during the heating and cooling cycle

3.6 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 2100

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SECTION 07 2129 – SPRAYED INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Self-supported, spray-applied cellulosic insulation at underside of floor deck in Apparatus Bay, Building 1.

1.3 RELATED SECTIONS

A. Section 07 2100 – Building Insulation.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Provide the following:
   1. Copies of the manufacturer's literature, clearly indicating conditions of acceptance and methods of applications shall be available on site before, and during, period of application of Work of this Section.

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
   1. Size: Minimum 6" x 6" of sprayed insulation bonded to a piece of rigid board.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
   3. Insulation: Product Data Sheets for each product to be used as required by the U.S.G.B.C. as proof that each product meets the requirements of the GREENGUARD Environmental Institute's GREENGUARD Gold certification.
   4. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e.s, from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
   5. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
   6. CDPH Standard Method v1.1 testing report.

D. CALGreen Submittals: Provide product data the following:
   1. Product Data for R-values for insulation materials supporting minimum energy performance.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

B. Manufacturer References: Provide project references for work complete, still performing and in place, for a minimum of 10 years.

1.7 QUALITY ASSURANCE

A. Applicator Qualifications: Applicators performing the Work of this Section must be approved by the manufacturers of the sprayed thermal material and have been in business for a minimum period of 3 years.

B. Manufacturer's Representative: Allow the manufacturer's representative full access to the site.

C. Ensure that copies of the manufacturer's printed literature, clearly indicating conditions of acceptance and methods of application are available on-site, before and during the period of application of the Work of this Section.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site in original labeled and unopened packages.

B. Store materials on-site in a warm, dry place and either on a concrete floor or a wood platform. Prevent adhesive from freezing at all times.

C. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.9 SITE CONDITIONS

A. Perform work of this Section only under the conditions stated in the manufacturer's printed application instructions.

B. Provide sufficient heat and ventilation at all times during installation and drying of spray insulation according to manufacturer’s printed instructions.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Paints and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MATERIALS

A. Product: International Cellulose Corporation; K-13 Spray-On-System.
   1. Color: TBD.

2. Comply with local Building Code requirements.
3. Sustainability Requirements: Emissions Testing: Certified Greenguard Gold or tested under California Department of Public Health (CDPH) 2010 Standard Method.

B. Spray-Applied Materials: ASTM E1042. Testing laboratory must be NVLAP-accredited.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

B. Verify surfaces are adequate to provide a satisfactory application of the specified materials. Report any deficiencies to the design authority.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove any dust, dirt, foreign material, loose paint etc. on surfaces to which the work is to be applied, which could otherwise create a false bond or staining of insulation. Clean and seal as required by manufacturer.

B. Verify bond requirements and compatibility of all surfaces to receive thermal insulation materials.

C. Ensure that all ducts, piping, equipment, or other items, which would interfere with application of thermal insulation, are not positioned until thermal insulation work is completed.

D. Protection:
1. Provide adequate protection to adjacent surfaces from being sprayed by means of drop cloths, polyethylene sheets, with necessary taping.
2. Close off and seal any ductwork in areas where sprayed insulation is being applied.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

3.4 APPLICATION

A. Mix and apply thermal insulation in strict accordance with manufacturer's recommendations.

B. Mix bonding adhesive with fresh, clean water to the exact proportions recommended by the manufacturer.

C. Apply self-supported, spray-applied cellulosic insulation according to manufacturer's written instructions.

1. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.
2. Apply insulation to substrate in sufficient thickness to achieve the required thermal value. Board tamp and over-spray with adhesive if required by design authority.
3. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.
4. Return Air Plenums: Board tamp insulation in place and overspray.

D. Paint as required, or apply spray insulation using manufacturer's pre-tinted adhesives, as per manufacturer's instructions.

3.5 PATCHING

A. Perform all patching and repairing of sprayed thermal insulation due to cutting by other trades under the requirements of this Section.
1. Payment for such patching and repair shall be paid for by the trade performing the cutting.

3.6 CLEANING

A. Remove sprayed thermal insulation from material and surfaces not specifically required to be insulated.

B. Broom clean work areas affected by the Work of this Section.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 2129

SECTION 07 2616 – BELOW-GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Heavy-duty under-slab plastic vapor retarder.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 DEFINITIONS

A. Vapor Retarder Assembly: The collection of vapor retarder materials and auxiliary materials applied over free draining gravel, including the sealing of sheet laps, joints, and penetrations, forming an impermeable membrane to control movement of moisture up through slabs-on-grade.

1.5 ACTION SUBMITTALS

A. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Installation Instructions: Indicate preparation and installation requirements, techniques.

B. Certificates of Compliance: Include the name, description of the product. Provide third party independent testing reports to verify compliance with referenced standards.
   1. When Certificates of Compliance cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance. Contractor shall pay for the cost of testing.

1.7 CLOSEOUT SUBMITTALS

A. Warranty: Sample of special warranty.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace vapor retarder material that does not comply with requirements or that fails achieve a watertight seal, or exhibits loss of adhesion or cohesion within specified warranty period.
   1. Warranty Period: Three years from date of Substantial Completion.

1.9 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM E1643 and manufacturers recommend methods.

B. Single-Source Responsibility: Obtain vapor retarder material and installation accessories from single source providing consistent quality in performance and appearance without delaying progress of the Work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect vapor retarder materials from puncture damage prior to use.

B. Comply with manufacturer's written recommendations for handling and storage, and protection during installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide continuous vapor retarder under floor slab throughout the building, unless indicated otherwise on Drawings and ASTM E1643.

2.2 MATERIALS

A. Plastic Vapor Retarder Sheeting: ASTM E1745, Class A, 15.0 mil total thickness, 14'-0" wide sheets.
   1. Basis-of-Design: Stego Industries; StegoWrap
   2. Puncture Resistance, ASTM D1709, Method B: 3,000 grams
   3. Tensile Strength, ASTM E154, Section 9: 67 lbf / in.
   4. Water Vapor Permeance, ASTM F1249: 0.0067 perms.

2.3 ACCESSORIES

A. Tape: Polyethylene pressure sensitive, self-adhering type, mesh reinforced, 4-inch wide, compatible with vapor retarder material.
   1. Water Vapor Transmission Rate: ASTM E96/E96M; 0.3 perms or lower.

B. Adhesive: Compatible with vapor retarder and substrate, permanently non-curing; as manufactured by vapor retarder manufacturer, with demonstrated capability to bond vapor retarders securely to substrates indicated.
   1. Water Vapor Transmission Rate: ASTM E96/E96M; 0.3 perms or lower

C. Pipe Boots: Solid 10 mill pre-manufactured peel and stick patching product with aggressive all weather adhesive for direct adhesion to vapor retarder surface, pipes and penetrations.
   1. Water Vapor Transmission Rate: ASTM E96/E96M; 0.0016 perms or lower

D. Cleaner for Vapor Retarder: As recommended by vapor retarder manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify required condition of substrate and adjacent construction with installer present. Make any corrections before proceeding with vapor retarder installation.

B. Do not proceed with installation of retarder until unsatisfactory conditions have been corrected. Proceeding with installation indicates acceptance of substrate.

3.2 PREPARATION

A. Remove loose or foreign matter that might impair adhesion.

B. Level and tamp or roll aggregate, sand or tamped earth base. Ensure that subsoil is approved by Architect.

C. Clean and prime substrate surfaces to receive adhesive in accordance with manufacturers' instructions.

3.3 INSTALLATION

A. Install vapor retarder materials in accordance with manufacturer's instructions and ASTM E1643 requirements.

B. Lay vapor retarder over base rock with width of sheet running parallel with the direction of concrete pour.

C. Lap vapor retarder 6 inches minimum and seal with 4-inch wide adhesive tape. Position lap seals over firm bearing. Tape joints.

D. Lap vapor retarder 3 inches over footings and grade beams. Seal membrane to concrete with adhesive or concrete nail every 5 foot on footing surface.

E. Offset intermediate end joints in adjacent sheets no less than 4 feet.

F. Cut sheeting to fit closely and neatly around penetrations of pipe and conduit. Seal tears and punctures.

G. Slip sheeting over penetrations where possible, otherwise slit from penetration hole to nearest edge.

H. Slip pipe boots fabricated from sheeting material over penetration holes and tape in place completely.
   1. Single pipe penetrations may be sealed using pipe boot constructed from the product. Cut a piece of plastic 12-inches wide x 1-1/2 times the circumference of the pipe. With scissors, cut slits half the width of the film Wrap boot around pipe; tape onto pipe and completely tape the base to the vapor barrier.
   2. Multiple pipe penetrations in close proximity and very small pipes shall be sealed using mastic. Cut out a small area around pipes. Cut a patch of vapor barrier extending at least 6-inches past the cut out in all directions. Cut X’s or small circles in the patch and install over pipes. Overlap at least 6-inches and tape. Build up 40- to 60-mils of mastic or as required to completely fill voids between the pipe and the vapor barrier.

I. Seal penetrations of pipe and conduit with tape to ensure an airtight seal. Seal tears and punctures with tape immediately before proceeding with covering the vapor retarder. Use a second layer of vapor retarder material where damage to vapor retarder is extensive and would require excessive use of tape to repair.
   1. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities.
   2. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all four sides with tape.

J. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Protect installed vapor retarders from damage by harmful weather exposure, and other construction activities.

B. Repair any punctures to vapor retarder before pouring concrete slab over retarder.

C. Do not permit adjacent Work to damage Work of this Section.

END OF SECTION 07 2616

SECTION 07 2727 – SELF-ADHERING AIR AND WATER BARRIER

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 SECTION INCLUDES

A. Air and water resistive barrier self-adhering, vapor permeable flexible sheet membrane system.

B. Work includes all necessary sheet goods, flashing, tapes, mastics, and sealants to insure a complete water resistive, vapor permeable air barrier wall system including:
1. Connections of wall air barrier to roof membrane.
2. Connection of wall air barrier to foundation air barrier.
3. Air barriers across construction, control, seismic and expansion joints.
4. Opening and penetrations for windows, doors, vents, ducts, pipes, and curtain wall systems.
5. Brick ties, bolts, and similar hardware penetrations.
6. All other joints, opening, and pathways in the building wall enclosure with potential for air leakage or moisture infiltration.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.5 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. 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. 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.

B. Qualification Data: For Applicator.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.7 CLOSEOUT SUBMITTALS

A. Warranty: Executed special warranty specified in this Section.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum of 20 years' experience in the production of air barrier materials, with minimum of 5 years in the production of fluid-applied membrane air barriers.

B. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance and that is an ABAA-licensed contractor, employs certified and registered installers, and complies with ABAA's Quality Assurance Program.

C. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly, 150 sq. ft. (14 sq. m) in size, 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.
   1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
   2. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
   3. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
   4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Pre-Installation Conference: Conduct a pre-installation conference prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
   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, and system manufacturer's field representative.
   2. Agenda for meeting shall include but not be limited to the following:
      a. Review of submittals.
      b. Review substrate condition and pretreatment.
      c. Review of surface preparation, minimum curing period, forecasted weather conditions, and installation procedures.
      d. Review of installation procedures, special details and flashings.
      e. Sequence of construction, responsibilities and schedule for subsequent operations.

f. Review of mock-up requirements.
g. Review of inspection, testing, protection and repair procedures.

1.9 PRECONSTRUCTION TESTING

A. Mockup Testing: Air barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
1. Owner will engage a qualified testing agency.
2. Quantitative Air Leakage Testing: Testing of the mockup for air leakage will be conducted not to exceed the test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage when tested according to ASTM E283.
3. Notify Architect seven days in advance of the dates and times when mockup testing will take place.

1.10 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.

1.11 SITE CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of the fully self-adhered water-resistive vapor permeable systems installed in accordance with manufacturer's instructions that do not comply with requirements or that fail in materials, fabrication, or installation within specified warranty period.
1. Warranty Period: 20 years from date of Substantial Completion.

B. Installer’s Special Warranty: Installer's standard form in which installer agrees to repair or replace concrete wall planks that fail in materials, fabrication, or installation within specified warranty period.
1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate

movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:
   1. It must be continuous, with all joints made airtight.
   2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water. (1.57 psf) (equal to 0.02L/sq. m @ 75 Pa), when tested in accordance with ASTM E2178.
   3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
   4. It shall be durable or maintainable.
   5. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
      a. Foundation and walls.
      b. Walls and windows or doors.
      c. Different wall systems.
      d. Wall and roof.
      e. Wall and roof over unconditioned space.
      f. Walls, floor and roof across construction, control and expansion joints.
      g. Walls, floors and roof to utility, pipe and duct penetrations.
   6. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

C. Air Barrier Assembly Air Leakage:
   1. The self-adhering air barrier shall have less than 0.01 cfm/ft^2 of air leakage when tested in accordance with ASTM E2357.
   2. The self-adhering air barrier shall have less than 0.0040 cfm/ft^2 at 1.57 psf when tested in accordance with ASTM E2178.
   3. The self-adhesive air barrier and metal cladding panel specified in Division 07 shall be jointly tested as an assembly in accordance with ASTM E283 with an air leakage rate of less than 0.04 cfm/ft^2 at 1.57 psf.

D. Water Resistance.
   1. The self-adhering air barrier shall be tested for water resistance in accordance with AATCC 127 with a result of No Leakage after 5 hours with a 21.5-inch hydrostatic water head.
   2. The self-adhesive air barrier and metal cladding panel specified in Division 07 shall be jointly tested as an assembly in accordance with ASTM E331 with no uncontrolled leakage at 1.57 psf and 6.24 psf.

E. Vapor Permeance: The self-adhering air barrier shall be vapor permeable with a minimum vapor transmission rate of 50 perms when tested in accordance with ASTM E96, Method B.

2.2 MATERIALS

A. General: Obtain all primary air barrier components and accessories from the same supplier to ensure total system compatibility and integrity.

B. Air Barrier Membrane Materials.
   1. Basis-of-Design: IntelliWrap SA by Innovative Metals Company, Inc. (IMETCO), Norcross, GA 800-646-3826.
   2. Alternate suppliers are subject to full compliance with specification requirements, and shall be submitted for approval as follows.
      a. Suppliers not listed above must submit for approval, ten (10) days prior to bid date, the following: Suppliers' literature; certification of testing in accordance with specification requirements and sections 1.4 and 1.5; sample warranties in accordance with specification section 1.11; installer qualifications in accordance with specification section 1.6, and a list of five (5) similar projects in size and scope of work.
      b. In addition to the above requirements, requests for substitute products for this section of the specification shall be accompanied by a notarized statement from a corporate officer of the Air and Water Barrier supplier stating that the proposed alternate air barrier product is specifically acceptable for issuance of the Special Raincreen System Water Tightness Warranty required in Article 1.11 A 3 of this specification, which the Air and Water Barrier supplier is required to provide upon substantial completion of this project. This notarized statement shall identify by supplier, product name, and model number each component of the Rainscreen wall system, including each of those components listed in Article 1.5 A of this specification that the Air and Water Barrier supplier will cover under this warranty.
      c. No substitutions will be permitted after the bid date of this project.
   3. Material: Multi-layer UV stabilized self-adhering vapor permeable sheet membrane comprised of two a high strength spun-bonded polypropylene fabric outer layers thermally bonded to a highly vapor permeable, watertight polymeric middle layer.
   4. Weight: 40 lbs per roll.
   5. Allowable UV Exposure: 50 days.
   6. Application Temperature: Ambient temperature must be above 40 ºF.
   7. Service Temperature: -40 ºF to 176 ºF.
   8. Roll Dimensions: 59-inches wide by 115-ft long.

C. Physical Properties
   1. Low Temperature Flexibility: The self-adhering air barrier shall demonstrate acceptable low temperature flexibility in accordance with the requirements of ASTM D1970.
   2. Bend Test: The self-adhering air barrier shall demonstrate acceptable bend flexibility in accordance with the requirements of ICC AC38 3.3.4.
   3. Peel Adhesion: The self-adhering air barrier shall exhibit a 90 degree peel adhesion in accordance with AAMA 711-5.3 and ASTM D3330.
   4. Wet Adhesion: The self-adhering air barrier shall demonstrate acceptable adhesion after immersion in water in accordance with the requirements of AAMA 711-5.8.
   5. Puncture Resistance: The self-adhering air barrier shall demonstrate a minimum puncture resistance of 75 lbf in accordance with ASTM E154.
   6. Elevated Temperature: The self-adhering air barrier shall be suitable for use at an elevated temperature of 176ºF in accordance with the requirements of AAMA 771-5.5 and ASTM D3330 Level 3.
   7. Breaking Strength: The self-adhering air barrier shall have a minimum breaking strength and elongation at break of 70 lbf/in and 25% in the machine direction, and a minimum of 65 lbf/in and 60% in the cross-machine direction when tested in accordance with ASTM D5034.
   8. Tearing Strength: The self-adhering air barrier shall have a minimum trapezoidal tearing strength of 21 lbf/in in the machine direction, and a minimum of 14 lbf/in in the cross-machine direction when tested in accordance with ASTM D4533.

9. Linear Dimensional Change: The self-adhering air barrier shall be have a change in linear dimension at elevated temperatures in accordance with ASTM D1204 of no more than 1.5% in the machine direction and 0.1% in the cross-machine direction.
10. Crack Bridging Ability: The self-adhering air barrier shall have a demonstrated ability to bridge cracks in the substrate material in accordance with the requirements of ASTM C1305 at a temperature of -15ºF.
11. Cyclical Thermal Change: The self-adhering air barrier shall demonstrate acceptable performance for thermal cycling in accordance with the requirements of AAMA 711-5.6.

D. Surface Burning Characteristics: The self-adhering air barrier shall have be rated as Class A material with a flame spread rating of less than 15 and a smoke-development index of less than 50 when tested in accordance with ASTM E84.

E. Air Barrier Transition and Flashing Membrane.
1. Transition and flashing air barrier membrane shall be IntelliWrap Flashing SA by IMETCO, a self-adhering, water-resistive, vapor permeable membrane flashing sheet with properties the same as those of the Air Barrier Membrane.
2. Roll Dimensions: 4-inches or 9-inches wide by 75-ft long.

F. Air Barrier Flashing and Penetration Tapes: Tapes shall be IntelliWrap Tape by IMETCO, a UV stabilized double or single sided moisture-resistant flexible tape with adhesive backing having the following characteristics:
1. IntelliWrap Tape Single-Sided: 2.5-inches wide penetration seam tape.

G. Preformed Window and Door Corners: Preformed window and door flashing membrane shall be IntelliWrap SA Factory Formed Corners by IMETCO, an 18-inch by 18-inch preformed 90º inside corner membrane with the same vapor permeance, resistance to air leakage, and physical properties as the primary air barrier membrane.

2.3 ACCESSORY MATERIALS

A. Provide penetration sealants, including fire-stop sealants as recommended by supplier and as specified under Division 07, Section: Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate surfaces, and other conditions affecting performance of the Work.

B. Examine solid 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. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263 and take suitable measurements until substrate passes moisture test.

D. Verify all surfaces are dry, sound, clean, and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the water resistive air barrier membrane and

flashings. Fill voids and gaps in substrate greater than 1/4-inch in width to provide an even surface. Strike masonry joints full-flush.

E. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with the sheathing and fastened into solid backing material.

F. Examine roughing-in for components and systems penetrating the rainscreen wall assembly to verify actual locations of penetrations.

G. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to air barrier installation, including removing projections capable of interfering with air barrier.

B. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through water-resistive air barrier and at protrusions.

C. Establish straight, side and crosswise benchmarks

D. All walls shall be checked for square and straightness. Inside and outside corners may not be plumb; set a true line for the corner flashing with string line.

E. Ensure all preparatory work is complete prior to applying primary self-adhering water-resistive air barrier sheet membrane.

F. Prime surfaces as recommended by air barrier supplier.

G. Minimum application temperature of self-adhered membrane and flashings to be above 40 ºF (5 ºC).

3.3 AIR BARRIER INSTALLATION

A. Coordination and Sequence.
1. Install self-adhered water-resistive air barrier sheet complete and continuous to the substrate in a sequential overlapping weatherboard method staring at bottom or base of wall and working upward.
2. Complete detail work around corners, wall openings, building transitions and penetrations prior to field applications.
3. Install self-adhering air barrier membrane over the outside face of exterior sheathing board or substrate, measured and precut into manageable size sheet to suit the application conditions.
4. Stagger all end-lap seams.
5. Roll installed membrane with roller to ensure positive contact and adhesion.
6. At changes in substrate plane, provide transition material (bead of sealant, mastic, extruded silicone sealant, membrane counterflashing, or other material recommended by supplier) under membrane to eliminate all sharp 90º inside corners and to make a smooth transition from one plane to another.
7. At end of each working day, seal top edge of membrane to substrate with termination mastic.

B. Window, Door, and Other Wall Openings.
   1. To avoid waste, predetermine best method and sequence to the install self-adhered air barrier transition and flashing membrane around window or wall openings subject to the opening size and installation of window, door or louver type.
   2. Wrap self-adhered air barrier transition and flashing membrane into wall openings to cover sill, jambs and head. It is not required to install continuous sheets through corners.
   3. Remove release film, align flashing membrane and apply pressure to ensure positive contact. Roll Lap seams to ensure adhesion. Provide lap seams to shed water.
   4. Install preformed corner flashing membrane into corners over flashing membrane. Secure preformed corners into position with flashing tape and seal to self-adhered air barrier.
   5. Subject to window installation requirements, install preformed sill pan system and seal to installed self-adhered air barrier window flashing membrane with sealant.
   6. Install windows in accordance with window manufacturer's details and cover nail flange with flashing tape. Install flashing tape along jamb and across head flanges of window and seal to installed self-adhered air barrier transition membrane. Roll tape to ensure positive contact to substrate. Seal exposed leading edge of tape.
   7. For windows without nail flange, install specified aluminized tape around perimeter of opening to accommodate placement of backer rod and sealant between window frame and self-adhered vapor permeable air barrier membrane.

C. Inside and Outside Corners.
   1. Pre-treat inside and outside corners with self-adhered air barrier transition and flashing membrane extending a minimum of 5-inches from inside and outside corners, or overlap field material a minimum of 3-inches in each direction.
   2. Align and position self-adhered air barrier transition and flashing membrane, remove protective film and press firmly into place. Provide minimum 3-inches overlap at all side laps and minimum 3-inches overlap at all end laps of membrane.
   3. Roll membrane and lap seams with roller to ensure positive contact and adhesion.

D. Building Transition Conditions.
   1. Tie-in to structural beams, columns, floor slabs and intermittent floors, parapet curbs, foundation walls, roofing systems and at the interface of dissimilar materials with self-adhering air barrier transition and flashing membrane.
   2. Align and position self-adhered air barrier transition and flashing membrane, remove protective film and press firmly into place. Provide minimum 3-inches lap on to substrates.
   3. Ensure minimum 3-inches overlap at side and end laps of membrane.
   4. Roll membrane and lap seams with roller to ensure positive contact and adhesion.
   5. Connect air and water barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior doors and other intersection conditions and perform sealing of penetrations, using accessory materials and in accordance with the supplier's recommendations.
   6. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Membrane shall be continuously supported by substrate.
   7. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.
   8. At expansion and seismic joints provide transition to the joint assemblies.
   9. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the supplier.

E. Mechanical Equipment Penetrations.

1. Mechanical pipe, electrical conduit and/or duct work must be secured solid into position prior to installation of self-adhered vapor permeable air barrier membrane.
2. Electrical services penetrating the wall assembly and self-adhered vapor permeable air barrier membrane must be placed in appropriate conduit and secured solid into position.
3. Install manufactured flanged penetration sleeves as recommended by sleeve supplier.
4. For straight sided penetrations, cut and fit self-adhered vapor permeable air barrier to accommodate sleeve, install specified single sided flashing tape to seal the air barrier membrane to ductwork or preformed flange sleeve.
5. For pipe penetrations, refer to supplier's standard details.
6. Seal around all penetrations with termination mastic, extruded silicone sealant, membrane counterflashing or other procedure in accordance with supplier's recommendations.
7. At through-wall flashings, provide an additional 6-inches wide strip of supplier's recommended membrane counterflashing to seal top of through-wall flashing to membrane. Seal exposed top edge of strip with bead of mastic as recommended by supplier.

F. Field Membrane Installation.
1. Align sheets and begin installation of water-resistive weather barrier at bottom or lowest point of wall.
2. To avoid wrinkles and miss-alignment of subsequent applications it is recommended to pre-mark or "Snap" a level line to work from. Measure and pre-cut into manageable sized sheets to suit the application conditions.
3. Allow for excess material at bottom of wall to accommodate tie-ins and connections to adjacent surfaces.
4. Align and position self-adhered membrane, remove release film and press firmly into place. Provide minimum 3-inches overlap at all side and end laps of membrane. Roll membrane and lap seams with roller to ensure contact and adhesion.
5. Continue to remove release film and apply pressure to ensure positive contact onto wall substrate.
6. Install subsequent sheets of self-adhered vapor permeable air barrier sheets in overlapping weatherboard format. Ensure sheets lay smooth and flat to surfaces. Roll membrane and lap seams with roller to ensure contact and adhesion.

3.4 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. Site conditions for application temperature and dryness of substrates have been maintained.
4. Maximum exposure time of materials to UV deterioration has not been exceeded.
5. Surfaces have been primed.
6. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
7. Termination mastic has been applied on cut edges.
8. Air barrier has been firmly adhered to substrate.
9. Compatible materials have been used.

10. Transitions at changes in direction and structural support at gaps have been provided.
11. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
12. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by Owner's testing agency.

D. Remove and replace deficient air barrier components and retest as specified above.

3.5 CLEANING AND PROTECTION

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

B. Clean spills, stains, and soiling from adjacent construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

3.6 PROTECTION

A. Protect wall areas covered with self-adhered water-resistive vapor permeable air barrier from damage due to construction activities, high wind conditions, and extended exposure to inclement weather.

B. Review condition of self-adhered water-resistive vapor permeable air barrier prior to installation of cladding. Repair, or remove and replace damaged sections with new membrane.

C. Recommend to cap and protect exposed back-up walls against wet weather conditions during and after application of membrane, including wall openings and construction activity above completed self-adhered water-resistive vapor permeable air barrier installations.

D. Do not allow materials to come in contact with chemically incompatible materials.

E. Do not expose membrane to sunlight longer than as recommended by the supplier.

F. Remove and replace water-resistive weather barrier membrane affected by chemical spills or surfactants.

G. Review condition of water-resistive weather barrier prior to installation of cladding. Repair, or remove and replace damaged sections with new membrane.

END OF SECTION 07 2727

SECTION 07 3113 – ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fiberglass composition asphalt shingles.

B. Self-adhering sheet underlayment.

1.3 RELATED SECTIONS

A. Section 06 1000 - Rough Carpentry: Roof deck wood structural panels.

B. Section 07 3216 – Concrete Roof Tiles

C. Section 07 4113 – Metal Roof Panels.

D. Section 07 5200 - Cold Applied Asphalt Roofing.

E. Section 07 6000 - Flashing and Sheet Metal: Metal roof penetration flashings and counterflashings not part of this Section.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.6 ACTION SUBMITTALS

A. Product Data: Include dimensions of individual components, profiles, textures, and colors.

B. Samples for Verification: For the following products, of sizes indicated, to verify color selected.
1. Asphalt Shingle: Full-size asphalt shingle strip.
2. Ridge and Hip Cap Shingles: Full-size ridge and hip cap asphalt shingle.
3. Ridge Vent: 12-inch- (300-mm-) long sample.
4. Exposed Valley Lining: 12-inches (300 mm) square.

1.7 INFORMATIONAL SUBMITTALS

A. Wind-Resistance-Test Characteristics: Where wind-resistant shingles are indicated, provide products identical to those that have passed tests according to ASTM D3161/D3161M or UL 997.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

C. Research/Evaluation Reports: ICC-ES report for asphalt shingles.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

B. Warranty: Special warranty specified in this Section.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual that is approved, authorized, or licensed by asphalt shingle roofing system manufacturer to install roofing system indicated.

B. Source Limitations: Obtain ridge and hip cap shingles, ridge vents, felt underlayment, and self-adhering sheet underlayment through one source from a single asphalt shingle manufacturer.

C. Fire-Test-Response Characteristics: Provide asphalt shingle and related roofing materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
1. Exterior Fire-Test Exposure: Class A; ASTM E108 or UL 790, for application and roof slopes indicated.

1.10 PRE-INSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this section. Conference shall be attended by Contractor, Owner, Architect, roofing subcontractor and his foreman, decking subcontractor, mechanical and electrical subcontractors (where applicable), and a representative of roofing materials manufacturer.

B. Agenda shall include, but not be limited to the following:
1. Review of preparation and installation procedures.
2. Roof and flashing details including conflicts with manufacturer's specifications.
3. Coordination of flashing details.
4. Establishment of schedules and work methods which will prevent roof damage.
5. Coordination of penetrations, and other items on roof to be in place prior to roofing installation.
6. Designation of area on job site to be used as work and storage location.
7. Establishment of weather and working conditions to which all parties agree.
8. Establishment of requirements pertaining to temporary roofing.
9. Enactment of provisions for monitoring roof installation after completion and prior to acceptance of entire project.
10. Other business relating to Work.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.

1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

C. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.12 SITE CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt shingle roofing to be performed according to manufacturer's written instructions and warranty requirements.
1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.13 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials, fabrication, or installation within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Manufacturing defects.
b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
2. Material Warranty Period: 35 years from date of Substantial Completion, prorated, with first three years nonprorated.
3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 80 mph (36 m/s) for five years from date of Substantial Completion.
4. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor five years from date of Substantial Completion.
5. Warranty Period: 10 years from date of Substantial Completion.

B. Special Project Warranty: Roofing Installer's Warranty, or warranty form at end of this Section, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials, fabrication, or installation within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ASPHALT SHINGLES

A. Basis-of-Design Product: The design for the asphalt shingles is based on the manufacturer identified below. Product requirements in this Section are based on products by the named manufacturer. Subject to compliance with requirements, provide the named product or an approved comparable system:
1. Basis-of-Design: CertainTeed Corporation.
2. GAF Materials Corporation.
3. PABCO Roofing Products.

B. Square-Tab, Fiberglass Strip Shingles: Mineral-surfaced, self-sealing, 3-tab, fiberglass-based, strip shingles, complying with ASTM D3018/D3018M, Type I, and meeting the following requirements:
   1. Physical Requirements: Meet the physical requirements of ASTM D3462/D3462M.
   2. Wind Resistance: Passes the test requirements of ASTM D3161/3161M.
   3. Fire-Test-Response Classification: Class A.

C. Hip and Ridge Shingles: Job-fabricated or factory-precut units to match shingles.

D. Match colors, textures, and patterns indicated by referencing manufacturer's standard designations for these characteristics.

2.2 ACCESSORIES

A. Roof Felt Underlayment: ASTM D226/D226M or ASTM D4869/D4869M, Type II, asphalt-saturated organic felt, 15 lb minimum.

B. Sheet Membrane Underlayment at Roofing: Self-adhered, cold-applied composite rubberized asphalt sheet membrane consisting of rubberized asphalt bonded to a cross-laminated high-density polyethylene film with primers and seam sealers as required for a complete watertight installation; provide materials compliant with applicable regulations limiting VOCs.
   1. Carlisle Coatings and Waterproofing: Dri-Start HR.
   2. GCP Applied Technologies; Grace Ice and Water Shield.
   3. Meadows, W. R., Inc.; SealTight Mel-Rol.

C. Ridge Vent: High-density polypropylene, nonwoven modified polyester, or other UV-stabilized plastic.

D. Mineral-Surface, Glass-Felt Roll Roofing: ASTM D3909/D3909M.

E. Asphalt Plastic Cement: ASTM D4586/D4586M.

F. Roll-Roofing Lap Cement: ASTM D3019, Type III.

G. Roofing Nails: ASTM F1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.
   1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

H. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

2.3 SHEET METAL MATERIALS

A. Galvanized-Steel Sheets: ASTM A653/A653M, G90 hot-dip galvanized steel with coating designation according to ASTM A653/A653M, mill phosphatized where indicated for painting; 0.0217-inch thick, unless otherwise indicated.

B. Metal Drip Edge: Brake-formed sheet metal with at least a 2-inch roof deck flange and a 1-1/2-inch fascia flange with a 3/8-inch drip at lower edge. Furnish galvanized steel sheets in lengths of 8 or 10 feet.

C. Metal Flashing: Job-cut to sizes and configurations required, galvanized steel. See Section 07 6000.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine substrate for compliance with requirements for conditions affecting performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Clean substrates of projections and cover knotholes or other minor voids in substrate with sheet metal flashing.

C. Coordinate installation with flashings and other adjoining work to ensure proper sequencing.

3.2 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Double-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Install a 19-inch- (485-mm-) wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches (485 mm) in shingle fashion. Lap ends a minimum of 6 inches (150 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt underlayment nails.
   1. Terminate felt underlayment extended up not less than 4 inches (100 mm) against sidewalls, curbs, chimneys, and other roof projections.
   2. Install fasteners at no more than 36 inch (900 mm) oc.

C. Concealed, Closed-Cut Valley Lining: Comply with NRCA's recommendations. Install a 36-inch- (914-mm-) wide felt underlayment centered in valley. Fasten to roof deck with felt underlayment nails.
   1. Lap roof-deck felt underlayment over valley felt underlayment at least 6 inches (150 mm).
   2. Install a 36-inch- (914-mm-) wide strip of granular-surfaced valley lining centered in valley, with granular-surface face up. Lap ends of strips at least 12 inches (300 mm) in direction to shed water, and seal with asphalt roofing cement. Fasten to roof deck with roofing nails.

3.3 FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."
   1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Waterproof Underlayment: Apply waterproof underlayment at eaves. Cover deck from eaves to at least 24-inches inside exterior wall line.

C. Step Flashings: Install with a headlap of 2 inches (50 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

F. In addition to eaves, apply waterproof underlayment in place of felt underlayment at valleys.

G. Valleys: Comply with ARMA and NRCA recommendations.

3.4 SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Install shingles, beginning at roof's lower edge, with a starter strip. Fasten shingles in the desired weather exposure pattern with number of fasteners per shingle as recommended by manufacturer.

C. Cut and fit shingles at valleys, ridges, and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof.

D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

E. Fasten asphalt shingle strips with a minimum of six roofing nails located according to manufacturer's written instructions.
   1. Where roof slope exceeds 20:12, seal asphalt shingles with asphalt roofing cement spots, each spot about the size of a quarter, centered under each covering tooth, 1” up from the bottom edge of that covering tooth under each tab.

F. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12 inches (300 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2 inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
   1. Do not nail asphalt shingles within 6 inches (150 mm) of valley center.
   2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.

G. Ridge Vents: Install ridge vents according to manufacturer's instructions.

H. Ridge Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
   1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

I. Replace damaged materials installed under this Section with new materials that meet specified requirements.

3.5 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 07 3113

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SECTION 07 3216 – CONCRETE ROOF TILES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Concrete roof tiles.

B. Felt underlayment.

C. Tile accessories.

1.3 RELATED SECTIONS

A. Section 06 1053 – Miscellaneous Rough Carpentry: Wood roof battens and wood nailers.

B. Section 07 3113 – Asphalt Shingles.

C. Section 07 4113 – Metal Roof Panels.

D. Section 07 5200 - Cold Applied Asphalt Roofing.

E. Section 07 6000 - Flashing and Sheet Metal: Metal roof-penetration flashings, counterflashings, and flashings.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079, glossaries in RTI/WSRCA's "Concrete and Clay Roof Tile Design Criteria Installation Manual for Moderate Climate Regions," and NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.6 ACTION SUBMITTALS

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

B. Samples for Initial Selection: For each type of concrete tile and concrete tile accessory indicated.
   1. Include similar Samples of trim involving color selection.

1.7 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each type of tile.

B. Research/Evaluation Reports: For concrete tiles, fasteners, and fastener systems.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For concrete tile roofing to include in maintenance manuals.

B. Warranty: Special warranty specified in this Section.

1.9 QUALITY ASSURANCE

A. Source Limitations: Obtain concrete tiles and concrete tile accessories through one source from a single manufacturer.

1.10 PRE-INSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this section. Conference shall be attended by Contractor, Owner, Architect, roofing subcontractor and his foreman, decking subcontractor, mechanical and electrical subcontractors, and a representative of roofing materials manufacturer.

B. Agenda shall include, but not be limited to the following:
1. Review of preparation and installation procedures.
2. Roof and flashing details including conflicts with manufacturer's specifications.
3. Coordination of flashing details at dormers and cupola.
4. Establishment of schedules and work methods which will prevent roof damage.
5. Coordination of penetrations, and other items on roof to be in place prior to roofing installation.
6. Designation of area on job site to be used as work and storage location.
7. Establishment of weather and working conditions to which all parties agree.
8. Establishment of requirements pertaining to temporary roofing.
9. Enactment of provisions for monitoring roof installation after completion and prior to acceptance of entire project.
10. Other business relating to Work.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.12 SITE 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. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.13 WARRANTY

A. Special Concrete Roof Tile Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace tile that fails in materials within specified warranty period. Material failures include manufacturing defects that result in leaks.
   1. Material Warranty Period: 50 years from date of Substantial Completion.

B. Special Roofing Installer's Warranty: Roofing Installer's warranty, on warranty form at end of this Section, signed by roofing Installer, covering Work of this Section, in which roofing Installer agrees to repair or replace components of concrete tile roofing that fail in materials, fabrication, or installation within the following warranty period:
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE TILE

A. Concrete Tile: ASTM C1492, molded- or extruded-concrete roof tile units of shape and configuration indicated, with integral color, and free of surface imperfections. Provide with fastening holes predrilled at factory when manufactured.
   1. Weight: Normal weight.
   2. High-Profile Shape: Low-profile tile, Eagle Roofing “Malibu” or similar.
   3. Side Configuration: Interlocking.
   4. Colors, Blends, and Patterns: As selected by Architect from manufacturer's full range.
   5. Finish and Texture: Matte, smooth.

2.2 UNDERLAYMENT MATERIALS

A. Roof Felt Underlayment: ASTM D226 or ASTM D4869/D4869M, Type II, asphalt-saturated organic felt, 15 lb minimum.

2.3 FASTENERS

A. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

B. Wood Batten Nails: ASTM F1667, common or box, steel wire, flat head, and smooth shank.

C. Wire Ties: Stainless steel, 0.083-inch (2.1-mm) minimum diameter.

D. Hook Nails: One-piece wind lock and tile fastener system, minimum 0.1-inch- (2.5-mm-) diameter brass 0.09-inch- (2.3-mm-) diameter galvanized steel wire, for direct deck nailing on roofs steeper than 7:12.

E. Tile Locks: Hot-dip galvanized steel, 0.1-inch- (2.5-mm-) diameter wire device designed to secure butt edges of cover tiles.

2.4 SHEET METAL FLASHING AND TRIM

A. Sheet Metal Flashing and Trim: Comply with requirements in Section 076000.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.

C. Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches (100 mm) from pipe onto roof.

2.5 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D4586/4586M, Type II, asbestos free.

B. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied.

C. Elastomeric Sealant: ASTM C920, polyurethane-based joint sealant; of Type M or S, Grade NS, Class 25, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O.

D. Roofing Asphalt: ASTM D312, Type IV, for adhering top-layer underlayment to anchor or first layer.

E. Cold-Applied Adhesive: Manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with underlayments.

F. Foam Adhesive: Two-component polyurethane expanding adhesive recommended for application by tile manufacturer.

G. Mortar: ASTM C270, Type M, natural color for concealed-from-view mortar.
1. Mortar Pigment: ASTM C979/C979M. Produce mortar matching the color of tile selected for exposed-to-view mortar.

H. Eave Closure: Manufacturer's standard EPDM stainless-steel zinc-tin alloy-coated, eave closure formed to shape of tile.

I. Ridge Closure: Manufacturer's standard EPDM ridge closure formed to shape of tile.

J. Wood Nailers, Beveled Cant Strips and Battens: See section 06 1053.

K. Mesh Fabric Insect Screens: 18-by-14 (1.1-by-1.4-mm) mesh of PVC coated, glass-fiber thread.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through roof.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayments according to tile manufacturer's written recommendations and recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Double-Layer Roof Felt Underlayment: Install perpendicular to roof slope in parallel courses. Install a 19-inch- (485-mm-) wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches (485 mm) in shingle fashion. Lap ends a minimum of 6 inches (150 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with roofing nails.

C. Self-Adhering Sheet Underlayment: Install wrinkle free, complying with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated on Drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm), staggered 24 inches (600 mm) between succeeding courses. Roll laps with roller. Cover underlayment within seven days.

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Section 07 6000.
1. Install metal flashings according to tile manufacturer's written recommendations and recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope tile roofing and up the vertical surface.

C. Step Flashings: Install with 3-inch (75-mm) headlap extending over the underlying tile and up the vertical surface. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying tile. Fasten to roof deck only.

D. Cricket Flashings: Install against roof-penetrating elements, extending concealed flange beneath upslope tile roofing and beyond each side.

E. Channel Flashings: Install over underlayment and fasten to roof deck.

F. Rake Drip Edges: Install over underlayment and fasten to roof deck.

G. Eave Drip Edges: Install beneath underlayment and fasten to roof deck.

H. Pipe Flashings: Form flashing around pipe penetrations and tile roofing. Fasten and seal to tile roofing.

I. Ridge Vent Sheet Metal: Install centrally and mechanically fasten to wood ridge. Adhere each side to roof tile in elastomeric sealant.
1. Install fabric mesh over roof deck air ventilation gaps to prevent insect entry.

3.4 CONCRETE TILE INSTALLATION

A. General: Install roof tiles according to manufacturer's written instructions and recommendations in RTI/WSRCA's "Concrete and Clay Roof Tile Design Criteria

Installation Manual for Moderate Climate Regions," and to NRCA's "The NRCA Roofing and Waterproofing Manual."

1. Maintain uniform exposure and coursing of tiles throughout roof.
2. Extend tiles 2 inches (50 mm) over eave fasciae.
3. Nail Fastening: Drive nails to clear the tile so the tile hangs from the nail and is not drawn up.
4. Install tile locks to support and lock overlying tile butts to underlying tiles.
5. Cut and fit tiles neatly around roof vents, pipes, ventilators, and other projections through roof. Fill voids with mortar.

B. Closed Valleys: Cut tiles at closed valleys to form straight lines, trimming upper concealed corners of tiles. Maintain uniform gap of 1/2 to 3/4 inch (13 to 19 mm) 3/4 to 1 inch (19 to 25 mm) at centerline of valley.

1. Drill or notch cut valley tiles and wire tie to fastener placed clear of valley metal flashing. Do not nail tiles to metal flashings.

3.5 ADJUSTING

A. Remove and replace damaged or broken tiles.

B. Remove excess tile and debris from Project site.

3.6 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 07 3216

SECTION 07 4113 – METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Factory-formed and field-assembled concealed-fastener, lap-seam metal roof panels.

B. Metal soffit panels.

1.3 RELATED SECTIONS

A. Section 05 4000 - Cold-Formed Metal Framing: Secondary support framing supporting metal roof panels.

B. Section 07 2727 - Self-Adhering Air and Water Barrier

C. Section 07 3113 – Asphalt Shingles.

D. Section 07 3216 – Concrete Roof Tiles

E. Section 07 5200 - Cold Applied Asphalt Roofing.

F. Section 07 6000 - Flashing and Sheet Metal: Flashings and other sheet metal work not part of metal roof panel assemblies.

G. Section 07 9200 - Joint Sealants: Field-applied sealants not otherwise specified in this Section.

H. Section 09 5423 – Linear Metal Ceilings: Interior metal plank ceiling systems.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.6 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roof panel and accessory.

B. Shop Drawings: Show roofing system with flashings and accessories in plan and elevation; sections and details. Include metal thickness' and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations. Indicate relationships with adjacent and interfacing work. Shop drawings must be completed by the metal panel manufacturer's engineering department. Any and/or all changes recommended by the successful bidder must be approved by the manufacturer in writing prior to submittal.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Metal Roof Panels: 12- by 12-inches (300 by 300 mm) of profile indicated.
   2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
   3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.
   4. The following samples must be submitted by alternate manufacturers:
      a. Submit sample of panel section, at least 6" x 6" showing seam profile and also a sampler of color selected.
      b. Submit sample of panel clip

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Product Test Reports and Data for Credit SS 7.2: For roof materials, indicating that roof materials comply with Solar Reflectance Index (SRI) requirement.
      a. Provide drawings of roof highlighting locations of specific roof materials and green roof systems.
      b. Indicate total area of installed SRI compliant roofing materials.
      c. Provide a list of installed roofing materials and their SRI values.
   2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   3. Product Data for Credit MR 5: For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

E. Delegated-Design Submittal: For metal roof panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Design Test Reports:
   1. Indicate fastener types of spacings; and provide fastener pullout values.
   2. Submit copy of manufacturer's minimum design load calculations according to ASCE-7-10.
   3. Submit copy of certification from manufacturer stating that specified system has been tested in accordance with ASTM-1592 requirements by an independent Engineering Firm. All test results must be submitted including Air (ASTM E 283) Infiltration Tests. These test results must meet or exceed those listed in Section 1.8 (Design and Performance Criteria) and be stamped by an independent Engineering Firm.

1.8 CLOSEOUT SUBMITTALS

A. Warranty: Executed special warranty specified in this Section.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
   1. Engage an experienced metal roofing contractor (erector) to install standing seam system who has a minimum of five (5) years' experience specializing in the installation of structural standing seam metal roof systems.
   2. Contractor must be certified by manufacturer specified a supplier of structural standing seam system and obtain written certification from manufacturer that installer is approved for installation of specified system. If requested, contractor must supply owner with a copy of this certification.
   3. Successful contractor is required to maintain a full-time supervisor/foreman who is on the job-site at all times during installation of new roof system. Foreman must have a minimum of five (5) years' experience with the installation of system similar to that specified.

B. Manufacturer Qualifications: The materials outlined in the Material and Method Specifications are based on the performance characteristics of the Rmer Span system by the Garland Company. Bidder will not be allowed to supply panels formed at the job-site on portable rollformers; metal panels must be pre-manufactured and engineered for this project. Bidder will not be allowed to change materials after the bid opening date. If the bidder wishes to propose an alternate manufacturer and/or material than that specified, the following manufacturer criteria must be submitted and approved in writing by the Architect and or Customer 10 days prior to bid due date. Failure to comply with this requirement is grounds for disqualification of Bid.
   1. Submit certified test reports from a testing laboratory that bear the stamp of a registered California P.E. to show compliance with specified performance criteria. Test reports must meet the specified negative uplift pressures as listed per this specification for the gauge, panel width and clip spacing specified as confirmed by manufacturers ASTM-E-1592 test results.
   2. Tests shall have been made identical systems within the ranges of specified performance criteria.
   3. Empirical calculations for roof performance shall only be acceptable for positive loads.
   4. Indicate fastener types and spacings and provide fastener pullout values.
   5. Submit copy of manufacturer's Factory Mutual Certification for specified system.
   6. Submit copy of certification from manufacturer stating that specified system has been tested in accordance with ASTM-1592 requirements by an independent Engineering Firm. All test results must be submitted including Air (ASTM E 283) Infiltration and meet or exceed those listed in Section 1.8 (Design and Performance Criteria).
   7. A list of a minimum of five (5) jobs where the proposed alternate material was used under similar conditions. The reference list shall include date of project, size of project, address and contact telephone number.
   8. A financial statement demonstrating a current ratio of 2:1 (current assets to current liabilities).
   9. A written statement from the manufacturer stating that they will provide the building owner with a daily site inspection for a minimum of one (1) hour by an experienced, full time employee of the company.
   10. A written statement from a corporate officer of the manufacturing company stating that he or she has reviewed the specifications and confirms that the proposed system meets or exceeds all performance requirements listed as well as meets the panel size, gauge, weight, clip design, sealant design, uplift pressures and height of the vertical seam.
   11. A copy of manufacturer's 30 year NDL standing seam/modified built up warranty.

C. Reference Standards:
   1. American Society for Testing and Materials (ASTM):

a. B209-03 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
b. E283-93 Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
c. E1592-01 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
3. Architectural Sheet Metal Manual, Latest Edition.
4. Underwriters' Laboratories (UL):
   a. Standard UL – 580 Tests for Wind-Uplift Resistance of Roof Assemblies.
   b. Standard UL – 790 Class A Fire Rated Materials.

D. Source Limitations: Obtain each type of metal roof panels from single source from single manufacturer.

E. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative, deck Installer, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.
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 roof panel installation, including manufacturer's written instructions.
4. Examine deck substrate conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
8. Review temporary protection requirements for metal roof panel assembly during and after installation.
9. Review roof observation and repair procedures after metal roof panel installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.11 SITE CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed according to manufacturers' written instructions.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal roof panels without field measurements, or allow for field-trimming of panels. Coordinate roof construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard NDL form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials, fabrication, or installation within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
2. ~~Manufacturer's warranty shall be~~ **Manufacturer shall issue** a total systems warranty including all metal soffit, standing seam roofing, metal wall panels modified bitumen, ~~soffits,~~ plaza deck coating, and ANSI-SPRI ES-1 edge metal. The same company shall manufacture the soffit, standing seam metal, modified bitumen, and ANSI-SPRI ES-1. This composite warranty shall provide the city with a single source of liability by guaranteeing both waterproofing systems against leaks for a period of 30 years
3. Warranty must cover the calculated wind speed of 120 mph uplift pressures.
4. Warranty Period: 30 years from date of Substantial Completion.

B. Special Installer's Warranty: Installer's standard form in which installer agrees to repair or replace metal roof panel systems that fail in materials, fabrication, or installation within specified warranty period including watertightness.
1. Warranty Period: Five years from date of Substantial Completion.

C. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof 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 D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   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 PERFORMANCE REQUIREMENTS

A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of roof area when tested according to ASTM E1680 at the following test-pressure difference:
   1. Test-Pressure Difference, Slope of 30 Degrees or Less: Negative 1.57 lbf/sq. ft. (75 Pa).
   2. Test-Pressure Difference, Slope Steeper than 30 Degrees: Positive and negative 1.57 lbf/sq. ft. (75 Pa).

D. Water Penetration: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:
   1. Test-Pressure Difference, Slope of 30 Degrees or Less: 2.86 lbf/sq. ft. (137 Pa)
   2. Test-Pressure Difference, Slope Steeper than 30 Degrees: 20 percent of positive design wind pressure, but not less than 6.24 lbf/sq. ft. (300 Pa) and not more than 12.0 lbf/sq. ft. (575 Pa).
   3. Dynamic Pressure: No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of ASMA 501.1.

E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.

F. Underwriters' Laboratories, Inc., (UL) fire resistance P ratings for roof assemblies. Underwriters' Laboratories, Inc., (UL) Class A fire rated materials per UL 790.

G. ASTM E283: Static pressure air infiltration:

Pressure	**Leakage Rate**
1.57 PSF	0.0007 cfm/sq.ft.
6.24 PSF	0.0002 cfm/sq.ft.
20.0 PSF	0.0036 cfm/sq.ft.

H. Capacities for gauge, span, or loading other than those tested may be determined by interpolation of test results within the range of test data. Extrapolation for conditions outside test range are not acceptable.

I. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E1592:
   1. Wind Loads: Determine loads based on the following minimum design wind pressures:
      a. Uniform pressure as indicated on Drawings.
         1) Roof test specimens shall be either full length or representative of the main body of the roof, free from edge restraint or perimeter attachments, continuous over one or more supports, and containing at least five panel modules for standing seam roof.
         2) No attachments shall be permitted at sides or end perimeter other than those that occur uniformly throughout roof. Side and end seals shall be flexible and in no way restrain crosswise distortion of panels.
         3) Panels and accessories shall be production materials of same type and thickness proposed for use on project.

2. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than L/180 of the span.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
3. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.

K. Energy Performance: Provide metal roofing with solar reflectance index not less than 29 when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency.

L. Energy Performance: Provide roof panels that are listed on the U.S. Department of Energy's ENERGY STAR Roof Products Qualified Product List for low-slope roof products.

M. Energy Performance: Provide roof panels with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1 and an aged solar reflectance of 0.20 or higher.
1. Verify that colors selected meet this minimum criteria.

N. Applicable erection tolerances: Maximum variation from true planes or lines: ¼" in 20'-0"; 3/8" in 40'-0" or more.

2.2 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Solar Reflectance Index: Provide aluminum panels with Solar Reflectance Index not less than 29 when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency, or as certified by the manufacturer to meet the requirements of the CBC, whichever is stricter.

C. Roof Material: Energy Star compliant and have a non-rounded emissivity value of at least 0.9 when tested in accordance with ASTM E408.

2.3 MANUFACTURERS:

A. Basis of Design: R-mer Span by Garland Company, Inc. (The), which is located at: 3800 E 91st St,; Cleveland, OH 44105;
1. Local Representative: Doug Clark (925) 784-6701 – Email: dclark@garlandind.com

B. Metal Roofing System:
1. Whenever a particular make of material, trade name and/or manufacturer's name is specified herein, it shall be regarded as being indicative of the minimum standard of quality required. A bidder who proposes to quote on the basis of an alternate material and/or system will only be considered if the proposed alternate is submitted

on time and is documented as being equivalent or superior in quality to the specified system as described in these specifications. Additionally, all manufacturer and contractor/fabricator guidelines must be met as specified.

2.4 ROOF AND SOFFIT PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
   1. Aluminum: 3105-H14 alloy, smooth as per ASTM B209.
   2. Thickness: 040 inch thickness.
   3. Surface: Smooth, flat finish.
   4. Exterior Finish: Two-coat fluoropolymer.
   5. Color: Regal White CR.
   6. Flashing, gutters, and flat stock material: Fabricate in profiles indicated on drawings of same material, thickness, and finish as roof system, unless indicated otherwise.

B. Finish on surfaces:
   1. Exposed surfaces for coated panels: Metal roofing, gutters, ridge caps, drip stiffener, and flashing components shall receive two coat coil applied, baked-on full-strenght (70% resin) fluorocarbon coating system (polyvinylidene fluoride, PVF2), applied by manufacturer's approved applicator. Color shall be as selected by Architect from Manufacturer's standard or designer colors available.
   2. Coating system shall provide nominal 1.0 mil dry film thickness, consisting of primer and color coat.
   3. Color shall be as selected by Architect or Owner from manufacturer's stock colors available and shall match preformed metal roofing color Section 07430.

C. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating.
   1. Fasteners for Roof Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal roof panels.
   2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
   3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

D. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 CONCEALED-FASTENER, LAP-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps.

B. Product: Profile as indicated on Drawings.
   1. Mechanically seamed: Garland Company, Inc.; R-mer Span or accepted equivalent.
   2. Major Rib Height: 2-3/8-inches.

C. Characteristics:
1. Configuration: Standing seams incorporating mechanically interlocked, concealed anchor clips allowing unlimited thermal movement, and of configuration which will prevent entrance or passage of water.
   a. Panel/Cap configuration must have a total of four (4) layers of steel surrounding anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.
   b. Profile of panel shall have mesa's every 1/2" o.c. continuous throughout panel which are a minimum of 1.5" wide. These will absorb thermal stresses, reduce oil canning in panel and increase load carrying capacity.
   c. Exposed fasteners, screws and/or roof mastic is unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap (if required) and trim details (as per manufacturer's guidelines).
   d. Panels must be furnished in continuous lengths from ridge to eave with no overlaps unless approved by manufacturer to length of run.
2. Seam must be 2-3/8" minimum height for added upward pressures and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral (not mechanically sealed) seams are not acceptable.
3. Concealed Anchor Clips: Clips must be 16 gauge stainless steel, alloy 316L ONE (1) piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.
   a. Two-piece (2) clips are NOT acceptable.
   b. Clip design must isolate sealant in panel cap from clip to insure that no sealant damage occurs from the clip during expansion and contraction.
   c. Clip must maintain a clearance of a minimum of 3/8" between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.
4. Seam cap: Snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to 45 feet accordingly to job condition and field seamed by means of manufacturer's standard seaming machine.
   a. Cap shall be designed to receive continuous double bead of hot applied, foamed in place gasketing sealant which will not come in contact with the anchor clip to allow unlimited thermal movement of panel without damage to cap sealant.
   b. Sealant shall be non-fatigue, nitrogen injected water barrier.
5. Standing Seam Panel Width: ~~12-inches~~. **16-inches.**
6. Replaceability: Panels shall be of a symmetrical design with snap on cap configuration such that individual panels may be removable for replacement without removing adjacent panels.
7. Panel ends shall be panned at ridge, headwall, and hip conditions where applicable.

2.6 METAL SOFFIT PANELS

A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
1. Metal Soffit Panel System; Type 1 (only occurs outside building on underside of roof): IMETCO FW-160 Panel; standard flush profile - material:.040" thickness aluminum, 3105-H14 alloy, smooth as per ASTM B209.

2. Metal Soffit Panel System; Type 2 IMETCO 12” W planks with perforations and acoustic backing (Building 1 2nd floor upper Lobby /underside of deck and Building 2 Lobby).
3. Flashing and flat stock material: Fabricate from .040" thick aluminum in profiles indicated on drawings of same material and finish as soffit system, unless indicated otherwise.
4. Exposed surfaces for coated panels:
   a. Two coat coil applied, baked-on full-strength (70% resin) fluorocarbon coating system (polyvinylidene fluoride, PVF2), applied by manufacturer's approved applicator.
   b. Coating system shall provide nominal one point zero (1.0) mil dry film thickness, consisting of primer and color coat.
      1) Color: Bone White 391X035.
   c. Perforation: refer to architectural drawings and manufacturers shop drawings for locations of panel perforations.
   d. Unexposed surfaces for coated panels shall be baked-on polyester coating with .20 - .30 dry film thickness (TDF).

C. Characteristics:
1. Fabrication: Panels shall be factory roll-formed from the specified metal. Field rolled panels will not be allowed.
2. Configuration: Interlocking flush/flat seams incorporating concealed screw type fastener. Concealed clip systems are not acceptable.
3. Panel width: sixteen (16) inch nominal.
4. Panel lengths: Full length without joints to the extent as is practical. For lengths which exceed twenty-five (25) feet, shorter panels may be butted end-to-end (no overlap). End joints shall be staggered.
5. Panels shall be flush and butted to limit reveal to the minimum possible. No vees, messas, or pencil lines shall be accepted.
6. Panels shall be with and without vent perforations according to architectural drawings. Refer to job documents for layout.

D. Accessories:
1. Fasteners:
   a. Concealed fasteners: Corrosion resistant steel screws, #10 x 1" long, pancake head, Phillips drive. Use self-drilling, self-tapping for metal substrate or A-point for plywood substrate.
   b. Exposed fasteners: Series 410 stainless steel screws or one eighth (1/8) inch diameter stainless steel waterproof rivets. All exposed fasteners shall be factory painted to match the color of the soffit panels.
2. Provide all miscellaneous accessories for complete installation.
3. 3/4" high x 24 gauge (minimum) Galvalume steel furring hat sections to soffit structural substrate. Hat sections shall be installed perpendicular to panel seams, and shall be spaced 24" oc. (maximum) to accommodate the panel fastener spacing specified in Part 3 of this Section.

2.7 FABRICATION

A. General: Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

2.8 ACCESSORIES

A. Gable anchor clips: Standing Seam styles galvanized minimum thickness 16 gauge stainless steel.

B. Fasteners:
1. Concealed fasteners: Corrosion resistant steel screws designed to meet structural loading requirements. The normal minimum screw size shall be #12.

C. Closures: Factory pre-cut closed cell foam meeting ASTM D3575-93 a cross-linked closed cell polyolefin foam, enclosed in metal channel matching panels when used at hip and ridge.

D. Panel joint (endlap) sealant: Non-curing modified isobutylene tri-polymer tape of thickness to fully adhere to both surfaces being joined with indicated service life of 30 years.

E. Sealant:
1. Acceptable product:
a. Concealed Application: PT1-707 or Bostik Chem-Calk butyl sealant.
b. Exposed Application: The Garland Company, Tuff Stuff or Equal

F. Underlayment:
1. The Garland Company, R-mer Seal or Equal

G. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including trim, ridge closures, clips, flashings, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.
1. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

2.9 FABRICATION

A. Shop fabricate metal roofing, gutter, and flashing components to the maximum extent possible, forming metal work with clear, sharp, straight, and uniform bends and rises. Hem exposed edges of flashings.

B. Form flashing components and gutters from full single width sheet in minimum 10’-0” sections. Provide mitered corners, joined using closed end pop rivets and joint sealant.

C. Fabricate roofing and related sheet metal work in accord with approved shop drawings and applicable standards.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal recommended by metal roof panel manufacturer. Supply cleats of size recommended by SMACNA's "Architectural

Sheet Metal Manual" or metal roof panel manufacturer for application but not less than thickness of metal being secured.

2.10 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying specified finish.

B. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2605.
      a. Color: As selected by the Architect from manufacturer's standard colors or a custom color to be matched by the siding supplier.

C. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

D. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of work.

B. Examine the alignment and placement of the building structure and substrate. Correct any objectionable warp, waves or buckles in the substrate before proceeding with installation of the preformed metal roofing. The installed roof panels will follow the contour of the structure and may appear irregular if not corrected.

C. Establish straight side and crosswise benchmarks.

D. Use proper size and length fastener for strength requirements. Approximately 5/16” is allowable for maximum fastener head size beneath the panel.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install flashings and other sheet metal to comply with requirements specified in Section 07 6000.

B. Miscellaneous Framing: Install sub-purlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. General: Install underlayment over the entire deck surface as indicated on Drawings.

B. All details will be shown on manufacturer's shop drawings to successful bidder; install roofing and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.

C. Self-Adhering Sheet Underlayment: Install a high-temperature self-adhering sheet underlayment, wrinkle free over entire deck surface.
1. 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.
2. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller.
3. Cover underlayment within 14 days.

3.4 METAL ROOF PANEL INSTALLATION, GENERAL

A. Install 3" x 5" (16 gauge) pre-punched bearing plates with the 16 gauge one piece panel clips as necessary to provide even panel seam height. Bearing plates shall possess two pre-slotted holes and be fastened into the deck.

B. Installation of Roof Panels: Roof panels can be installed by starting from either end and working towards the opposite end. Due to the symmetrical design of the specified panel system, it is also acceptable to start from the middle of the roof and work toward each end.
1. A stainless steel pop rivet shall be secured through the anchor reveal of the panel leg and extend into the arms of the panel clip located at the ridge of the system. This is done at each arm of the clip along the ridge. The panel is then anchored at both sides of the clip.
   a. Be sure to capture all drilling debris during this operation with a rag or cloth placed on the panels at the drilling operation.
2. The seam caps are shipped with two rolls of factory applied hot melt sealant located inside the caps. To install the caps, hook one side of the cap over the panel edge and rotate over the opposite panel leg. For ease of installation, start at one end of the panel and work toward the opposite end.
3. A hand crimping tool is used to crimp the cap around the top of two adjacent panels.
4. Caps shall then be permanently seamed with manufacturers mechanical seamer.

C. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.

D. Limit exposed fasteners to extent indicated on shop drawings.

E. Anchorage shall allow for temperature expansion/contraction movement without stress or elongation of panels, clips, or anchors. Attach clips to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.

F. Seal laps and joints in accordance with roofing system manufacturer's product data.

G. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with standards of SMACNA Manual.

H. Provide temperature expansion/contraction movement of panels at roof penetrations and roof mounted equipment in accordance with system manufacturer's product data and design calculations.

I. Installed system shall be true to line and plane and free of dents, and physical defects with a minimum of oil canning.

J. Form joints in linear sheet metal to allow for ¼" minimum expansion at 20'-0" o.c. maximum and 8'-0" from corners.

K. At joints in linear sheet metal items, set sheet metal items in two ¼" beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.

L. Remove damaged work and replace with new, undamaged components.

M. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

N. Install expansion joints on all gutters exceeding 50'-0" long or a minimum of 1 per 12 units. SMACNA Figure 1-7- Butt Type gutter expansion joint.

3.5 SOFFIT INSTALLATION

A. All details will be shown on manufacturer's shop drawings to successful bidder; install soffit and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.

B. Prepare soffit for the installation of panels, including:
1. Install all sheathing, framing, and/or furring members as indicated in this specification and bid documents.
2. Install all insulation, vapor retarder, and/or air infiltration barriers as indicated in this specification and bid documents.
3. Install all temporary water proofing materials as required in this specification and bid documents.

C. Directly over the completed soffit substrate, install metal soffit panels. All panels will be fastened into the structural substrate with screw type fasteners at twenty-four (24) inches oc. maximum spacing along each panel seam.

D. Seal laps and joints in accordance with roofing system manufacturer's product data.

E. Coordinate flashing and sheet metal work to provide weathertight conditions at soffit terminations. Fabricate and install in accordance with standards of SMACNA Manual.

F. Installed system shall be true to line and plane and free of dents, and physical defects. In light gauge panels with wide flat surfaces, some oil canning may be present. Oil canning does not affect the finish or structural integrity of the panel and is therefore not cause for rejection.

G. Form joints in linear sheet metal to allow for one quarter (1/4) inch minimum expansion at twenty (20) feet zero (0) inch on-center maximum and eight (8) feet zero (0) inch from corners.

H. At joints in linear sheet metal items, set sheet metal items in two (2) one quarter (1/4) inch beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.

I. Remove damaged work and replace with new, undamaged components.

J. Touch up exposed fasteners using paint furnished by soffit panel manufacturer and matching exposed panel surface finish.

K. Clean exposed surfaces of soffit and accessories after completion of installation. Leave in clean condition at date of substantial completion. Touch up minor abrasions and scratches in finish.

3.6 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal roof panel assembly including trim, ridge closures, flashings, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet (1.2 m) oc using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1-inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60-inches (1500 mm) oc in between.
1. Provide elbows at base of downspouts to direct water away from building.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.8 CLEANING

A. Clean exposed surfaces of work promptly after completion of installation. To prevent rust staining on finished surfaces, immediately remove filings produced by drilling or cutting.

B. Clean roofs in accordance with manufacturer’s recommendations.

C. Clean exposed surfaces of roofing and accessories after completion of installation. Leave in clean condition at Date of Substantial Completion for Project. Touch up minor abrasions and scratches in finish.

D. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

E. Remove all scrap and construction debris from the site.

F. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

G. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

H. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.9 FINAL INSPECTION

A. Final inspection will be performed by a firm appointed and paid for by the owner in accordance with general requirements.

END OF SECTION 07 4113

SECTION 07 4213 – 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 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Preformed, concealed fastener, metal wall panels.

B. Parapet coping, column covers, soffits, sills, border, filler items and accessories as integral components of the panel system or as designed.

1.3 RELATED SECTIONS

A. Section 05 4000 - Cold-Formed Metal Framing: Secondary support framing supporting metal wall panels.

B. Section 07 6000 - Flashing and Sheet Metal: Flashings and other sheet metal work not part of metal wall panel assemblies.

C. Section 07 9200 - Joint Sealants: Field-applied sealants not otherwise specified in this Section.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for sustainability requirements related to this Section.

1.5 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leakproof, secure, and non-corrosive installation.

1.6 ACTION SUBMITTALS

A. Product Data: Two copies of manufacturer's literature for panel material.

~~B. Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.~~

B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work. Shop drawings shall contain wind uplift calculations per ASCE 7 -10. Shop drawings shall be completed by the roofing system manufacturer's engineering department and stamped by a licensed professional structural engineer (California).

C. Samples:
1. Panel System Assembly: Two samples of each type of assembly; 12-inches by actual panel width.
2. Two samples of each color or finish selected, 3- by 4-inches (76 mm by 102mm) minimum.

D. LEED Submittals: See Section 01 81 13 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
4. For priming and sealing coatings, including printed statement of VOC content and chemical components.
5. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e., from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
6. GreenGuard Gold Certified Certificate.
7. Declare Label: Manufacture's publicly available Declar Label as included in the declare database https://living-future.org/declare-products.
8. CDPH Standard Method v1.1 testing report.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and professional engineer.

B. Documents showing product compliance with the local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product. Alternate materials must be approved by the architect prior to the bid date.

~~B.~~C. Warranties: Sample manufacturer's 20-year warranty and total system (building envelope) warranty covering metal wall panels, standing seam metal roofing, modified bitumen roofing, soffits, and plaza deck waterproofing for the specified warranty period.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal wall panels to include in maintenance manuals.

B. Warranty: ~~S~~Executed special ~~warranty~~ warranties specified in this Section.

1.9 QUALITY ASSURANCE

A. Metal Panel Manufacturer: Minimum of 15 years' experience in the manufacturing of this product and be solely responsible for panel manufacture and application of Kynar finish.

B. Fabricator/Installer shall have a minimum 5 years' experience of metal panel work similar in scope and size to this project and be an employer of workers trained and approved by manufacturer.

C. Source Limitations: ~~Obtain each type of metal wall panel from single source from single manufacturer.~~ Obtain each type of metal wall panel, low slope roofing, and metal roof panel from a single manufacturer.

D. Engineering Responsibility: Prepare data for wall panel systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

E. Shop drawings shall show the preferred joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E331.

F. Maximum deviation from vertical and horizontal alignment of erected panels: 1/4-inch (6 mm) in 20-feet (6 m) non-cumulative.

G. Panel fabricator/installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

1.10 PRE-INSTALLATION CONFERENCE

A. Meet with Owner, Architect, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.

B. Conduct conference at Project site. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
5. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
6. Review temporary protection requirements for metal wall panel assembly during and after installation.
7. Review wall panel observation and repair procedures after metal wall panel installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage. Protect finish and edges in accordance with panel manufacturer's recommendations. Secure against damage from wind.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

1.12 SITE CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

C. Coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of work. Field fabrication may be allowed on a case-by-case basis, subject to approval by the Architect, to ensure proper fit. Keep field fabrication to an absolute minimum; perform the majority of the fabrication under controlled shop conditions.

1.13 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material 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 must cover the calculated wind speed. No third-party insurance riders are acceptable.
~~2.~~3. Sole source manufacturers building envelope warranty to include: metal wall panels, metal roof panels, modified bitumen roofing, and soffits.
~~3.~~4. Warranty Period: 20 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 composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Provide metal panels having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. GreenGuard Gold Certified
3. Type III Environmental Product Declaration.

4. Declare Label.

2.2 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 1592:
1. Wind Loads: As indicated on Structural Drawings.
2. Other Design Loads: As indicated on Structural Drawings
3. Deflection Limits: As indicated on Structural Drawings.

B. Wind Uplift Resistance: Provide metal wall panel assemblies that comply with wind-uplift-resistance class indicated. (C.1.) Uplift Rating: verify panel meets uplift requirements using ASCE 7-10.

C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

F. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 CONCEALED-FASTENER METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Basis-of-Design Product: The design for the metal wall panels is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: IMETCO . Latitude Series.
~~2. Morin; a Kingspan Group Company; C-29-7/8.~~
~~3. Metal Sales Manufacturing Corporation.~~
~~4.~~2. Accepted equivalent.

C. Corrugated Profile, Concealed-Fastener Metal Wall Panels:
1. Aluminum Plate: ASTM B209, alloy and temper as recommended by manufacturer for application. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
2. LEED Criteria:
a. CDPH Standard Method V1.1 compliant
b. GreenGuard Gold Certified

c. Type III Environmental Product Declaration.
d. Declare Label.

3. Panel Coverage: As indicated on Drawings.
4. Panel Depth: As indicated on Drawings.
5. Nominal Thickness: 0.050 inch (16 Gauge) (1.27 mm).
6. Texture: Smooth.
7. Exterior Finish: Three-coat fluoropolymer.
8. Color: Imetco Epic Bronze.

2.4 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. Panels and Accessories: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2605.
a. Color: As selected by the Architect from manufacturer's standard colors or a custom color to be matched by the wall panel supplier.

D. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.5 ACCESSORIES

A. Wall Panel Accessories: Provide accessories as required for a complete installation. Accessories shall be as indicated on approved shop drawings and per manufacturer's approved standard details. Match material and finish of metal wall panels.
1. Fasteners: Concealed.
2. Closure Strips:
a. Closed Cell Closure Strips: Provide minimum 1 inch thick matching metal wall panel profile.
b. Metal Profile Closure Strips: Shall be fabricated from same gauge, material and finish as metal panel.

B. Underlayment: See Section 072727 – Self-Adhering Air and Water Barrier.

~~B.~~C. Trim:
1. Locations include, but are not limited to the following: Drips, sills, jambs, corners, framed openings, parapet caps, reveals and fillers.

~~C.~~D. Metal Framing:
1. General: ASTM C645, cold-formed metallic-coated steel sheet, ASTM A653, G60 hot-dip galvanized.
2. Hat-Shaped, Rigid Furring Channels:

a. Nominal Thickness: 16 gauge unless indicated otherwise on Drawings.
b. Depth: As indicated on Drawings.

3. Cold-Rolled Furring Channels: Minimum 1/2-inch wide flange.
a. Nominal Thickness: 16 gauge unless indicated otherwise on Drawings.
b. Depth: As indicated on Drawings.

~~D.~~E. Panel Sealant:

1. Joint Sealant: ASTM C920 as recommended in writing by metal wall panel manufacturer for installation at joints between wall panels and adjacent building components.
2. Sealant Tape: Not required for rainscreen installation. Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/8 inch wide and 1/8 inch thick.
3. Butyl-Rubber-Based, Solvent-Release Sealant: Not required for rainscreen installation. ASTM C1311.

2.6 FABRICATION

A. Metal wall panels shall be formed to lap with edges of adjacent panels which are then mechanically attached through panel supports using fasteners with a neoprene washer.

B. Fabricate metal wall panels to eliminate condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Panels shall be factory formed. Field formed panels are not acceptable.

D. Trim Accessories: Fabricate steel trim accessories to comply with recommendations outlined in SMACNA's "Architectural Sheet Metal Manual".

E. Mitered Corners: Structurally bonded horizontal outside or inside trimless corners matching metal wall panel material, profile and factory applied finish shall be fabricated by metal wall panel manufacturer.
1. Welded, riveted or field fabricated corners are not acceptable and will be rejected.
2. Basis of Design: Morin Miterseam Corners (12” x 12”)

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect surfaces and structure to receive panels to verify substrates are even, smooth, sound, clean, dry and free from defects detrimental to work. Notify Contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.
1. Verify field dimensions and alignment of the structural members to assure that the wall panel system can be installed straight and true.
2. Identify any conditions which may adversely affect the appearance and performance of the installed wall panel system.

B. Surfaces to receive panels shall be structurally sound as determined by a registered Architect/Engineer.

C. Examine primary and secondary 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.

D. Examine rough-in components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Erect panels plumb, level, and true, in orientation indicated on Drawings.

B. Install metal wall panels in accordance with approved layout drawings under the direct supervision of an experienced sheet metal craftsman trained in the installation of the product. Install flashing and trim in strict accord with the recommended practice of AA; NRCA, and SMACNA sheet metal manuals.

C. Completed work shall be plumb, true and free of dents. Panel ribs shall be on the module indicated on the approved layout drawings and within the tolerance as set forth in the Metal Construction Association “Preformed Metal Guidelines” and allowed by the actual construction dimensions. Excess sealant shall be removed. Any panels that are badly damaged and in the judgment of the Architect cannot be repaired shall be removed from the jobsite and replaced with acceptable material.

D. Panel lengths are to be continuous and only have lap joints where specifically shown on the design drawings.

E. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F. Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted.

F. Anchor panels securely according to engineering recommendations and in accordance with approved Shop Drawings to allow for necessary thermal movement and structural support.

G. Conform to panel fabricator's instructions for installation of concealed fasteners.

H. Do not install component parts that are observed to be defective, including; warped, bowed, dented, abraised, and broken members.

I. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.

J. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

3.3 FLASHING INSTALLATION

A. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners , and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24-inches (600 mm) of corner or intersection.

D. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 SEALANT INSTALLATION FOR EXPOSED JOINTS

A. Clean and prime surfaces to review exterior exposed sealants in accordance with sealant manufacturer’s recommendations.

B. Follow sealant manufacturer’s recommendations for joint width-to-depth ratio, application temperature range, size and type of backer rod, and compatibility of materials for adhesion.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4-inch in 20 feet (6 mm in 6 m), non-cumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

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

B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than 6.24 lbf/sq. ft. (300 Pa).

C. Water-Spray Test: After completing the installation of 50-foot by full heigh minimum area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test completed metal wall panel installation, including accessories.

E. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 ADJUSTING

A. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.

B. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

D. Remove masking (if used) as soon as possible after installation. Masking intentionally left in place on any panel after panel installation, shall become the responsibility of the General Contractor.

3.8 CLEANING

A. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.9 PROTECTION

A. Any additional protection, after installation, shall be the responsibility of the General Contractor.

END OF SECTION 07 4213

SECTION 07 4646 – FIBER-CEMENT BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fiber-cement boards.

1.3 RELATED SECTIONS

A. Section 07 6000 - Flashing and Sheet Metal: Flashing and other sheet metal work.

B. Section 07 9200 - Joint Sealants.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 SEQUENCING

A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Verification: For each type, color, texture, and pattern required.
1. 12-inch- (300-mm-) long-by-actual-width sample of fiber-cement board.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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. Furnish 2 percent of amount installed.

1.8 QUALITY ASSURANCE

A. Labeling: Provide fiber-cement board that is tested and labeled according to ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.

B. Source Limitations for Cementitious Panels: Obtain each type, color, texture, and pattern of cementitious panel, including related accessories, through one source from a single manufacturer.

1.9 PRE-INSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this section, under provisions of Section 01 3119. Conference shall be attended by Contractor, Owner, Architect, fiber-cement board subcontractor and his foreman, and a representative of fiber-cement board materials manufacturer.

B. Agenda shall include, but not be limited to the following:
1. Review of preparation and installation procedures.
2. Fiber-cement board and flashing details including conflicts with manufacturer's specifications.
3. Coordination of flashing details at juncture with existing openings.
4. Establishment of schedules and work methods which will prevent damage to adjacent existing construction designated to remain.
5. Designation of area on job site to be used as work and storage location.
6. Establishment of weather and working conditions to which all parties agree.
7. Establishment of requirements pertaining to temporary protection of exterior wall substrates which have been prepared for and are awaiting application of fiber-cement board.
8. Other business relating to Work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store materials in a dry, well-ventilated, weathertight place.

1.11 SITE CONDITIONS

A. Weather Limitations: Proceed with fiber-cement board installation only if substrate is completely dry and if existing and forecasted weather conditions permit fiber-cement board to be installed according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT MATERIAL

A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E136; with a flame-spread index of 25 or less when tested according to ASTM E84.
1. Basis-of-Design Product: The designs for the metal wall panel systems are based on the manufacturer identified below:
a. Basis-of-Design: Swiss Pearl, configuration as indicated on Drawings.
b. CertainTeed Corp.
c. Accepted equivalent.
2. Panel Pattern: As indicated on Drawings.
3. Surface Texture: Smooth.
4. Factory Priming: Manufacturer's standard acrylic primer.
5. Finish and Color: Factory-painted, Carat Sapphire 7060.

2.2 ACCESSORIES

A. Fiber-Cement Board Accessories: Provide starter strips, edge trim, corner cap, and other items as recommended by fiber-cement board manufacturer for building configuration.
1. Provide accessories made from same material as adjacent fiber-cement board, unless otherwise indicated.

2. Provide accessories matching color and texture of adjacent fiber-cement board, unless otherwise indicated.

B. Elastomeric Joint Sealant: Single-component urethane joint sealant complying with requirements in Section 07920 for Use NT (nontraffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

C. Fasteners:
1. For fastening fiber-cement board, use hot-dip galvanized stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement board. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with fiber-cement board manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply. Overlap joints to shed water away from direction of prevailing wind.

3.4 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.5 INSTALLATION

A. Installation Method: Rainscreen. 7/8” galvanized furring channels installed vertically at 16” oc. See details.

B. General: Comply with fiber-cement board manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
1. See James Hardie HZ-10 Best Practices-Installation Guide for Siding and Trim Products, Version 8.2, May 2014.

C. Pre-drill nail holes if required to prevent breakage. Use a masonry bit when drilling fiber cement products.

D. Touch-up all field cut edges before installing.

E. Allow space between both ends of fiber-cement boards that butt against trim for thermal movement; seal joint between panel and trim with exterior grade sealant.

F. Joints in Horizontal Fiber-Cement Boards: Avoid joints in lap except at corners; where joints are required, stagger between successive courses. Overlap joints to shed water away from direction of prevailing wind.

G. Install sheet metal flashing above door and window casings and horizontal trim in field of fiber-cement board as indicated on Drawings.

H. Joint Treatment: Follow manufacturer's written instructions.
   1. Butt Joints in Horizontal Fiber-cement board: Avoid butt joints in lap fiber-cement board where possible; where joints are inevitable, stagger joints between successive courses. Follow manufacturer's installation instructions for treatment of butt joints. Ensure butt joints always land over a stud.
   2. Joint flashing is required behind all butt joints, typical. Extend 1" onto the lap fiber-cement board course below, typical.
   3. A 1/4" minimum clearance must be maintained between fiber-cement board and trim products and any horizontal flashing.

I. Do not install fiber-cement board less than 6 inches (150 mm) from surface of ground nor closer than 1 inch (25 mm) to roofs, patios, porches, and other surfaces where water may collect.

J. After installation, seal joints in accordance with manufacturer's installation instructions. Seal around all penetrations. Paint all exposed cut edges.

3.6 ADJUSTING

A. Remove damaged, improperly installed, or otherwise defective fiber-cement board materials and replace with new materials complying with specified requirements.

B. Leave installed fiber-cement board in clean condition, ready to receive paint finish.

3.7 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 07 4646

SECTION 07 5200 – COLD-APPLIED ASPHALT ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Cold-applied 2-ply solvent free asphalt roofing at Canopy.

B. Insulation installed with roofing system.

1.3 RELATED SECTIONS

A. Section 06 1053 – Miscellaneous Rough Carpentry: Wood nailers, curbs, and blocking.

B. Section 07 2100 – Building Insulation: Insulation beneath the roof deck.

C. Section 07 3113 – Asphalt Shingles.

D. Section 07 3216 – Concrete Roof Tiles

E. Section 07 4113 – Metal Roof Panels.

F. Section 07 6000 - Flashing and Sheet Metal: Metal roof penetration flashings, flashings, and counterflashings.

G. Section 07 9200 - Joint Sealants.

1.4 REFERENCES

A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.

C. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.

D. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

E. ASTM D 2822 Standard Specification for Asphalt Roof Cement.

F. ASTM D 4601 Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.

G. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

H. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

I. ASTM D 6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.

J. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

K. Factory Mutual Research (FM): Roof Assembly Classifications.

L. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

M. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

N. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.

O. Warnock Hersey (WH): Fire Hazard Classifications.

P. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

Q. ASCE 7, Minimum Design Loads for Buildings and Other Structures

R. UL - Fire Resistance Directory.

S. FM Approvals - Roof Coverings and/or RoofNav assembly database.

T. FBC - Florida Building Code.

U. Miami-Dade Building Code Compliance - N.O.A. (Notice of Acceptance).

V. California Title 24 Energy Efficient Standards.

1.5 DESIGN / PERFORMANCE REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Exterior Fire Test Exposure: Roof system shall achieve a UL, FM or WH Class rating for roof slopes indicated on the Drawings as follows:
1. Factory Mutual Class A Rating.
2. Underwriters Laboratory Class A Rating.
3. Warnock Hersey Class A Rating.

C. Design Requirements:
1. Uniform Wind Uplift Load Capacity
a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
1) Design Code: ASCE 7, Method 2 for Components and Cladding.
2) Importance Category: III.
3) Importance Factor of: 1
4) Wind Speed: 120 mph
5) Ultimate Pullout Value: 574 pounds per each fastener.
6) Exposure Category: B.

7) Design Roof Height: 20 feet.
8) Roof Pitch: 1/4":12".

2. Live Load: 20 psf, or not to exceed original building design.
3. Dead Load:
   a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.

D. Energy Star: Roof System shall comply with the initial and aged reflectivity required by the U.S. Federal Government's Energy Star program.

E. Roof system shall have been tested in compliance with the following codes and test requirements:
1. Underwriters Laboratories:
   a. Certification TGFU.R
2. Warnock Hersey
   a. ITS Directory of Listed Products
3. FM Approvals:
   a. RoofNav Website

1.6 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
1. Base flashings, cants, and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.
4. Insulation fastening patterns.
5. Shop Drawings shall be signed and stamped by a licensed CA engineer.

C. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. For roof materials, indicating that roof materials comply with Solar Reflectance Index (SRI) requirement.
   a. Provide drawings of roof highlighting locations of specific roof materials and systems.
   b. Indicate total area of installed SRI compliant roofing materials.
   c. Provide a list of installed roofing materials and their SRI values.
2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

1.7 INFORMATIONAL SUBMITTALS

A. Cool Roof Certification: Certification of Compliance with Title 24 Part 6 Section 118 California Energy Code. Reflectance; product shall have a minimum initial reflectance of at least 0.70 when tested in accordance with CRRC-1, ASTM E903 and emissivity at least 0.75 when tested in accordance with CRRC-1, ASTM E408.

1. Provide R-value in accordance with Table 143-A of 2005 Energy Commission Efficiency Standards for Nonresidential Buildings (adopted pursuant to Assembly Bill 970, Statutes of 2000).

B. Qualification Data: For Installer and manufacturer.

C. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins. Report shall be signed and sealed by a Professional Engineer registered in the State of the Project who has provided roof system attachment analysis for not less than 5 consecutive years.

D. Any material submitted as equal to or better than the specified material must be accompanied by a report signed and sealed by a professional engineer licensed in the state in which the installation is to take place. This report shall show that the submitted equal meets the Design and Performance criteria in this specification. Material substitutions may only be submitted by prime bidding contractors. Substitution requests submitted without a licensed engineer stamp or by non-prime bidding contractors will be rejected for non-conformance.

E. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.

F. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at 0 deg. F will not be considered.

G. Manufacturer's Fire Compliance Certificate: Certify that the roof system furnished is approved by Factory Mutual (FM), Underwritters Laboratories (UL), Warnock Hersey (WH) or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

H. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

I. Specimen Warranty: Provide an unexecuted copy of the 30 year No Dollar Limit water tight warranty covering every part of the Built-Up Roofing system specified for this project. Warranty sample shall be sole source including modified bitumen, coping and edge metal, metal roof panels, and soffit panels.

1.8 CLOSEOUT SUBMITTALS

A. Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

B. Litigation and settlements: provide a notarized statement from a corporate officer stating roofing system manufacture has not settled litigation or paid fines to a public agency in excess of $20 million dollars.

C. Maintenance Data: For roofing system to include in maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.9 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and a certified Pre-Approved Garland Contractor.

C. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.

D. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last ten years.

E. Source Limitations: Obtain all components of roof system from a single manufacturer. All modified bitumen, metal wall panels, edge metal, and metal roof panels are part of the roof system and must be sole sourced. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

F. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
   1. Exterior Fire-Test Exposure: Class A; ASTM E108, for application and roof slopes indicated.

G. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

H. Manufacturers Field Inspections: Provide a notarized statement from the roofing system manufacturer, signed by an officer of the corporation stating that the roof system manufacturer will provide filed inspections three times a week during the entire period of installation until all construction is completed and to be performed by a full time employee of the manufacturer at no additional cost to the owner.

1.10 PRE-INSTALLATION MEETINGS

A. Convene a pre-installation conference two weeks prior to commencing work of this Section. Conduct conference at Project site. Conference shall be attended by Contractor, Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer and his foreman, roofing system manufacturer's representative, deck Installer and his foreman, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.

B. Agenda shall include, but not be limited to the following:
   1. Review preparation, methods and procedures related to roofing installation, including manufacturer's written instructions.

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. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review structural loading limitations of roof deck during and after roofing.
5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
6. Examine roof and flashing details for conflicts with manufacturer's specifications.
7. Coordinate flashing details at roof penetrations and edge conditions.
8. Review code conflicts with UL, FMG, or other requirements.
9. Review governing regulations and requirements for insurance and certificates if applicable.
10. Establishment of trade related job schedules, including installation of roof mounted equipment.
11. Establishment of schedules and work methods which will prevent roof damage.
12. Coordination of penetrations, curbs and walls on roof to be in place prior to roof installation.
13. Designation of area on job site to be used as work and storage location.
14. Establishment of weather and working conditions to which all parties agree.
15. Establishment of requirements for temporary roofing during installation.
16. Enactment of provisions for monitoring roof installation after completion and prior to acceptance of entire project.
17. Review roof observation and repair procedures after roofing installation.
18. Other business relating to Work.

C. Inspect and make notes of job conditions prior to installation:
1. Record minutes of the conference and provide copies to all parties present.
2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface. No wet or damaged materials will be used in the application.

D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

F. Adhesive storage shall be between the range of above 40 degree F (4 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.12 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.13 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.14 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of total roofing system that fail in materials, fabrication, or installation within specified warranty period. Failure includes roof leaks.

B. Upon completion of the work, provide the Manufacturer's written and signed NDL Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installing contractor, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition.
   1. Warranty Details:
      a. Warranty shall cover the calculated wind speed of 120 mph.
      b. All components of the new roof system to building envelope system including: metal wall panels, primer, mastic, mesh, coatings, modified sheets, fluoropolymer-coated sheet metal, ANSI-SPRI ES-1 edge metal, metal roof panels, and metal soffit panels shall be manufactured by a single source manufacturer and covered under a sole source warranty.
   2. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards, substrate board, vapor retarder, walkway products, and other components of roofing system.
   3. Warranty Period: 30 years from date of Substantial Completion.

C. Special Installer's Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section.
   1. Include all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, and walkway products, and other components of the roofing systems.
      a. Warranty Period: 5 years from date of acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Garland Company, Inc. (The), which is located at: 3800 E. 91st St.; Cleveland, OH 44105; Toll Free Tel: 800-321-9336; Tel: 216-641-7500; Fax: 216-641-0633; Local Representative – Doug Clark - Email: dclark@garlandind.com (925) 784-6701; or accepted equivalent.

B. The Products specified are intended and the Standard of Quality for the products required for this project. If other products are proposed the bidder must disclose in the bid the manufacturer and the products that they intend to use on the Project.

1. Any materials substituted must be equal to the performance requirements listed in this specification. If no manufacturer and products are listed, the bid may be accepted only with the use of products specified.
2. Bidder will not be allowed to change materials after the bid opening date.
3. If alternate products are included in the bid, the products must be equal to or exceed the products specified. Supporting technical data shall be submitted to the Architect/ Owner for approval prior to acceptance.
4. In making a request for substitution, the Bidder/Roofing Contractor represents that it has:
    a. Personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
    b. Will provide the same guarantee for substitution as for the product and method specified.
    c. Will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
    d. Will waive all claims for additional cost related to substitution, which consequently become apparent.
    e. Cost data is complete and includes all related cost under his/her contract or other contracts, which may be affected by the substitution.
    f. Will reimburse the Owner for all redesign cost by the Architect for accommodation of the substitution.
5. Architect/ Owner reserves the right to be the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that has met ALL specified requirement criteria.
6. Failure to submit substitution package, or any portion thereof requested, will result in immediate disqualification and consideration for that particular contractors request for manufacturer substitution.
7. Substitution requests must be made ten (10) days prior to bid date. Any substitutions made after the 10 day period will not be reviewed or accepted.

2.2 COLD APPLIED 2-PLY SOLVENT FREE ASPHALT ROOFING

A. Base (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
    1. FlexBase 80:

B. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with interplay adhesive.
    1. StressPly E FR Mineral with Sunburst

C. Interply Adhesive: (Layer 1 and 2)
    1. Green-Lock Membrane Adhesive:

D. Flashing Base Ply: One ply bonded to the prepared substrate with Interply Adhesive: except torch sheet.
    1. FlexBase 80:

E. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive: except torch sheet.
    1. StressPly E FR Mineral:

F. Flashing Ply Adhesive:
    1. Green-Lock Flashing Adhesive:

G. Surfacing: Requires 5-7 days wait before applying.
    1. Surface Coatings
        a. Pyramic:

b. White-Star:

H. Rocks: . Mexican Red Pebble matching Architect's sample. Stone ballast shall be smooth, water-worn pebbles with rounded edges and corners, relatively free of fractures, loam, sand or other foreign substances and contain no more than 4% fines. Stone ballast size shall conform to ASTM D448 size #2 using ASTM C136 method of testing.

2.3 SUBSTRATE BOARDS

A. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum substrate, Type X, 5/8-inch (16 mm) thick.
1. Product: Subject to compliance with requirements, provide "Dens-Deck" by Georgia-Pacific Corporation, no known equal.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates, corrosion-resistant, designed for fastening substrate panel to roof deck.

2.4 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation:
1. Acceptable Manufacturers:
a. Dow Roofing Systems.
b. Firestone Building Products Company.
c. GAF Materials Corporation.
d. Johns Manville International, Inc.
e. Accepted equivalent.

C. Polyisocyanurate Foam Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facing on both major surfaces.
1. Thermal Resistance: R-value: As indicated on Drawings.
2. Board Width: Maximum width as required for application.
3. Thickness: As indicated on Drawings.
4. Facing: Black (non-asphaltic) fiber-reinforced felt face both sides.
5. Flame Spread Rating: 25 or less.

D. Fiberglass-Mat Faced Gypsum Cover Board:
1. Product: G-P Gypsum DenDeck Prime, G-P Gypsum DenDeck DuraGuard, USG Securrock for proper adhesion of the self-adhered base sheet.
2. Thermal Resistance: R-Value: ASTM C518; as indicated on Drawings.
3. Surfacing: Fiberglass mat.
4. Water Absorption: ASTM C1177/C1177M; Less than 10 percent of weight.

E. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4-inch per 12-inches (1:48), unless otherwise indicated.

F. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 ACCESSORIES

A. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel, Fasteners shall be self-clinching type of penetrating type as recommended by the deck manufacturer. Fasten nails and fasteners flush-driven through flat metal discs not less than 1 inch (25 mm) diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than 1 inch (25 mm) diameter are used.

B. Sealant - Green-Lock Structural Adhesive: Single component, 100% solids structural adhesive as furnished and recommended by the membrane manufacturer.
1. Elongation, ASTM D 412: 300%
2. Hardness, Shore A, ASTM C 920: 50
3. Shear Strength, ASTM D 1002: 300 psi

2.6 EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

A. Vents and Breathers: Heavy gauge aluminum and fully insulated vent that allows moisture and air to escape but not enter the roof system as recommended and furnished by the membrane manufacturer.

B. Drain Flashings should be 4lb (1.8kg) sheet lead formed and rolled.

C. Plumbing stacks should be 4lb (1.8kg) sheet lead formed and rolled.

D. Fabricated Flashings: Fabricated flashings and trim are specified in Section 07 6000.
1. All metal trim to be supplied by Imetco to meet ANSI-SPRI ES-1

E. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are specified in Section 07 6000.
1. Manufactured roof specialties shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the NRCA "Roofing and Waterproofing Manual" as applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. General: Clean surfaces thoroughly prior to installation.
1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.
4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.
5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.
7. Prime decks where required, in accordance with requirements and recommendations of the primer and deck manufacturer.

B. Poured reinforced concrete
1. Shall be smooth, dry, clean and free of ice/frost, projections and depressions. Concrete shall be fully cured and the surface shall be broom cleaned and free of release/curing agents prior to commencement of work.
2. Prepared concrete surfaces for roofing or insulation by priming with asphalt/concrete primer conforming to ASTM D 41. Apply at a rate of approx. 1 gallon/100 sq. ft. (.4 L/m2). All primed areas shall be fully dried before proceeding with the application of the roof system. Hold back bitumen at the joints approximately 4 inches (102 mm) to prevent bitumen drippage.

3.3 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water

D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated

systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION COLD APPLIED ROOF SYSTEM

A. Modified Cap Ply(s): Cut cap ply sheets into 18 foot lengths and allow plies to relax before installing. Install in interplay adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plys specified. Shingle in proper direction to shed water on each large area of roofing.
   1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
   2. Solidly bond to the base layers with specified cold adhesive at the rate of 2 to 2-1/2 gallons per 100 square feet.
   3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
   4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the underlayers but the laps shall not coincide with the laps of the base layers.
   5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
   6. Extend membrane 2 inches beyond top edge of all cants in full moppings of the cold adhesive as shown on the Drawings.

B. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.

C. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as specified in Section 06 1053.
   1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
   2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
   3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
   4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.

D. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07 6000. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

E. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches (203 mm) o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.

F. Flashing Base Ply: Install flashing sheets by the same application method used for the base ply.
   1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.

2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Solidly adhere the entire flashing ply to the substrate. Secure the tops of all flashings that are not run up and over curb through termination bar fastened at 6 inches (152 mm) O.C. and sealed at top.
5. Seal all vertical laps of flashing ply with a three-course application of trowel-grade mastic and fiberglass mesh.
6. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
7. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

G. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the base ply.
1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
6. All stripping shall be installed prior to flashing cap sheet installation.
7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

H. Surface Coatings: Apply roof coatings in strict conformance with the manufacturer's recommended procedures.

I. Roof Walkways: Provide walkways in areas indicated on the Drawings.

3.5 INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

A. Scupper Through Wall (Overflow):
1. Inspect the nailer to assure proper attachment and configuration.
2. Run one ply over nailer up the overflow, into the scupper hole and up flashing as in typical wall flashing detail. Assure coverage of all wood nailers.
3. Install scupper box in a 1/4 inch (6 mm) bed of mastic. Assure all box seams are soldered and have a minimum 4 inch (101 mm) flange. Make sure all corners are closed and soldered. Prime scupper at a rate of 100 square feet per gallon and allow to dry.

4. Fasten flange of scupper box every 3 inches (76 mm) o.c. staggered.
5. Strip in flange scupper box with base flashing ply covering entire area with 6 inch (152 mm) overlap on to the field of the roof and wall flashing.
6. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all seams.

B. Coping Cap:
1. Minimum flashing height is 8 inches (203 mm) above finished roof height. Maximum flashing height is 24 inches (609 mm). Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Attach tapered board to top of wall.
4. Install base flashing ply covering entire wall and wrapped over top of wall and down face with 6 inches (152 mm) on to field of roof and set in cold asphalt. Nail membrane at 8 inches (203 mm) o.c.
5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all seams and allow to cure and aluminize.
6. Install continuous cleat and fasten at 6 inches (152 mm) o.c. to outside wall.
7. Install new metal coping cap hooked to continuous cleat.
8. Fasten inside cap 24 inches (609 mm) o.c. with approved fasteners and neoprene washers through slotted holes, which allow for expansion and contraction.

C. Surface Mounted Counterflashing/Coping Cap:
1. Minimum flashing height is 8 inches (203 mm) above finished roof height. Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering wall set in bitumen with 6 inches (152 mm) on to field of roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all seams and allow to cure and aluminize.
5. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall. Alternatively use caulk to replace the butyl tape.
6. Secure counterflashing set on butyl tape above flashing. Fasten 8 inches (203 mm) o.c. and caulk top of counterflashing.
7. Attach tapered board to top of wall (minimum slope 1/4 -12). Do not use organic fiberboard or perlite.
8. Cover tapered board and all exposed wood with base flashing ply. Fasten inside and out at 8 inches (203 mm) o.c.
9. Install continuous cleat and fasten at 6 inches (152 mm) o.c. to outside wall.
10. Install new metal coping cap hooked to continuous cleat.
11. Fasten inside of cap 24 inch (609 mm) o.c. with approved fasteners and neoprene washers.

D. Expansion Joint:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Chamfer top of curb. Prime vertical curb at a rate of 100 square feet per gallon and allow to dry.
2. Mechanically attach wood cant to expansion joint nailers. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install compressible insulation in neoprene cradle.
4. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Attach top of membrane to top of curb and

nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.

6. Install pre-manufactured expansion joint cover. Fasten sides at 12 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.

E. Curb Detail/Air Handling Station:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

F. Roof Drain:
1. Plug drain to prevent debris from entering plumbing.
2. Taper insulation to drain minimum of 24 inches (609 mm) from center of drain.
3. Run roof system plies over drain. Cut out plies inside drain bowl.
4. Set lead/copper flashing (30 inch square minimum) in 1/4 inch bed of mastic. Run lead/copper into drain a minimum of 2 inches (50 mm). Prime lead/copper at a rate of 100 square feet per gallon and allow to dry.
5. Install base flashing ply (40 inch square minimum) in bitumen.
6. Install modified membrane (48 inch square minimum) in bitumen.
7. Install clamping ring and assure that all plies are under the clamping ring.
8. Remove drain plug and install strainer.

G. Plumbing Stack:
1. Minimum stack height is 12 inches (609 mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of 1 inch (25 mm) down inside of stack.

3.6 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.7 FIELD QUALITY CONTROL

A. Inspection: Provide manufacturer's field observations a minimum of 3 times per week. Provide a final inspection upon completion of the Work.
   1. Warranty shall be issued upon manufacturer's acceptance of the installation.
   2. Field observations shall be performed by a Technical Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve membrane installations for the manufacturer.
   3. Provide observation reports from the Technical Representative indicating procedures followed, weather conditions and any discrepancies found during inspection.
   4. Provide a final report from the Technical Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

3.8 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.9 SCHEDULES

A. Base (Ply) Sheet and Flashing Base Sheet:
   1. FlexBase 80: 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.
      a. Tensile Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 225 lbf/in XD 225 lbf/in
      b. Tear Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
      c. Elongation at Maximum Tensile, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 2.5 % XD 7 %
         2) 50mm/min@ 23 +/- 2 deg. C MD 2.5 % XD 7 %
      d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-28.8 deg. C)

B. Modified Cap (Ply) Sheet and Flashing Cap Sheet:
   1. StressPly E FR Mineral: 160 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced, rubber modified roofing membrane with combination of polyester and fiberglass reinforced scrim. ASTM D6163, Type III Grade S
      a. Tensile Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 500 lbf/in XD 5500 lbf/in
      b. Tear Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 900 lbf XD 950 lbf
      c. Elongation at Maximum Tensile, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. FMD 6.0% XD 6.0%
      d. Low Temperature Flexibility, ASTM D 5147, Passes -40 deg. F (-34 deg. C)

C. Interply Adhesive:
   1. Green-Lock Membrane Adhesive: Cold applied solvent free membrane adhesive: zero V.O.C. compliant performance requirements:
      a. Non-Volatile Content ASTM D 4586 100%
      b. Density ASTM D 1475 11.4 lbs./gal. (1.36 g/m3)
      c. Viscosity Brookfield 20,000-50,000 cPs.

d. Flash Point ASTM D 93 400 deg. F min. (232 deg. C)
e. Slope: up to 3:12

D. Flashing Ply Adhesive:
1. Green-Lock Flashing Adhesive: Cold applied solvent free flashing adhesive: zero V.O.C.
a. Non-Volatile Content ASTM D 4586 100%
b. Density ASTM D 1475 11.8 lbs./gal. (1.17 g/m3)
c. Viscosity Brookfield 400,000 cPs.
d. Flash Point ASTM D 93 400 deg. F min. (232 deg. C)

E. Surfacing:
1. Surface Coatings:
a. Surfacing:
1) Pyramic: White elastomeric roof coating, Energy Star approved acrylic roof coating:
2) Weight/Gallon 12 lbs./gal. (1.44 g/cm3)
3) Non-Volatile % (ASTM D 1644) 66 min
4) Reflectance 81%
2. Flood Coat/Aggregate:
a. White-Star with All-Knight Primer: Polyurea flood coat adhesive: White Star; one-component, flexible, low odor, polyurea roof adhesive top coat. Performance Requirements:
1) Non-Volatile Content ASTM D 2369 89%
2) Density 9.85 lbs./gal.
3) V.O.C. Less than 130 g/L
4) Viscosity at 77 deg. F Brookfield viscometer 60 poise
5) Flash Point ASTM D 93 120 deg. F (41 deg. C)
6) Roofing Aggregate: ASTM D 1863 3/8” Title 24 approved white rock.

END OF SECTION 07 5200

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SECTION 07 6000 – FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Metal flashings of the following types:
1. Metal flashing and counter flashings.
2. Exposed metal trim/fascia units.
3. Reglets.
4. Copings.
5. Roof drainage components including scuppers, downspouts, and splash pans.
6. Through-wall flashings.
7. Preformed flashing sleeves.
8. Equipment support flashings.

B. Miscellaneous sheet metal accessories.

1.3 RELATED SECTIONS

~~A. Section 07 5423 – Thermoplastic-Polyolefin Roofing: Integral flashings installed as part of TPO roofing system.~~

A. Section 07 3113 - Asphalt Shingles

B. Section 07 3216 - Concrete Roof Tiles

C. Section 07 4113 - Metal Roof Panels

D. Section 07 5200 - Cold Applied Asphalt Roofing

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

~~A. Steel Sheet Thicknesses: Thickness dimensions, are minimums as defined in referenced ASTM standards for metallic-coated (galvanized) steel sheets. Metal thicknesses indicated below correspond to former gauge thicknesses:~~
~~1. 16 Gauge: 0.053-inch (1.3-mm).~~
~~2. 18 Gauge: 0.042-inch (1.0-mm).~~
~~3. 20 Gauge: 0.040-inch (1.02-mm).~~
~~4. 22 Gauge: 0.034-inch (0.85-mm).~~
~~5. 24 Gauge: 0.028-inch (0.71-mm).~~
~~6. 26 Gauge: 0.022-inch (0.55-mm).~~

~~B.~~A. Aluminum Sheet Thicknesses:

1. 12 Gauge: 0.080 inch (2.03 mm).
2. 14 Gauge: 0.063 inch (1.60 mm).
3. 16 Gauge: 0.050 inch (1.27 mm).
4. 18 Gauge: 0.040 inch (1.02 mm).
5. 20 Gauge: 0.032 inch (0.81 mm).
6. 22 Gauge: 0.024 inch (0.61 mm).

1.6 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 each manufactured product and accessory.

B. Shop Drawings: Describe material profiles, jointing pattern, jointing details, fastening methods, interface with other work and installation details.
1. Material.
2. Thickness of material.
3. Weight.
4. Finish.
5. Location of each item and details of expansion joint covers, including the direction of expansion and contraction.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

1.7 QUALITY ASSURANCE

A. Conform to profiles and sizes shown on drawings, and comply with "Architectural Sheet Metal Manual" by SMACNA, for each general category of work required.

B. Applicator: Applicator who has complete sheet metal flashing and trim work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance and with 5 years minimum experience.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

D. Mock-ups: Build mock-ups to demonstrate aesthetic effects and set quality standards for fabrication and installation. Build mock-ups ~~approximately 48-inches long,~~ including supporting construction cleats, seams, attachments, underlayment, and accessories. Do not proceed with the installation until the mock-ups are approved by the Architect in writing.

1. Coordinate these mockup requirements with the site-built, free-standing exterior mockup requirements in Section 01 4339.
~~1.~~2. Approved mock-ups may become part of the completed work if undisturbed at the time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with a suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
1. Sheet Metal Flashings: Minimum 30 percent post-consumer recycled content.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

2.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install flashings and copings capable of resisting forces for the appropriate wind zone, per Factory Mutual's Loss Prevention Data Sheet 1-49.

C. Temperature Range: 120 deg F ambient; 180 deg F, material surface.

D. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the maximum range of ambient and surface temperatures provided above by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of sealant joints, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

E. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to the building interior.
1. Watertight and weatherproof performance of flashing and sheet metal work is required.

2.3 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 (Z275) coating designation; structural quality, mill phosphatized where indicated for field painting.
   1. Do not apply an acrylic passivator coating to galvanized sheet metal scheduled to be painted, or remove this coating mechanically before delivery to the project site.
   2. Prime all surfaces of bonderized metal.
   3. Finish: Standard (dull) mill finish; painted unless noted otherwise on Drawings.
   4. Paint: Paint sheet galvanized sheet metal that is not coil-coated.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
   1. As-Milled Finish: Mill finish.
   2. Surface: Smooth, flat.
   3. Exposed Coil-Coated Finishes:
      a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   4. Color: As selected by Architect from manufacturer's full range.
   5. 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. Sheet Membrane Underlayment at Flashings: Self-adhered, cold-applied composite rubberized asphalt sheet membrane consisting of rubberized asphalt bonded to a cross-laminated high-density polyethylene film with primers and seam sealers as required for a complete watertight installation; provide materials compliant with applicable regulations limiting VOCs.
   1. Under Sheet Metal and Flashing: Minimum 40-mil thick, high temperature self-adhering, polymer-modified, bituminous sheet membrane, complying with ASTM D1970/D1970M, manufacturers and types as follows:
      a. Grace Construction Products: Grace Ice and Water Shield HT.

D. Bedding Compound: Rubber-asphalt type.

E. Plastic Cement: Asphaltic base cement.

F. Solder:
   1. For Zinc-Coated (Galvanized) Steel Sheet: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

G. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide elastic, non-sag, nontoxic, non-staining tape.

H. Sealant: Type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight; see Section 07 9200.

I. Flux: FS O-F-506.

J. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

K. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

L. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

M. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329 or Series 300 stainless steel.
4. Fasteners for Zinc Sheet: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329 or Series 300 stainless steel.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.
1. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers and with channel for sealant at top edge.
2. Concrete Type: 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.
3. 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 Drawings show reglet without metal counterflashing.
4. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

B. Drawbands: Stainless steel.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers,[gutter bead reinforcing bars,] and gutter accessories from same metal as gutters.
1. Material: Galvanized steel; 0.022 inch (0.56 mm) thick.
2. Finish: Painted.
3. Strainers: Wire ball downspout strainers in accordance with SMACNA Figure 1-24D.

B. Downspouts: ASTM A53/A53M; Type F or Type S, Grade A, standard weight Schedule 40 pipe; coped and mitered, hot dip galvanized after fabrication. Furnish with metal hangers, supports, and anchors.
1. Material: Galvanized steel; 0.028-inch (0.70-mm) thick.

2. Finish: Painted.

C. Parapet Scuppers: Fabricate scuppers of 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.
1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim, and built-in overflows.
1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Furnish with 6-inch- (150-mm-) wide joint cover plates.
1. Galvanized Steel: 0.028 inch (0.71 mm)

B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Fabricate 1-inch drive joints at the coping joints of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.
1. Vertical Face of Copings: Bottom edge formed outward 1/4- to1/2-inch, hemmed to form a drip.
2. Coping Profile: As indicated on Drawings.
3. Galvanized Steel: 0.040 inch (1.02 mm), field-painted.
4. Aluminum: 0.050 inch (1.27 mm) thick, prefinished.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch (0.56 mm) thick.

B. Valley Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

C. Drip Edges: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch (0.56 mm) thick.

D. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch (0.56 mm) thick.

E. Counterflashing: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch (0.56 mm) thick.

F. Flashing Receivers: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch (0.56 mm) thick.

G. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in maximum 96-inch- (2400-mm-) long sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6-inches (150 mm) beyond each side of wall openings. Form with 2-inch- (50-mm-) high end dams where flashing is discontinuous.
   1. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
   2. Fabricate through-wall flashing with sealant stop, unless otherwise indicated. Fabricate by bending metal back on itself 3/4-inch (19 mm) at exterior face of wall and down into joint 3/8-inch (10 mm) to form a stop for retaining sealant backer rod.
   3. Metal Flashing Terminations: Fabricate from galvanized steel. At exterior face of wall, bend metal back on itself for 3/4-inch (19 mm) and down into joint 3/8-inch (10 mm) to form a stop for retaining sealant backer rod.
   4. Fabricate from one of the following:
      a. Galvanized Steel: 0.022 inch (0.56 mm) thick.
      b. Aluminum: 0.032 inch (0.81 mm) thick.
      c. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

2.9 FABRICATION

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop-fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal with flat-lock seams; solder with type solder and flux recommended by manufacturer, except seal aluminum seams with sealant and, where required for strength, rivet seams and joints.

C. Fabricate sheet metal flashing and trim in thickness and weight needed to comply with performance requirements, but not less than that specified for each application of metal.

D. Fabricate corners, transitions, and terminations as a single unit; extend a minimum of 4-inches and a maximum of 8-inches in any direction.

E. Fabricate cleats and attachment devices from the same material as the accessory being anchored or from a compatible, non-corrosive metal. The thickness of these cleats and attachment devices should be as recommended by SMACNA's 'Architectural Sheet Metal Manual' and Factory Mutual's Loss Prevention Data Sheet 1-49 for the given application, but not less than the thickness of the metal being secured.

F. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

G. Coat backside of fabricated sheet metal with 15-mil sulfur-free bituminous coating, SSPC-Paint 12, where required to separate metals from corrosive substrates, including cementitious materials, wood or other absorbent materials; or provide other permanent separation.

H. Provide for thermal expansion of running sheet metal work by overlaps of expansion joints in fabricated work. Where required for watertight construction, provide hooked flanges filled with polyisobutylene mastic for 1-inch embedment of flanges.

I. Space expansion joints at intervals of not more than 50-feet. Conceal expansion provisions where possible.

J. Roof-Penetration Flashing: Fabricate from the following material:
1. Galvanized Steel: 0.0276-inch (0.7 mm) thick.

2.10 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches (300 mm) high, with removable metal hood and slotted or perforated metal collar.
1. Manufacturers: Subject to compliance with requirements, acceptable manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Custom Solution Roof and Metal Products.
b. Thaler Metal USA Inc.
2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Diameter: As required for vent size.
4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
1. Manufacturers: Subject to compliance with requirements, acceptable manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Custom Solution Roof and Metal Products.
b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
c. Thaler Metal USA Inc.
1. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
2. Height: As required by CBC.
3. Diameter: As required for vent size.
4. Finish: Manufacturer's standard.

2.11 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from galvanized steel 0.0276-inch (0.7 mm) thick.

2.12 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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. Beginning of installation means acceptance of existing conditions.

B. Ensure that adjacent work by other trades has been completed as required and as shown on the Drawings.

3.2 PREPARATION

A. Allow wet substrates to dry thoroughly.

B. Clean debris from all substrates.

3.3 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, 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, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

3.4 INSTALLATION

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Anchor work in place with non-corrosive fasteners, adhesives, setting compounds, tapes and other materials and devices as recommended by manufacturer of each material or system.

C. Install self-adhesive flashing prior to or in conjunction with sheet metal items, as shown on Drawings.

D. Provide for thermal expansion and building movements. Comply with recommendations of "Architectural Sheet Metal Manual" by SMACNA.

E. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

F. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

G. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

H. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

I. Composition Stripping: Cover flanges (edges) of work set on bituminous substrate with 5 courses of glass fiber fabric (ASTM D1668/D1668M) set in and covered with asphaltic roofing cement.

J. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4-inches (32 mm) for nails and not less than 3/4-inch (19 mm) for wood screws.
1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
2. Aluminum: Use aluminum or stainless-steel fasteners.

3. Use concealed fasteners wherever possible. Exposed fasteners should have bonded neoprene washers or should be sealed.

K. Seal moving joints in metal work with butyl joint sealants, complying with requirements specified in Section 07 9200 as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1-inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

L. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2-inches (38 mm) except where pre-tinned surface would show in finished Work.
1. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.
2. Clean metal surfaces of soldering flux and other substances that could cause corrosion.

M. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.5 ELASTOMERIC SHEET MEMBRANE COUNTERFLASHING INSTALLATION AT PENETRATIONS

A. Surface Preparation:
1. Remove oil, grease, scale, paint dust, corrosion products, and any other materials that may affect the adhesive bond of the elastomeric sheet membrane.
2. Etch concrete, masonry, and metal surfaces with 10% muriatic acid.

B. Apply primer to clean, dry surface immediately after surface preparation.
1. Allow to dry 2 hours minimum.
2. Do not apply primer to membrane.
3. Install bond breaker tape centered over joint between penetration and top edge of flashing collar.

C. Renew primer if over 24 hours elapses before application of adhesive.

D. Application of Adhesive:
1. Apply two even brush coats of adhesive to substrate.
2. Allow 15 minutes drying time between coats.
3. Apply one full coat of adhesive to membrane sheet.
4. Minimum drying times:
   a. Allow sufficient adhesive drying to take place to prevent trapping of solvents in the adhesive, which causes significant weakening of bond strength.
   b. Minimum drying times have been observed to range between 10 minutes in warm, dry weather (90 def F, 10% relative humidity), to 1/2 hour in colder weather.
   c. Do not attempt joining coated surfaces during the drying time.
   d. Form bonds after adhesive becomes dull, and while still sticky.
   e. If adhesive is 'open' too long before joining coated surfaces, the membrane will no longer adhere to substrate; reactive adhesive by applying an additional full coat of adhesive.

E. Joint Coated Surfaces:
1. Elastomeric sheet membrane may be stretched during placement, to 1% to 2% elongation in final position, to conform to various contours, without undo stress to membrane during placement, and without damage to cured membrane.
2. Provided a plastic or clot liner is used, membrane may be rolled or folded; use caution as adhesive coated surfaces bond readily to uncoated membrane surfaces.
3. Apply sheet by unrolling or otherwise placing in position and flattening with the hand to prevent air entrapment.
4. Do not work too large an area at a time.
5. Roll all of the area with a steel flat face roller.
6. 'Stitch' all edges, corners and laps using a 2-inch x 1/4-inch knurled hand stitcher and stiff pressure.
7. Overlap edges a minimum of 3-inches and end joints 6-inches in such a way as to shed water.
8. At all edge intersections of laps including inside or outside corners, apply a fillet of membrane sealant.

F. Application of Color Coating: Apply adhesive to elastomeric sheet membrane and allow to dry as described above.
1. Coat elastomeric membrane with U66A to provide a 15 mil dry film thickness.

3.6 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36-inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1-inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60-inches (1500 mm) oc in between.
1. Provide elbows at base of downspout to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Install scupper over roof plies before cap sheet is installed.
2. Strip in scupper flanges with two stripping plies; install cap sheet over stripping plies.
3. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
4. Loosely lock front edge of scupper with conductor head.
5. Seal or solder exterior wall scupper flanges into back of conductor head.

E. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1-inch (25 mm) below scupper and gutter discharges.

3.7 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual". Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with claps, joints, and seams that will be watertight.

B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4-inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4-inches (100 mm) and bed with elastomeric sealant.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4-inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

D. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.
1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch (400-mm) centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch (600-mm) centers.
3. Do not cover scupper overflows with copings.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof.
1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof. Use stainless steel drawband and tighten.
2. Install premanufactured membrane flashing a minimum of 8 inches up vent piping and over base roof membrane, being careful not to block vent piping with flashing. Seal flashing to base roof membrane where required by roofing manufacturer.
3. Seal top of membrane flashing with elastomeric sealant and clamp flashing to pipes with stainless steel drawband.

3.8 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: At plaster walls, extend flashing through plaster system, across air space behind plaster, and up face of sheathing at least 8-inches (200 mm); with upper edge tucked under building paper or building wrap, lapping at least 4-inches (100 mm).
1. Install metal sealant stops with sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 for application indicated.

3.9 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.10 ADJUSTING

A. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.11 CLEANING

A. Clean and neutralize flux materials. Clean off excess solder and sealants.

B. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 07 6000

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SECTION 07 7200 – ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Prefabricated roof hatches, with integral support curbs, operable hardware, and counterflashings.

B. Prefabricated roof ladders and cages.

C. Parapet ladders.

D. Aluminum roof walkway system.

1.3 RELATED SECTIONS

A. Section 06 1053 - Miscellaneous Carpentry: Wood curbs.

B. Section 05 5000 – Metal Fabrications: Shop-fabricated ladders.

C. Section 07 5200 - Cold Applied Asphalt Roofing.

D. Section 07 6000 - Flashing and Sheet Metal: Counter flashing to roof system.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Provide data on unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination 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.

D. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Installation Instructions: Indicate special installation criteria, interface with adjacent components.

1.7 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

PART 2 - PRODUCTS

2.1 PREFABRICATED CURBS AND EQUIPMENT SUPPORTS

A. Prefabricated Curb and Equipment Support Units:
1. Type: Designed for roof type and equipment.
2. Materials: Steel, 14 gauge (.0747 inch), baked enamel finish.
3. Materials: Steel, 14 gauge (.0747 inch), hot dip galvanized.

2.2 ROOF HATCH

A. Roof Hatches:
1. Lid: Insulated metal lid.
2. Framing: Formed or extruded aluminum, mill finish.
3. Curb Type: Insulated double wall curb.
4. Metal roof hatch with folding Aluminum Guard Rail system by Precision Ladders, LLC at Bldgs 1 & 2 only
5. Bilco "LadderUp" Safety Post at Bldgs 1 & 2 only

B. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Bilco Manufacturing.

C. Unit: 30 by 36 inch size, single leaf type; insulated lid and integral support curb; complete with integral counterflashings to roof flashing system and flanges on support curb for anchorage to roof deck.

D. Integral Aluminum Curb: 11 gage mill finished aluminum with full welded corners; 1 inch rigid glass fiber insulation; integral cap flashing to receive roof flashing; extended flange for mounting.

E. Flush Aluminum Cover: 11 gage mill finish aluminum; 1 inch glass fiber insulation; sandwiched by 18 gage aluminum interior liner; continuous neoprene gasket to provide weatherproof seal.

F. Hardware:
1. Compression spring operator enclosed in telescopic tubes;

2. Positive snap latch pull handle for interior and exterior operation;
3. Automatic hold open arm with vinyl covered grip handle for easy release and hand control of the cover to its closed and latched position.
4. Components zinc plated and chromate sealed, mill finish;
5. Padlock hasps inside and outside.

G. Hinges: Heavy duty pintle type.

2.3 ROOF LADDERS

A. Pre-fabricated Ladder: O'Keeffe's 530, fixed access ladder.

B. Fabricate ladders under provisions of Section 055000.

C. Cage: In accordance with OSHA requirements; provide where ladders exceed 20 feet in height for each 30 feet of height or fraction thereof.

2.4 ROOF LADDER FABRICATION

A. Fabricate components free of visual distortion or defects. Weld corners and joints fully.

B. Provide for removal of condensation occurring within components or assembly.

C. Fit components for weathertight assembly.

2.5 PARAPET LADDERS

A. Ladder Units: Manufacturer's standard aluminum units designed to be installed over parapets as indicated on Drawings.
1. Type 1: Tubular rail low parapet access ladder with platform and return, O'Keeffe's Model 503, or approved equal.
2. Type 2: Tubular rail low parapet access ladder with platform and no return, O'Keeffe's Model 503A, or approved equal.

2.6 ALUMINUM ROOF WALKWAY SYSTEM

A. Basis-of-Design Product: The design for the aluminum roof walkway system is based on the manufacturer identified below. Product requirements in this Section are based on products by the named manufacturer. Subject to compliance with requirements, provide the named product or an approved comparable system:
1. Basis-of-Design: FIXFAST; GW21 Clamp-On System with KATTWALK Aluminum Walkway.
2. Accepted equivalent.
3. Dimensions: As indicated on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with accessory manufacturer's instructions and recommendations. Anchor securely to structure to withstand inward and outward loads.

B. Coordinate with installation of roofing system and related flashings to ensure weathertight installation.

C. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals to prevent galvanic action.

3.2 LADDERS, POSTS, AND CAGES

A. Provide a minimum clear dimension of 15 inches each way from centerline of rung.

B. Securely fasten bottom of ladder to floor where indicated on Drawings. Connect intermediate supports to wall and top of ladder to roof hatch opening to provide firm anchorage.

C. Install bottom of cage at 8 feet above finish floor.

D. Secure safety post to fabricated ladder rungs where directed by manufacturer's written instructions using hardware provided by manufacturer for that purpose.

3.3 ROOF WALKWAY

A. Install walkway where indicated on Drawings following manufacturer's written instructions. Secure and flash in place in coordination with roofing installation specified in Section 05 2000.

3.4 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

B. Test and operate units; clean, lubricate and adjust moving parts. Leave units ready for field painting.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 07 7200

SECTION 07 8116 – CEMENTITIOUS FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Concealed cementitious spray-on fireproofing (SFRM) of structural steel and metal decking, with clean up of all areas affected by the work of this Section.

1.3 RELATED SECTIONS

A. Section 05 1200 - Structural Steel Framing: Surface conditions required for structural steel receiving SFRM.

B. Section 07 2100 - Building Insulation: Fire-safing insulation.

C. Section 07 8400 – Firestopping: Fire-resistance-rated firestopping systems.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. SFRM: Sprayed fire-resistive material.

B. Concealed: Fire-resistive materials applied to surfaces that are concealed from view behind other construction when the Work is completed and have not been defined as exposed.

1.6 COORDINATION

A. Sequence and coordinate application of SFRM 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-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
   3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
   4. Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
   5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.

6. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
8. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.7 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product literature, and application instructions for each fireproofing material to be used.

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Product Data for paints and coatings, documentation including printed statement of VOC content.

1.8 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of SFRM, signed by product manufacturer.

B. Compatibility and Adhesion Test Reports: From SFRM manufacturer indicating the following:
1. Materials have been tested for bond with substrates.
2. Materials have been verified by SFRM manufacturer to be compatible with substrate primers and coatings.
3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed SFRM.

D. Test Reports: Representative of current application standards; indicate all materials not in the original fireproofing bag added by the applicator and test lab. The test report shall indicate concentration and quantity added for the specimens prepared.

E. Research/Evaluation Reports: For SFRM.

F. Tables: After manufacturer approval and prior to application, submit table showing the thickness, density and UL Design Number to be used for each condition, including W/D ratios for beams and columns. Submit any laboratory test reports used in this table not included in the current UL Fire Resistance Directory.

1.9 CLOSEOUT SUBMITTALS

A. Warranty: Sample of special warranty.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace SFRMs that fail in materials, fabrication, or installation within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of SFRM from substrates.

b. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

2. Warranty Period: Two years from date of Substantial Completion.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by SFRM manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain SFRM through one source from a single manufacturer.

C. Products, execution and fireproofing material thickness and density shall conform to the applicable Uniform Building Code requirements, UL "Fire Resistance Directory" and UL test reports.

D. Fire-Test-Response Characteristics: Provide SFRM 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 SFRM with appropriate markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" acceptable to authorities having jurisdiction, for SFRM serving as direct-applied protection tested per ASTM E119.
2. Surface-Burning Characteristics: ASTM E84.

E. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to SFRM including, but not limited to, the following:

1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
2. Review and finalize construction schedule and verify sequencing and coordination requirements.
3. Review weather predictions, ambient conditions, and proposed temporary protections for SFRM during and after installation.
4. Review surface conditions and preparations.
5. Review field quality-control testing procedures.

1.12 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, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.13 SITE CONDITIONS

A. Maintain temperature of substrate and ambient air at 40 degrees F minimum for 24 hours before, during and after application of fireproofing. If required, use heaters to maintain minimum temperatures.

B. Ventilation: Ventilate building spaces during and after application of SFRM. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

PART 2 - MATERIALS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Paints and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 ACCEPTABLE MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Concealed Cementitious SFRM:
      a. Carboline Co., Fireproofing Products Div.; Pyrolite 15 High Yield.
      b. Grace, W. R. & Co. - Conn., Construction Products Div.; Monokote Type MK-6.
      c. Isolatek International Corp.; Cafco 300.
      d. Southwest Fireproofing Co., Inc.; Type 5.

2.3 MATERIALS

A. Material Composition: Manufacturer's standard product, as follows:
   1. Concealed Cementitious SFRM: Factory-mixed, dry formulation of gypsum or Portland cement binders, additives, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

B. 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. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
      a. Flame-Spread Index: 10 or less.
      b. Smoke-Developed Index: 0.
   2. Classified as to fire resistance in accordance with the designs in the UL "Fire Resistance Directory" or E119.

3. Dry Density: 15 lb/cu ft (240 kg/cu m) for average and individual densities, or greater if required to attain fire-resistance ratings indicated, per ASTM E605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
4. Thickness: 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 E605:
   a. Where the referenced fire-resistance design lists a thickness of 1-inch (25 mm) or more, the minimum allowable individual thickness of SFRM 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 SFRM 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).
5. Minimum Bond Strength: 200 psf based on laboratory testing under ASTM E736.
6. Minimum Compressive Strength: 1200 psf when tested under ASTM E761. Minimum thickness of SFRM 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).
7. Maximum Allowable Weight Loss: 0.005 grams/sq ft when tested under ASTM E859.
8. Aggregate: Light-weight aggregates; synthetic aggregates not permitted.
9. Corrosion Resistance: No evidence of corrosion per ASTM E937.
10. Deflection: No cracking, spalling, or delamination per ASTM E759.
11. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E760.
12. Air Erosion: Maximum weight loss of 0.025 g/sq ft (0.270 g/sq m) in 24 hours per ASTM E859. For laboratory tests, minimum thickness of SFRM 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.
13. Fungal Resistance: No observed growth on specimens per ASTM G21.

C. Fireproofing materials shall contain no asbestos.

D. Water shall be potable and free of substances that would adversely affect fireproofing materials.

E. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction. and the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

2.4 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM 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: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E736.

2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of SFRM per ASTM E119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of SFRM.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Verify that concrete work on steel deck has been completed.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work are completed.

D. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

B. Clean substrates of rust, mill scale, paint, primers, dirt, dust, grease, oil and other substances that may affect the bond strength.

C. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.

3.3 APPLICATION, GENERAL

A. Coordinate application of fireproofing with other Work in order to minimize the need to cut or remove fireproofing.

B. Mix and apply fireproofing materials in accordance with manufacturer's printed instructions and fire-resistive ratings specified. Apply to all areas requiring fireproofing, as shown on the Drawings. Thickness and density, as measured by CBC Standard 7-6, to comply with the specifications and UL "Fire Resistance Directory".

C. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

D. Apply SFRM that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

E. Coat metal deck substrates with bonding adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by SFRM manufacturer for material and application indicated.

F. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by SFRM manufacturer, install body of fire-resistive covering in a single course.

G. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by SFRM manufacturer.

3.4 APPLICATION, CONCEALED SFRM

A. Apply concealed SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "Concealed SFRM" Article.

B. Cure concealed SFRM according to product manufacturer's written recommendations.

C. Patch damaged or removed fireproofing prior to concealment of fireproofing by other Work.

D. Protect fireproofing until permanent cover is installed, or until completion where exposed to view in the completed Work.

E. Do not commence the installation of piping, duct work, conduits or other suspended equipment until the application of the fireproofing material is complete in that area.

3.5 REPAIR

A. Repair or replace work that has not successfully protected steel.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspection and prepare reports:
   1. SFRM.

B. As the work progresses, the Testing Agency shall perform thickness and density testing as required in CBC Chapter 17.

C. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

D. Tests and Inspections: Testing and inspecting of completed applications of SFRM shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of SFRM for the next area until test results for previously completed applications of SFRM show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.
   1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq ft (93-sq m) area, or partial area, on each floor, from the average of 4 measurements from a 144-sq in (0.093-sq m) sample area, with sample width of not less than 6-inches (152 mm) per ASTM E605.
   2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E605.
   3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
   4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq ft (929 sq m) area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E736.
      a. Field test SFRM 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 SFRM 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 200 lbf/sq ft minimum per ASTM E736.
   5. If testing finds applications of SFRM are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

E. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.

F. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

G. Make the results of that testing to Contractor and Architect at the completion of each test area.

3.7 ADJUSTING

A. Coordinate application of SFRM with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect SFRM and patch any damaged or removed areas.

3.8 CLEANING

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. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.9 PROTECTION

A. Protect SFRM, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 07 8116

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SECTION 07 8400 – FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items for the following, including at entrance and exit of the Project area:
   1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
   2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
   3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
   4. Sealant joints in fire-rated construction.

1.3 RELATED SECTIONS

A. Section 07 9200 – Joint Sealants: Electrical and pipe penetration, acoustical and fire sealants at walls.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 SEQUENCING AND SCHEDULING

A. Sequence: Perform work of this and other sections in proper sequence to prevent damage to the Firestop Systems and to ensure that their installation will occur prior to enclosing or concealing work.

B. Do not cover Firestop Systems until they have been properly inspected and accepted by the authority having jurisdiction and/or Architect.

1.6 ACTION SUBMITTALS

A. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
   2. SCAQMD Rule 1113 compliant VOC testing compliance statement
   3. Declare Label: Manufacturers publicly available Declare Label as included in the Declare database https://living-future.org/declare-products
   4. CDPH Standard Method v1.1 testing report

1.7 INFORMATIONAL SUBMITTALS

A. Product test reports from a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

B. Certificates of Compliance:
   1. Provide certificates accompanied by classification indicating material or combination of materials used meets requirements specified for flame spread and fire resistance.
   2. Certificates to be by nationally recognized testing authority or by other supporting evidence is satisfactory to Architect.

C. Fire-Test-Response Characteristics: Provide firestopping that complies Firestopping tests performed by a qualified testing and inspecting agency, including UL, Warnock Hersey, or another agency performing testing and follow-up inspection services, that is acceptable to authorities having jurisdiction.
   1. Through-penetration firestop systems are identical to those tested per ASTM E814 under conditions where positive furnace pressure differential of at least 0.01-inch of water is maintained at a distance of 0.78-inch below the fill materials surrounding the penetrating items in the test assembly.
   2. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E119 under conditions where the positive furnace pressure differential is at least 0.01-inch of water, as measured 0.78-inch from the face exposed to furnace fire.
   3. Materials being applied in openings between elements of differing fire ratings shall conform to the most restrictive rating.
   4. Ratings of Firestopping: As indicated by reference to designations of UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
   5. Flame Spread: 25 or less per ASTM E84.
   6. Smoke Developed: 450 of less per ASTM E84.

1.8 QUALITY ASSURANCE

A. Certifications and Code Approvals: Materials proposed for use shall be approved by the State Fire Marshal for their intended use.

B. Single Source Responsibility for Materials: Obtain firestopping materials from one manufacturer for entire Project.
   1. This does not restrict Contractor from subcontracting installation of firestopping to multiple subcontracts, but does require installers to use the same manufacturer throughout the Project and be licensed by that manufacturer for the installation of firestopping.

C. Firestopping materials and systems shall be listed and labeled in accordance with requirements of Underwriters Laboratories, Inc. (UL) Building Materials Directory.

D. Firestopping materials shall conform to California Building Code (CBC) for fire resistance standards and requirements for penetrations in walls, partitions, and floor/ceiling and floor/roof assemblies.

E. Firestopping materials shall comply with ASTM E814 and UL 1479.

F. Firestopping sealants shall comply with ASTM C719 and ASTM C920.

G. Form materials to remain in place in the completed work and sealant used for firestopping work shall be UL listed and labeled.

H. Firestopping materials shall be rated as required when tested in accordance with ASTM E119.

I. Firestopping materials shall be asbestos free and shall not incorporate nor require the use of hazardous solvents.

J. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surface.

K. Installer shall have a minimum of 5-years' experience installing UL listed firestopping systems in similar type construction.
1. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.
2. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

L. Mock-up: Prior to proceeding with application, provide where directed by Architect, a sample installation of fire calking at window to rated wall joint, color Grey, to establish requirements of the final appearance.
1. Make the sample installation at least 4 ft. long.
2. Make such modifications as necessary to achieve a sample installation satisfactory to the Owner's Representative, or remove and construct additional mock-up(s).
3. Approved mock-up installation will serve as the standard for the same work on the building, and may remain a part of the Work when properly identified for future reference, as authorized by the Owner's Representative.

M. Preinstallation Conference: Conduct conference at Project site. Include Owner, Owner's Representative, Contractor, and subcontractor responsible for firestopping application.
1. Establish procedures to maintain optimum working conditions and to coordinate this work with related adjacent work.

1.9 DELIVERY, STORAGE AND HANDLING.

A. Deliver materials in their original unopened packages and store in location providing protection from damage and exposure to elements.

B. Do not use damaged or expired materials.

1.10 SITE CONDITIONS

A. Environmental Requirements: Comply with firestopping material manufacturer's recommendations for temperature and humidity conditions before, during, and after installation of firestopping.
1. All materials shall be asbestos free and non-carcinogenic. Materials should meet the requirements for use in a "Green Building" as defined by the U.S. Green Building Council and the ADTM Green Building Sub-committee E 50.06.
2. Firestop materials shall contain no flammable or toxic solvents and shall not produce toxic or flammable out gassing during the drying or curing process.
3. Firestop materials used shall not require solvent based chemicals for clean-up purposes.

B. Maintain Material Safety Data Sheets (MSDS) available on the job site for all materials. Follow Manufacturer's guidelines for use, handling and disposal.
1. Do not use any product whose MSDS contains warning that continued inhalation may cause silicon's or lung cancer.

C. Maintain current copy of UL "Fire Resistance Directory" on Project site.

D. Ventilation Requirements: Comply with firestopping material manufacturer's recommendations during and after installation of firestopping by natural or mechanical means.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Firestopping and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Provide firestopping materials having the following certifications and labels:
   1. CDPH Standard Method V1.1 compliant
   2. SCAQMD Rule 1113 compliant.
   3. Declare Label.

2.2 MANUFACTURERS

A. Basis of Design Manufacturer and product is Protega AB – Novatherm 2FR or a comparable product by an approved equal, shall be SCAQMD Rule 1113 compliant, shall be CDPH Standard Method v1.1 compliant, and shall have a Declare Label.

B. Basis of Design Manufacturer and product is Protega AB – Novatherm 2FRe or a comparable product by an approved equal, shall be SCAQMD Rule 1113 compliant, shall be CDPH Standard Method v1.1 compliant, and shall have a Declare Label.

C. Basis of Design Manufacturer and product is Protega AB – Topcoat W or a comparable product by an approved equal, shall be SCAQMD Rule 1113 compliant, shall be CDPH Standard Method v1.1 compliant, and shall have a Declare Label.

2.3 PERFORMANCE REQUIREMENTS

A. Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.

B. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.

C. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.

D. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.

E. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

F. When mechanical cable pathways are not practical, openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.

G. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words “Chase Wall Optional”.

H. Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in Standards, ASTM E1399/E1399M, ASTM E1966 or ANSI/ UL 2079.

I. Provide penetration firestop systems, fire-resistive joint systems, or perimeter fire barrier systems subjected to an air leakage test conducted in accordance with Standard, ANSI/ UL1479 for penetrations and ANSI/UL2079 for joint systems with published L-Ratings for ambient and elevated temperatures as evidence of the ability of firestop system to restrict the movement of smoke.

J. Provide T-Rating Collar Devices tested in accordance with ASTM E814 or ANSI/UL1479 for metallic pipe penetrations requiring T-Ratings per the applicable building code.

K. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E814:
   1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
   2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
      a. Penetrations located outside wall cavities.
      b. Penetrations located outside fire-resistance-rated shaft enclosures.
      c. Where firestop systems protect penetrating items larger than a 4-inch diameter nominal pipe or 16 sq inch overall cross-sectional area.
      d. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.

L. Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

M. Fire Rated Construction Design Requirements: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

N. Smoke Barrier Construction Design Requirements: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

O. 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.

P. Assembly designs are specified generally under UL system categories by penetrating item. Manufacturers' product applications must have specific UL system designations.

Q. Duct Damper Penetrations: Completely fill annular space with mineral wool safing and seal with flexible firestop sealant. Comply with duct damper manufacturer's requirements.

2.4 MATERIALS

A. Through-Penetration Firestop Systems: Comply with the following requirements in providing system components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating firestops under conditions of service and application, based on testing and field experience.

B. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, provided that they conform to the construction type, penetrant type, annular space requirements, and fire rating involved in each separate instance, and that the system is symmetrical for wall applications.
1. Provide only asbestos-free systems or devices.
2. Additional requirements: Prevent the passage of cold smoke either as an inherent property of the product, or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.

2.5 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. Horizontal assemblies include floors, floor/ceiling assemblies, and, ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

G. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-wool-fiber or rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.
   5. Steel sleeves.

2.6 FILL MATERIALS

A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

B. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

C. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

D. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

E. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

2.7 SEALANTS

A. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant.

B. Sealant Colors: As selected by Architect from manufacturer's full range of standard colors for products of type indicated.

C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

D. Single-Component, Nonsag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.8 FIRESTOPPING AT ELECTRICAL BOXES AND UTILITY OUTLETS

A. Sealant for 1-hour Rated Walls: Nondrying, non-hardening, non-skinning, non-staining, single component fire rated material for through-penetration firestop systems.
1. Specified Technologies Inc., SSP Putty and Putty Pads.
2. 3M Fire Protection Products, Fire Barrier Moldable Putty or Putty Pads.
3. Locations: Steel electrical outlet boxes which exceed 16-square inches.
4. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
5. Architectural Sealants: 250 g/L.
6. Sealant Primers for Nonporous Substrates: 250 g/L.
7. Sealant Primers for Porous Substrates: 775 g/L.

B. Utility penetrations in walls, ceilings, or floors requiring protected openings shall be firestopped and sealed with an approved material securely installed, capable of maintaining its integrity when subjected to test temperatures specified in ASTM E814.

C. Steel electrical outlet boxes on opposite sides of walls requiring protected openings shall be separated by a horizontal distance of 24-inches.

D. Steel electrical outlet boxes which occur in combination with outlet boxes of any size such that the aggregate area of unprotected outlet boxes exceeds 100-square inches in any 100-square feet of wall area shall be protected by an approved material or detail to decrease the aggregate area of unprotected utility boxes to less than 100-square inches in any 100-square feet of wall.

E. Utility and electrical outlets or boxes shall be securely fastened to the stud or framing of the wall or ceiling assembly. The opening in the gypsum board shall be cut so that the clearance between the box and the gypsum board does not exceed 1/8-inch.
1. Fill the 1/8-inch gap with an approved fire-rated sealant.

2.9 ACCESSORIES

A. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

B. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item.

C. Fire Rated Cable Pathways: STI EZ-PATH™ Brand device modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill.

D. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film.

E. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag.

F. Composite Sheet: Intumescent material sandwiched between a galvanized steel sheet and steel wire mesh protected with aluminum foil.

G. Cast-In-Place Firestop Device: Single component molded firestop device installed on forms prior to concrete placement with totally encapsulated, tamper-proof integral firestop system and smoke sealing gasket.

H. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestop gasket for use on steel HVAC ducts.

I. Firestop Plugs: Re-enterable, foam rubber plug impregnated with intumescent material for use in blank openings and cable sleeves.

J. Fire-Rated T Rating Collar Device: Louvered steel collar system with synthetic aluminized polymer coolant wrap installed on metallic pipes where T Ratings are required by applicable building code requirements.

K. Fire-Rated Cable Grommet: Molded two-piece grommet made from plenum grade polymer with a foam inner core for sealing individual cable penetrations up to 0.27 in. (7 mm) diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 INSTALLATION

A. Install through-penetration firestops to comply with the performance requirements of this Section and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

C. Install firestopping in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
1. Provide sprinkler piping with NFPA 13 required annular space using insulation and firestop to allow movement.
2. Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.
3. Follow safety procedures recommended in the Material Safety Data Sheets.

D. Install in accordance with Manufacturer's current printed instructions to provide a Flame (F) rating of at least one (1) hour, but not less than the fire resistance rating of the assembly being penetrated. Ensure that anchoring devices, back-up materials, clips, sleeves, supports and other materials used in the actual fire test are installed.

E. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

F. 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.

G. Install fire resistant filler in openings with sufficient pressure to properly fill and seal openings, ensuring an effective seal. Dam bottom of vertical openings and one side of horizontal openings with temporary containment forms or, where required to achieve fire resistance ratings, provide permanent mineral composition board forms.

H. Tool or trowel exposed surfaces. Remove excess firestop or smoke seal material promptly as work progresses and upon completion of installation.

I. On horizontal penetrations, provide partial face containment forms where required for material placement. Allow installed fillers to cure, and remove temporary forms; trim ragged

edges with sharp knife; inspect and fill voids with additional filler to form uniform thickness of filler.

J. Spillage: Do not allow sealants to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

K. Recess exposed edges of gaskets and exposed joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.

L. Tool or trowel exposed surfaces. Remove excess firestop or smoke seal material promptly as work progresses and upon completion.

M. Apply firestop or smoke seal material at penetrations of insulated piping after the insulation is installed. Use material that has been tested for compatibility and rating in conjunction with the use of the insulation material being used.
1. Calcium silicate, or other pipe insulation, may be substituted for fiberglass pipe insulation through the sleeve, if the insulation is part of an assembly which meets the requirements specified for firestopping or smoke sealing.

N. Install firestopping or smoke sealing materials for filling voids in floors having openings of 4 inches or greater that support the same load as the floor system, unless the area is protected by a permanent barrier preventing loading or traffic on the firestopped or smoke sealed area.

3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
1. The words: “Warning: Through-Penetration Firestop System – Do Not Disturb”.
2. Contractor’s name, address and phone number.
3. Designation of applicable testing and inspection agency.
4. Date of installation.
5. Manufacturer’s name for firestop materials.

3.5 FIELD INSPECTION

A. Maintain copy of manufacturer’s installation instructions and recommendations at each work area.

B. Keep area of work available for inspection by Architect and applicable authorities before and after application of firestopping.

3.6 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.7 CLEANING

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. Repair damage caused by work of this section; clean exposed surfaces soiled by work and leave work ready to receive subsequent work.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.8 PROTECTION

A. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion.
   1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 8400

SECTION 07 9200 – JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Exterior Joints in Vertical Surfaces and Horizontal Non-traffic Surfaces:
   1. At flashing and sheet metal.
   2. Construction joints in cast-in-place concrete.
   3. Perimeter joints around frames of storefronts, doors, windows, and louvers.

B. Interior Joints in Vertical Surfaces and Horizontal Non-traffic Surfaces:
   1. Control and expansion joints on exposed interior surfaces of exterior walls.
   2. Perimeter joints of exterior openings.
   3. Tile control and expansion joints.
   4. Vertical joints on exposed surfaces of concrete walls and partitions.
   5. Interior rated and non-rated sealants.
   6. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
   7. Perimeter joints between plumbing fixtures and adjoining walls, floors, and counters.
   8. Control and expansion joints in ceiling and overhead surfaces.
   9. Acoustical joints in wall and ceiling surfaces.

C. Interior Joints in Horizontal Traffic Surfaces:
   1. Isolation joints in cast-in-place concrete slabs.

D. Joint sealant primers and accessories.

1.3 RELATED SECTIONS

A. Section 07 6000 - Flashing and Sheet Metal.

B. Section 07 8400 - Firestopping: Sealing of perimeter joint and through-wall penetrations.

C. Section 08 8100 – Glass Glazing: Sealants used in glazing.

D. Section 09 2900 - Gypsum Board: Sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical data for each product required, including instructions for joint preparation and sealant application. Include certification by joint sealant manufacturer that sealants, primers, and cleaners comply with local regulations controlling the use of volatile organic compounds (VOC). Include tested physical and performance properties. Include data sheets for substrate cleaners and substrate primers recommended by sealant manufacturer for specific substrate surface conditions.
   1. Include certification by joint sealant manufacturer that sealants, primers, and cleaners comply with local regulations controlling the use of volatile organic compounds (VOC). Include tested physical and performance properties.
   2. Include data sheets for substrate cleaners and substrate primers recommended by sealant manufacturer for specific substrate surface conditions.
   3. SCAQMD Rule 1113 compliant VOC testing compliance statement

B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
   1. Submit 2 copies of manufacturer’s standard color chart with physical samples of each color. Submit information on availability of custom colored sealants.

C. Joint Sealant Schedule: Include the following information:
   1. Joint sealant application and typical joint locations to receive sealants.
   2. Joint sealant manufacturer and product name.
   3. Joint sealant formulation and color.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For sealants, including printed statement of VOC content and chemical components.
   3. Declare Label: Manufacture’s publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
   4. CDPH Standard Method v1.1 testing report.

1.3 INFORMATIONAL SUBMITTALS

A. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Submit manufacturer’s letter of certification that products comply with specified requirements and are suitable for the uses intended.

C. Product Test Reports:
   1. Certified test results of elastomeric sealants showing compliance with specified requirements. Include results of aged performances including hardness, stain-resistance, adhesion and cohesion under cyclic movement, low temperature flexibility, modulus of elasticity at 100-percent strain, effects of heat and aging, and effects of accelerated weathering.
   2. Preconstruction field test results indicating which products and joint preparation methods demonstrated acceptable adhesion to joint substrates.

D. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
   1. Ensure that sealants selected are compatible with and will adhere to all surfaces with which they are to be in contact.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the Work.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated, as documented according to ASTM E548.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.

D. Sealant manufacturer shall confirm in writing that all materials contacting the sealants, including joint backings, gaskets, spacers, and joint substrates, are compatible with the sealant to be installed. Schedule sufficient time to test these materials for compatibility with the sealant, as necessary. Compatibility tests shall be performed to the sealant manufacturer’s standards.
   1. Determine if priming and/or other preparation techniques are required.
   2. Determine compatibility of exterior joint sealant with stone material to be used. Verify that joint sealant oils do not migrate onto stone face causing visual banding while wet or dry. Manufacturer shall perform staining tests of sealant systems in accordance with ASTM C510 and ASTM D2203 methods for each joint substrate condition in the work.
   3. Testing for adhesion is not required if sealant manufacturer has performed previous testing of proposed sealants for adhesion to and compatibility with required joints substrates.

E. Sealant manufacturer shall confirm in writing the appropriate joint preparation and priming techniques required to obtain rapid, acceptable adhesion of the joint sealants to the joint substrates.

F. Preconstruction Field Testing: Prior to installation of joint sealants, field-test adhesion to all joint substrates and surface types. Field adhesion testing shall be completed and results shall be reviewed and approved by sealant manufacturer and installer before commencing sealant installation.
   1. Install joint sealants in 5-foot joint lengths. Allow to cure before testing. Test adhesion by pulling sealant out of joint according to “Method A, Field-Applied Sealant Joint Hand Pull Tab”, in Appendix X1 in ASTM C1193. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   2. Perform field tests for each type of elastomeric sealant and joint substrate.
   3. Arrange for tests to take place with joint sealant manufacturer's technical representative present.

4. Report whether or not 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.
5. Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrate during testing.

G. Pre-Installation Meeting: Review joint application procedures, compatibility tests, adhesion tests, and warranty requirements in a meeting involving installer, manufacturer or manufacturer's representative, building owner or manager, consultant, and contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials intact and legible.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 SITE CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
2. Below 40 deg F (4.4 deg C).
3. When joint substrates are wet or retaining moisture.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

B. Exterior Sealants: Furnish a written warranty against leaks or other defects of materials, fabrication, and installation. Defects include but are not limited to changes in the structural, physical or chemical properties of the sealant materials that impair function or require abnormal maintenance, changes in surface finish, color or texture, failure in adhesion, weather resistance or durability, failure to prevent entry of water, or failure to comply with specified requirements.
1. This warranty shall not cover formation of cracks or defects in substrate materials adjacent to the seal, joint movement in excess of movement rating of sealant, or physical damage caused by others.
2. Repair or replace defective materials, fabrication, and installation during warranty period without expense to Owner, including removal and replacement of other items as required.

3. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
4. Warranty Period: Ten years from date of Substantial Completion.

C. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

D. Failure of the materials, fabrication, and installation include leakage, hardening, cracking, crumbling, melting, shrinkage or running of the sealant or caulking, or the staining of adjacent materials.

E. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Firestopping and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 81 13 - Sustainable Design Requirements.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Provide firestopping materials having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. SCAQMD Rule 1113 compliant.
3. Declare Label.

2.2 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.

2.3 MATERIALS

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

C. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.4 EXTERIOR JOINT SEALANTS

A. Sealant types:
1. Weather barrier sealant.
2. Concrete walkway joint sealant.

B. Exterior Silicone Weatherproofing and Control Joint Sealant: ASTM C920, also ASTM C1193 and tested under ASTM C719; Type S, Grade NS, Class 100/50, Use NT, M, G, A, and O; single component, low-modulus, non-sag sealant, use at exterior joints in vertical surfaces and non-traffic horizontal surfaces such as but not limited to:
1. Control and expansion joints in cast-in-place concrete.
2. Joints between architectural precast concrete units.
3. Joints in exterior plaster wall systems.
4. Control and expansion joints in unit masonry.
5. Butt joints between metal panels.
6. Joints between different materials listed above.
7. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers, and similar openings.
8. Control and expansion joints in ceilings and overhead surfaces.
9. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
10. Acceptable Sealants:
    a. Dow Corning Corporation; Dow Corning 790.
    b. Pecora Corporation; 890.
    c. Tremco; Spectrem 1.

C. Exterior Polyurethane Weatherproofing and Control Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O; single component, chemical curing, non-staining, non-bleeding, non-sagging type; color as selected; use in exterior vertical surfaces such as, but not limited to:
1. Expansion and control joints of precast panels and tilt-up concrete panels.
2. Window and door perimeters, reglets, and flashings.
3. Joints between architectural precast concrete units.
4. Control and expansion joints in unit masonry.
5. Butt joints between metal panels.
6. Joints between different materials listed above.
7. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers, and similar openings.
8. Control and expansion joints in ceilings and overhead surfaces.
9. Acceptable Sealants:
    a. Pecora Corporation; Dynatrol I.
    b. Sika Corporation, Inc.; Sikaflex 1a.
    c. BASF (Sonneborne); NP 1.
    d. Tremco; Dymonic FC.

D. Reglets and Flashings Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, A, and O; single component elastomeric.
1. Acceptable Sealants:
    a. Dow Corning Corporation; Dow Corning 795.
    b. Pecora Corporation; 895NST.
    c. Tremco, Inc.; Spectrem 2.

E. Weather Barrier Sealant: ASTM C920, Type S, Grade NS, Class 25, neutral-cure, single-component elastomeric; ASTM C719 +/- 25 movement.
   1. Acceptable Sealants:
      a. Dow Corning Corporation; Dow Corning 758.

F. Concrete Walkway Joint Sealant: ASTM C920, Type M and A, Grade P, Class 25, Use T, M, and O; multi-component, pourable urethane sealant.
   1. Acceptable Sealants:
      a. Pecora Corporation; Urexpan NR-200.
      b. Sika, Inc. SikaFlex 2c SL.
      c. Tremco Incorporated, THC 900/901.

2.5 INTERIOR JOINT SEALANTS

A. Interior Weatherproofing and Control Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O; single component, chemical curing, non-staining, non-bleeding, non-sagging type; color as selected; use in interior surfaces such as, but not limited to:
   1. Control and expansion joints on exposed interior surfaces of exterior walls.
   2. Perimeter joints on exposed interior surfaces of exterior openings.
   3. Joints on precast beams and planks.
   4. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
   5. Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified.
   6. Acceptable Sealants:
      a. Pecora Corporation; Dynatrol I-XL.
      b. Sika Corporation, Inc.; Sikaflex 1a.
      c. BASF (Sonneborne); NP 1.
      d. Tremco; Dymonic FC.

B. Interior Latex Joint Sealant: Provide product complying with ASTM C834, Type S, Use O, Grade NS; use at interior joints in vertical surfaces and non-traffic horizontal surfaces such as, but not limited to:
   1. Perimeters of interior door and window frames.
   2. Interior wall surfaces scheduled to receive latex paints.
   3. Perimeters of plumbing fixtures.
   4. Control and expansion joints on exposed interior surfaces of exterior walls.
   5. Perimeter joints on exposed interior surfaces of exterior openings.
   6. Joints on precast beams and planks.
   7. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
   8. Trim or finish joints subject to movement.
   9. Acceptable Sealants:
      a. Pecora Corporation; AC-20.
      b. BASF (Sonneborn); Sonolac.
      c. Tremco; Tremflex 834.

C. Mildew Resistant Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25; Use NT, G, A, and O; use on non-porous interior surfaces under high humidity and temperature extremes. For use in bathrooms, spas, and similar applications where joints need protection against fungi and bacteria.
   1. Acceptable Sealants:
      a. Dow Corning Corporation; Dow Corning 786.
      b. Pecora, Inc. 898.
      c. Tremco, Inc Tremsil 200.

D. Interior Food Contact Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, G, A, and O; USDA compliant, for use at the following:
   1. Joints in kitchen countertops and work surfaces.
   2. Joints between food service equipment and surrounding construction.
   3. Other interior joints where incidental food contact may occur.
   4. Acceptable Sealants:
      a. Pecora Corporation; 898.
      b. BASF (Sonneborn); Omniplus.

E. Acoustical Sealant for Exposed and Concealed Joints: Non-sag, paintable, nonstaining, latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90; use for drywall or plaster wall systems, bedding electrical boxes and other wall outlets.
   1. Acceptable Sealants: One of the following or approved equal:
      a. Pecora Corporation; AIS 919 Acoustical and Insulation Latex Sealant.
      b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
      c. Tremco, Inc.; Tremflex 834 or Tremco Acoustical Sealant.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings and accessory materials, including primers, of material and type that are non-staining; are compatible with joint substrates, sealants, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Foam Joint Fillers: Non-gassing, preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of one of materials indicated below, as recommended by manufacturer for compatibility with their sealant; of size, shape, and density to control sealant depth, prevent three-sided adhesion, provide a surface against which to tool, and otherwise contribute to producing optimum sealant performance:
   1. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) or Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance and as recommended by sealant manufacturer.
   2. Elastomeric Tubing Sealant Backings: Flexible cellular rubber tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

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 pre-construction joint sealant-substrate tests and field tests. Certify that primer will not permanently stain adjacent joint surfaces.

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 in any way joint substrates and adjacent nonporous surfaces, 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, to mask off adjacent joint surfaces where sealant is not permanently intended to be applied.

D. Bondbreaker Tape: Polyethylene pressure sensitive adhesive tape, to be used in areas where backer rod cannot fit and where three-sided adhesion is to be avoided.

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. Verify that joint sizes and surfaces are free of defects and acceptable for installation of joint sealants.

C. Verify joint dimensions and shapes to ensure they are within the sealant manufacturer's guidelines. Resolve any variances prior to installation. Do not proceed with sealant installation until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Thoroughly clean the areas that the new sealant will contact using a de-greasing solvent not harmful to the environment using the two-rag wipe technique. IPA (isopropyl alcohol) is not a degreasing solvent. The new sealant should have a minimum contact area of 1/4".

B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.
      c. Porcelain enamel.
      d. Glazed ceramic tile.

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 JOINT PRIMING

A. Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on pre-construction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations.

B. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Allow primer to dry. Do not prime areas that cannot be sealed the same day.

3.4 INSTALLATION OF SEALANT BACKINGS

A. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of joint fillers.
2. Do not stretch, twist, puncture, or tear joint fillers.
3. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

3.5 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Install joint backing to maintain the following joint ratios, but in no case less than 1/4 inch (6 mm):
1. Joints up to 1/2 inch wide: 1:1 width to depth ratio.
2. Joints Greater than 1/2 inch wide: 2:1 width to depth ratio; maximum 1/2 inch joint depth.
3. Sub-caulk joints that are deep, or joints without suitable backstop, to proper depth.
4. Protect side walls of joint (to depth of caulking) with bond breaker tape.
5. Install with adhesive on 2 faces in contact with sides of joints.

F. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint.
1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C1193.

3.6 CLEANING

A. Clean off excess sealants and 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.

B. Leave finished work in a neat, clean condition with no evidence of spillovers onto adjacent surfaces.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.7 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion.

B. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 9200

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SECTION 08 1113 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Standard steel doors and frames indicated and scheduled on Drawings.

B. Commercial grade flush panel steel closet doors.

C. Forcible entry training simulator.

1.3 RELATED SECTIONS

A. Section 03 1000 – Concrete Formwork: Block outs for door openings to be cast in concrete panels.

B. Section 08 7100 - Door Hardware.

C. Section 09 9100 – Painting: Finish painting of steel items.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets. Metal thicknesses indicated below correspond to former gage thicknesses:
1. 20 Gage: 0.032-inch (0.8-mm).
2. 18 Gage: 0.042-inch (1.0-mm).
3. 16 Gage: 0.053-inch (1.3-mm).
4. 14 Gage: 0.067-inch (1.7-mm).
5. 12 Gage: 0.093-inch (2.3-mm).

1.6 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.

B. Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
      b. Provide total weight of products provided.
   3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
   4. For field-applied touch up primers, paints, clear coatings, and galvanizing agents, include printed statement of VOC content and chemical components.
   5. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e. from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
   6. GreenGuard Gold Certified Certificate.
   7. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
   8. CDPH Standard Method v1.1 testing report.

1.7 INFORMATIONAL SUBMITTALS

A. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

B. Indicate coordination of glazing frames and stops with glass and glazing requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.8 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames", ANSI A250, and as specified herein.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by UL, for fire ratings indicated, based on testing according to NFPA 252. Assemblies must be factory-welded or come complete with factory-installed mechanical joints and must not require job site fabrication.

C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257. Assemblies must be factory-welded or come complete with factory-installed mechanical joints and must not require job site fabrication.

D. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriter Laboratory maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.

B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
1. Steel: Average recycled content of steel to be a minimum 60 percent recycled content.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Welding and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 018113 - Sustainable Design Requirements.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Provide steel door and frame materials having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. GreenGuard Gold Certified
3. Type III Environmental Product Declaration.
4. Declare Label.

2.2 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following, or approved equal:
1. Amweld Building Products.
2. Curries Company.
3. Steelcraft, an Ingersol Rand Company.

2.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A653/A653M, with ASTM A924/A924M, G60 zinc coating, mill phosphatized.

C. Door Louvers: SDI 111C, sight proof, inverted V or Y blades, with insect screen at exterior doors, size as indicated on Drawings.

D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A153/A153M, Class B.

E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A153/A153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard steel door frames of type indicated.

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

H. Glazing: Comply with requirements in Section 08 8100.

2.4 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.
1. Design: Flush panel.
2. Non-Rated Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
3. Fire Door Core Construction: As required to provide fire-protection ratings indicated.
4. Vertical Edges, for Single- and Double-Acting Doors: Square edge.
5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
1. Fabricate from galvanized steel sheet.
2. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush) or Model 2 (Seamless) composite construction where indicated on Drawings.

C. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
1. Fabricate from cold-rolled steel sheet.
2. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush) or Model 2 (Seamless) composite construction where indicated on Drawings.

2.5 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from galvanized steel sheet.
1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Frames for Level 1 and Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

3. Frames for Level 3 and Level 4 Steel Doors: 0.067-inch- (1.7-mm-) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Knocked-Down Frames: Nor permitted.
3. Frames for Level 1 and Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
4. Frames for Level 3 and Level 4 Steel Doors: 0.067-inch- (1.7-mm-) thick steel sheet.
5. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
6. Frames for Borrowed Lights: 0.053-inch- (1.3-mm-) thick steel sheet.

D. Fire Rated Units: Construct assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to NFPA 252.
1. Labels: Place fire rating labels where visible when door frames are in installed, opened position.
2. Fire Ratings: Refer to Drawings for fire rating requirements.
3. Temperature Rise Rating: Provide doors with maximum 450°F Temperature Rise Rating in 30 minute fire exposure period at doors into exit enclosures.

E. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
1. Hinges: Minimum 0.123 inch (3.0 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch (1.7 mm) thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch (1.7 mm) thick.

F. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

G. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Metal Stud Anchor: Z-type anchor, welded to frame, 0.053-inch thick steel, UL listed as required for fire rating.
3. Post-Installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

H. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
1. Used at all frames installed prior to walls. Where frames are installed after walls, install an additional jamb anchor within the lowest 6-inches of the door jamb, one each side.
2. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
3. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

I. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch (16 mm) high, unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.7 FORCIBLE ENTRY TRAINING SIMULATOR

A. Basis-of-Design Product: The Enforcer training Building Door; 1.888.493.6723; http://www.theinforcer.com.

2.8 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant.

B. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site.

C. Hollow Metal Doors:
1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel. Install insulation in doors where scheduled on Drawings.
4. Fabricate exterior doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gage inverted steel channels. Seal joints watertight.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from cold-rolled or hot- rolled steel (at fabricator's option).

7. Provide 3/8-inch back bend return on frames where gypsum board wall material occurs whether on one or both sides.
8. Fabricate frames having multiple openings with mullion members having no visible seams or joints. Continuously weld face, rabbet, and soffit joints between abutted members and finish smooth when exposed to exterior.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
6. Factory-install glass in prepared openings.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts. Paint heads to match adjacent surfaces.

G. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
1. Locate finish hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware", published by Door and Hardware Institute.
2. Prepare frames for silencers except for frames which receive weatherstripping.
3. Provide dust cover boxes or mortar guards of 0.016-inch thick steel at all hardware mortises on frames.
4. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.

H. Attach fire rated label to each rated frame and door unit.

I. Factory-install louvers in prepared openings.

2.9 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Finish standard steel door and frames after assembly.

B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A780/A780M.
1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils (0.018 mm).
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

2.10 ACCESSORIES

A. 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 A510/A510M may be used in place of steel sheet.

B. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A153/A153M, Class C or D as applicable.

C. Shop Applied Primer: Rust-inhibitive enamel or paint, air-drying or baking type, suitable as a base for specified finish paints.

D. 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.

E. Finish: Paint in accordance with Section 09 9100.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

C. Placing Frames: Comply with provisions of ANSI A250.11 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.

D. Except for frames located at in-place concrete and at drywall installations, place frames prior to construction of enclosing walls. 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.

E. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws.

F. Standard Steel Frames: Install standard steel frames for doors, sidelights, transoms, borrowed lights and other openings, of size and profile indicated. Comply with ANSI A250.11.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-protection-rated openings, install frames according to NFPA 80.
      b. Install frames with removable glazing stops located on secure side of opening.
      c. Install door silencers in frames before grouting.
      d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      e. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      f. Apply bituminous coating to backs of frames that are filled with mortar and grout.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
      a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
   3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
   4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
   5. Concrete Walls: Solidly fill space between frames and concrete with grout. Install grout in lifts and take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
   6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
   7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
   8. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

G. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
      b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

H. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with standard steel door and frame manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) oc, and not more than 2 inches (50 mm) oc from each corner.

I. Forcible entry training simulator: Install according to manufacturer’s written instructions where indicated on Drawings.

3.2 ADJUSTING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

3.3 CLEANING

A. Clean grout and other bonding material off standard steel doors and frames immediately after installation.

B. Galvanized Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 08 1113

SECTION 08 1416 – FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Solid core wood doors, rated and non-rated.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 RELATED SECTIONS

A. Section 08 7100 –Door Hardware: Installation of hardware in wood doors.

B. Section 08 8100 – Glass Glazing: Glass for glazed wood doors.

C. Section 09 9100 – Painting: Field finishing of wood doors.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings.
   1. Include adhesive and composite wood materials manufacturers' product data indicating urea-formaldehyde content.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate doors to be factory finished and finish requirements.
   4. Indicate fire ratings for fire doors.

C. Samples for Verification: Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.

3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
4. Chain-of-custody certificates certifying that flush wood doors are to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
   a. Include statement indicating costs for each certified wood product.
5. Toxicity Certification:
   a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
   b. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
   c. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
6. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e., from cradle to cradle) that is verified by an ISO/IEC 17065 accredited certification body.
7. GreenGuard Gold Certified Certificate
8. CARB 93120 ATCM 2007 composite wood formaldehyde regulation Certificate
9. Declare Label: Manufacturers publicly available Declare Label as included in the Declare database https://living-future.org/declare-products
10. CDPH Standard Method v1.1 testing report

1.6 CLOSEOUT SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.7 QUALITY STANDARDS

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Comply with AWS "Architectural Woodwork Standards" for requirements in the door grades indicated.

C. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

D. 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. Door label shall include hourly rating followed by the letter "S" indicating conformance with air leakage resistance testing, serial number, and the listing agency's certification mark.

E. Temperature-Rise Rating: At exit enclosures and exitways, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure. In addition to the requirements specified for positive pressure test requirements specified above, the door label shall include temperature rise rating.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.9 SITE CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials, fabrication, or installation within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
   2. Warranty Period for Solid-Core Interior Doors: Life of the original installation, including costs of re-hanging.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. Certified Wood: Use wood based products made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils “Principles and Criteria.”

C. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.

E. Provide wood doors having the following certifications and labels:
   1. CDPH Standard Method V1.1 compliant
   2. GreenGuard Gold Certified
   3. CARB 93120 ATCM 2007 composite wood formaldehyde regulation Certificate
   4. Type III Environmental Product Declaration.
   5. Declare Label.

2.2 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Eggers Industries.
   2. Marshfield Door Systems.
   3. VT Industries Architectural Wood Doors.

2.3 MATERIALS

A. General Wood Door Product Requirements: Provide doors with same exposed surface material on both faces of each door; meeting requirements of AWS Section 9; unless otherwise indicated.

B. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

C. Adhesives: NWWDA IS-1.6, Type II adhesive bond or better for cores, Type I adhesive bond for faces and cross bands. Do not use adhesives containing urea formaldehyde.

2.4 INTERIOR DOOR CONSTRUCTION

A. General Wood Door Product Requirements: Provide doors with same exposed surface material on both faces of each door; meeting requirements of AWS Section 9 unless otherwise indicated.

B. Interior, Solid-Core, Veneer-Faced Doors:
   1. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
   2. WDMA I.S.1-A Performance Grade:
      a. Heavy Duty: At office, stairwell, mechanical service, hallway, storage doors.
      b. Extra Heavy Duty: At public bathrooms, assembly areas, and kitchens.
   3. Adhesive: Type I or Type II
   4. Blocking: Provide wood blocking in particleboard-core doors as follows:
      a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
      b. 5-inch (125-mm) bottom-rail blocking, typical, except where specified otherwise for special conditions.
      c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
      d. 10-inch (250-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
   5. Provide doors with glued-wood-stave cores instead of particleboard cores for doors indicated to receive exit devices.

C. Particleboard Cores:
   1. Core (Solid, Non-Rated): AWS Section 9, HPVA Grade A, particleboard core.
   2. Particleboard: ANSI A208.1, Grade LD-1.
      a. Use particleboard made with binder containing no urea-formaldehyde resin.
   3. Blocking: Provide wood blocking in particleboard-core doors as follows:
      a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
      b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
      c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
   4. Provide doors with glued-block cores instead of particleboard cores at locations where exit devices are indicated.

D. Mineral-Core Doors:
   1. Core (Solid, Fire Rated): AWS Section 9, HPVA Grade A, noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
   2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
      a. 5-inch (125-mm) top-rail blocking.
      b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
      c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
      d. 4-1/2-by-10-inch (114-by-250-mm) lock blocks.
      e. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
   3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

E. Veneer-Faced, Interior, Doors for Transparent Finish:
   1. Grade: Custom (Grade A faces).
   2. Species and Cut: Stained to match White Oak Fume, cut to match Cabinet veneer.
   3. Match between Veneer Leaves: Book match.
   4. Assembly of Veneer Leaves on Door Faces: Running match.
   5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
   6. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
   7. Corridor Match: Corridor door faces do not need to match where they are separated by 20 feet (6 m) or more.
   8. Stiles: Same species as faces.

2.5 FABRICATION

A. Factory-pre-fit and pre-machine doors to fit frame opening sizes indicated and complying with AWS pre-fitting tolerances.

B. Fabricate fire rated doors in accordance with AWS Architectural Woodwork Standards and to UL requirements. Attach fire rating label to door.

C. Provide lock blocks at lock edge and top of door for closer as required for hardware reinforcement.

D. Vertical Exposed Edge of Stiles: Hardwood of species compatible in color with veneer facing for transparent finish; hardwood for paint finish.

E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.

F. Fire Rated Doors: Of rating specified; construction shall be manufacturer's standard, conforming to the requirements of the applicable labeling agency acceptable to the authority having jurisdiction for the label specified.
   1. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
   2. Comply with NFPA 80 for fire-rated doors.
      a. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.

G. Prepare fire rated doors as required by NFPA 80, for locks, latches, hinges, remotely operated or monitored hardware, concealed closures, glass lights, vision panels, louvers, astragals and laminated overlays in conformance with the manufacturer's licensing and label service agreement.

2.6 SHOP PRIMING FOR FIELD FINISH

A. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing." Seal edges of cutouts and mortises with first coat of finish.
   1. Prime faces, all four edges, edges of cutouts, and mortises.

2.7 ACCESSORIES

A. Glazing Stops:
   1. Non-rated Areas: Wood, of same species as door facing.
   2. Rated Areas: Wood with metal clips, or welded steel with mitered corners as indicated on Drawings; prepared for countersink-style screws.

B. Astragals for Fire Rated Double Doors: Aluminum T-shaped section with silicone seal, specifically designed for double doors.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect openings before installation. Verify that rough openings are correct before proceeding.

B. Examine doors and substrates, with Installer present, for suitable conditions where wood doors and fire-rated wood door frames will be installed.
   1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   2. Reject doors with defects.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wood doors to comply with manufacturer's instructions, in accordance with AWS Section 9 requirements.

B. Align and fit doors in frames with uniform clearances and bevels. Machine doors for hardware. Seal cut surfaces after fitting and machining.

C. Do not impair utility or structural strength of doors in fitting to the opening, in applying hardware, preparing lights, louvers, or plant-ons or other detailing.

D. Fire-Rated Doors: Install in fire-rated frames in accordance with requirements of NFPA 80.
   1. Do not remove labels from fire rated doors.

E. Install pre-fit and pre-machined doors in accordance with manufacturer's data. Install with a maximum clearance of 1/8 inch on the lock side, 1/8 inch between meeting edges of paired doors and 1/8 inch between top of door and frame header.

F. If not pre-machined, use a minimum of 1 hinge for each 30 inches of door height. Equally space hinges when using 3 or more.

G. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
   1. Fitting Clearances:
      a. Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors.
      b. Provide 1/4 – 3/8-inch (6 – 9.5 mm) from bottom of door to top of decorative floor finish or covering.
      c. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.
      d. Fire-rated Doors: As specified in CBC Section 715 and NFPA 80.

H. Doors may not extend beyond 1/16 inch from the face of the jamb nor more than 1/8 inch behind jamb face.

I. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

J. Cutouts, Recesses, and Exposed Rail Edges: Unless factory provided, paint with two coats of clear sealer, each coat well dried, before hardware is set in place.

K. Meeting stiles of pairs of doors shall be in alignment along the entire height, and offset between adjacent leaves shall not exceed 1/8-inch

3.3 ADJUSTMENT

A. Adjust doors for smooth and balanced movement.

B. Operation: Rehang or replace doors that do not swing or operate freely.

C. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

3.4 CLEANING

A. Clean glass and hardware units promptly after installation in accordance with manufacturer's printed instructions.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Protect installed units to ensure that they are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 1416

SECTION 08 3113 – ACCESS DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Access panels and doors in walls.

B. Floor access doors.

1.3 RELATED SECTIONS

A. Section 09 9100 – Painting: Finish painting for metal surfaces.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Indicate type(s) of doors to be installed for wall and ceiling conditions, special installation requirements, fire ratings, finishes, closing mechanisms, and hardware.

B. LEED Submittals: See Section 01 8113 for additional requirements; provide Product Data for the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.

C. Location Drawing: Required access doors may not be indicated on the Drawings. Show proposed location of every required access door with dimensions in plan and elevation. Verify locations with the Architect. Access doors shall be located within walls and ceilings for access including but not limited to the following: automatic valves, automatic dampers, air terminal units, and fire/smoke dampers. Show location of adjacent materials, trim pieces, and hardware required to complete the work. Do not begin installation until location is approved. Submit access door locations superimposed on piping layout and duct layout shop drawings

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

B. Provide fire-rated access doors that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per test method indicated, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities have jurisdiction.
   1. Fire-Rated Vertical Access Door Assemblies: NFPA 252 or UL 10B.
   2. Fire-Rated Horizontal Access Door Assemblies: NFPA 288.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Babcock-Davis.
2. J.L. Industries.
3. Larsen's Manufacturing Company.

2.2 MATERIALS

A. Sheet Steel: ASTM A36/A36M, commercial-quality, cold-rolled steel with baked-on, rust inhibitive primer.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Cold-Rolled Steel Sheets: ASTM A36/A36M, Commercial Steel (CS), or ASTM A620/A620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A568/A568M. Electrolytic zinc-coated steel sheet, complying with ASTM A591/A591M, Class C coating, may be substituted at fabricator's option.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A591/A591M, 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 A568/A568M for uncoated base metal.

2.3 ACCESS DOORS

A. Furnish access doors of proper size for access to concealed equipment. Unless otherwise indicated, minimum size shall be 12-inch x 12-inch for hand access and minimum 18-inch x 18-inch for valve and actuator access and 24-inch x 24-inch for equipment access.

B. Flush, Insulated, Fire-Rated Access Doors and Frames with Exposed Flanges: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces or fire-rated and sound-rated construction.
2. Fire-Resistance Rating: One hour for ceilings and one and one-half hours for walls.
3. Temperature Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch (0.9 mm).
5. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with 1-inch (25-mm) wide, surface-mounted trim.
6. Finish: Phosphate dipped with baked-on rust inhibiting primer for field painting as specified in Section 09 91 00.
7. Insulation: 2-inch thick fire-rated insulation sandwiched between two pieces of 20-gauge steel.
8. Hinges: Continuous piano hinge.
9. Automatic Closer: Spring type.
10. Hardware: Self-latching bolt with automatic closer and interior latch release.
11. Latch/Lock: Ball bearing cylinder lock operated by a recessed flush key lock. Panels shall have interior latch release mechanism allowing the door to be unlocked from the inside. Provide keyed locks at access doors located in public areas.

12. At sound-rated construction, seal door flanges with Pemko S88 smoke seals at perimeter, color that most closely matches adjacent finished surfaces. Seal entire assembly to gypsum board with acoustical sealant specified in Section 07 92 00.

C. Flush, Non-Rated Access Doors and Frames with Exposed Flanges: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces in Toilet Rooms, Custodial Rooms, and other Wet Areas.
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 wide, surface-mounted trim.
4. Hinges: Continuous piano hinge.
5. Hardware: Screwdriver-operated cam latch.

2.4 FLOOR ACCESS DOORS

A. Steel Doors and Frames:
1. Door: 3/16” reinforced steel diamond plate.
2. Frame: 3/16” steel 2”x3” angle frame with integral masonry flange.
3. Finish: Gray prime painted
4. Latch: Type 316 stainless steel slam latch with inside lever handle and outside removable “L” handle fastened to door with tamper-resistant stainless steel bolts.
5. Hinge: 3 inch by 3 inch type 316 stainless steel, heavy-duty butt hinge with stainless steel pin fastened to door with stainless steel carriage bolts. Provide hinges with slotted bolt holes for on-site adjustment.
6. Springs: Type 316 stainless steel compression lift springs designed to counterbalance door weight and resist downward pressure when closing door.
7. Hold-Open Arm: 3/8 inch type 316 stainless steel arm that automatically locks when door is opened to 90 degrees. Provide release handle with red vinyl grip that releases door and allows for closure.

2.5 FABRICATION

A. General: Provide access door assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
1. Exposed Flanges: Nominal 1 inch (25 mm) wide around perimeter of frame.
2. Provide mounting holes in frames to attach frames to metal or wood framing in plaster and drywall construction and to attach masonry anchors in masonry construction.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
1. For keyed latches, furnish two keys per latch and key all latches alike.

2.6 STEEL FINISHES

A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Exteriors (SSPC Zone 1B): SSPC-SP6/NACE No. 3, "Commercial Blast Cleaning."
   2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

B. Steel and Metallic-Coated-Steel Finishes:
   1. Apply shop primer to uncoated surfaces of metal fabrications.
   2. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Advise installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

B. Furnish inserts and anchoring devices for access doors that must be built into other construction.

C. Coordinate delivery with other work to avoid delay.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for installing access doors.

B. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish.

C. Coordinate location of access doors in hung ceilings, furred spaces and walls to provide access to concealed work items requiring maintenance and/or adjustment. Obtain approval of the Architect for the locations of such access doors.

D. Locate and group equipment requiring access doors. Coordinate location of equipment with other trades to minimize number of access doors in one area.

E. Frames, doors and trim pieces shall not vary from straightness or snug contact fit by more than 1/16-inch.

F. Provide access doors for maintenance or adjustment purposes for mechanical system components, including but not limited to the following:
   1. Valves.
   2. Dampers.
   3. Concealed equipment.

3.3 ADJUSTING

A. Adjust and clean hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

3.4 CLEANING

A. Clean and prepare doors for painting in accordance with Section 099100.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 08 3113

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SECTION 08 3323 – OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Coiling doors.

B. Steel panels, galvanized, flush design, prefinished.

C. Manual operation, hardware, and supports.

1.3 RELATED SECTIONS

A. Section 05 5000 - Metal Fabrications: Miscellaneous steel supports.

B. Section 08 3421 - Vertical Bi-Fold Overhead Doors.

C. Section 08 3613 – Sectional Doors.

D. Section 08 7100 - Door Hardware: Lock cylinders and keying.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.6 COORDINATION

A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

1.7 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
   1. Summary of forces and loads on walls and jambs.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.
   1. Curtain Slats: 12 inches (305 mm) long.
   2. Bottom Bar: 6 inches (150 mm) long.
   3. Guides: 6 inches (150 mm) long.
   4. Brackets: 6 inches (150 mm) square.
   5. Hood: 6 inches (150 mm) square.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
      b. Provide total weight of products provided.
   3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
   4. For field-applied touch up primers, paints, clear coatings, and galvanizing agents, include printed statement of VOC content and chemical components.
   5. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e. from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
   6. GreenGuard Gold Certified Certificate.
   7. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
   8. CDPH Standard Method v1.1 testing report.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.
   1. Obtain operators and controls from overhead coiling door manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of overhead coiling doors that do not comply with requirements or that fail in materials, fabrication, or installation 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. Failure of components or operators before reaching required number of operation cycles.
c. Faulty operation of hardware.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
1. Steel: Average recycled content of steel to be a minimum 60 percent.
2. Aluminum: Average recycled content of aluminum to be a minimum of 70 percent.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

2.2 MANUFACTURERS

A. Basis-of-Design Product: The design for the overhead doors is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: Overhead Door Co.; . Model 610 Rolling Steel Service Door.
2. Cookson Company.
3. R & S Manufacturing, Inc.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel (SS) sheet; complying with ASTM A653/A653M, G90 (Z275) coating designation.
a. Minimum Base-Metal (Uncoated) Thickness: 0.0209 inch (0.55 mm).
b. Flat profile slats.
2. Inside Curtain Slat Face: To match material of outside metal curtain slat.

B. Endlocks and Windlocks for Coiling Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Bottom Bar for Coiling Doors: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; galvanized, stainless-steel, or aluminum extrusions to suit type of curtain slats.

D. Curtain Jamb Guides for Coiling Doors: Fabricate curtain jamb guides of steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch- (5-mm-) thick galvanized steel sections complying with ASTM A36/A36M and ASTM A123/A123M. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.4 HOODS AND ACCESSORIES

A. Hood: Form to act as weatherseal and entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.
1. Fabricate hoods for steel doors of minimum 0.028-inch- (0.7-mm-) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A653/A653M.
2. Shape: Manufacturer's standard.

B. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and top of exterior doors, unless otherwise indicated. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
1. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.

C. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
1. Locking Bars: Single-jamb side operable from inside only.
2. Lock cylinder is specified in Section 08 7100 Door Hardware.

2.5 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.
1. Operation Cycles: Minimum 100,000.

D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

2.6 MANUAL DOOR OPERATORS

A. Chain-Hoist Operator: Provide manual chain-hoist operator consisting of endless steel hand chain, chain pocket wheel and guard, and gear-reduction unit with a maximum 35-lbf (155-N) force for door operation. Provide alloy steel hand chain with chain holder secured to operator guide.

2.7 FINISHES, GENERAL

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL AND GALVANIZED STEEL FINISHES

A. Baked Finish: Manufacturer's standard baked finish consisting of primer and topcoat according to coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting, and minimum dry film thickness.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.

B. Set guides, door, and operating equipment complete with required hardware, anchors, inserts, hangers, and equipment supports according to manufacturer's installation instructions.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door guides suspended from structure. Secure guides to structural members only.

E. Fit and align door assembly including hardware, level and plumb, to provide smooth operation.

F. Install perimeter trim and closures.

3.3 ADJUSTING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

B. Remove visible markings.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

3.6 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION 08 3323

SECTION 08 3421 - HORIZONTAL BI-FOLD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Bi-folding, high-speed four-fold horizontal operating doors.

B. Electrical operating motor, hardware, and supports.

C. Note: Door Engineering and Manufacturing shall be the only sole source manufacturer per City Council's approved resolution.

1.3 RELATED SECTIONS

A. Section 05 5000 - Metal Fabrications: Miscellaneous steel supports.

B. Section 08 3323 - Overhead Coiling Doors.

C. Section 08 3613 – Sectional Doors.

D. Section 08 7100 - Door Hardware: Lock cylinders and keying.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.6 ACTION SUBMITTALS

A. Product Data: For each type and size of horizontal bi-fold door and accessory. Include the following:
   1. Summary of forces and loads on walls and jambs.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation manuals.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Show locations of replaceable fusible links.

3. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.
1. Panel: 6-inches (150 mm) square.
2. Bottom Bar: 6 inches (150 mm) long.
3. Guides: 6 inches (150 mm) long.
4. Brackets: 6 inches (150 mm) square.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
   b. Provide total weight of products provided.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
4. For field-applied touch up primers, paints, clear coatings, and galvanizing agents, include printed statement of VOC content and chemical components.
5. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e. from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
6. GreenGuard Gold Certified Certificate.
7. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
8. CDPH Standard Method v1.1 testing report.

E. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

B. Warranty: Special warranty specified in this Section.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

C. Source Limitations: Obtain horizontal bi-fold doors through one source from a single manufacturer.
1. Obtain operators and controls from horizontal bi-fold door manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of horizontal bi-fold doors that do not comply with requirements or that fail in materials, fabrication, or installation within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Doors that are warped, twisted, bowed or damaged as a result of defective product.
      b. Structural failures including, but not limited to, excessive deflection.
      c. Noise or vibration caused by thermal movements.
      d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      e. Adhesive or cohesive sealant failures.
      f. Water leakage through framing areas.
      g. Failure of operating components.
   2. Warranty Period: Two years from date of Substantial Completion.

B. Submit written agreement in manufacturer’s standard form signed by manufacturer and installer agreeing to repair or replace defective.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
   1. Steel: Average recycled content of steel to be a minimum 60 percent.
   2. Aluminum: Average recycled content of aluminum to be a minimum of 70 percent.

B. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

2.2 PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
   1. Design Pressure: 110 mph, Exposure D (65’-0” average roof height).
   2. Maximum Deflection: 1/300 of opening width.
   3. The following loads have been provided as a convenience:
      a. Working Load: +38 psf
      b. Ultimate Design Load: -70 psf.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Basis-of-Design Product: The design for the exterior horizontal bi-fold doors is based on the manufacturer identified below.
   1. Basis-of-Design: Door Engineering and Manufacturing, FF100-600XT Series.
   2. No substitutions.

B. Construction: Door framing shall be minimum 11-gauge structural steel tube with 14-gauge steel sheet on the exterior and interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush

C. Angle Frame: Supply pre-hung tube frame system constructed of minimum L6x4x0.25, designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.

D. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6x4x0.25, designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.

E. Factory finish: Door Panels and Tube Frames shall be finished with manufacturer's standard PPG Spectracron epoxy primer and polyurethane top coat.
   1. Color: . Custom color matching City of Hayward's existing fire stations.

2.4 OPERATING HARDWARE

A. Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.

B. Hinges: Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Jamb hinges shall be gusseted. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum 3/4-inch diameter hardened steel.

C. Weatherstripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16" cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weatherstripping at sill shall include two 1/16" cloth inserted neoprene sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.

D. Perimeter Weatherstripping: Provide jamb and head weatherstripping of 1/16" cloth-inserted neoprene bulb (or closed cell neoprene).

2.5 GLASS AND CLADDING

A. Vision Panels: Provide 1" insulated vision panels or grilles of the size, shape and location as noted on the drawings.

B. Glazing:
   1. Thickness: Insulated unit comprised of two lites of 1/4-inch thick tempered glass separated by a 1/2-inch air space.
   2. Type: 1" insulated LowE Solarban 60 tempered safety glass
   3. Location: Apparatus Bay of Building 1 (south wall).

2.6 ELECTRIC DOOR OPERATORS

A. Each Four-Fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.
   1. Comply with NFPA 70.
   2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards.

C. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to free wheeling mode for manual operation.

D. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for three phase 208/230/480 VAC, 60 Hertz operation.

E. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards. Incoming electrical shall be 480VAC 3-phase.
   1. Controls shall include a programmable logic controller with digital message display or LED indicators. Controller shall include programmable close timers and programmable inputs/outputs.
   2. Motor starters shall be magnetic reversing, factory wired with overload and under voltage protection, and equipped with mechanical interlocks. All control components shall be enclosed in one enclosure with a wiring diagram placed on the inside of the cover.
   3. If incoming voltage is single phase, control panel shall include a variable frequency drive to convert voltage to 3-phase for the motor
   4. Enclosures shall be NEMA 4 with disconnect switch.
   5. Pushbuttons (interior) for each door shall have one (1) momentary pressure three-button push-button station marked “OPEN”, “CLOSE” and “STOP”. Push button enclosure shall be NEMA 4.
   6. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.
   7. Safety edges: Provide electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.
   8. Photo eyes: Provide (1) exterior, jamb mounted, thru-beam type photo eyes, NEMA 4 rated.
   9. Presence Sensor: Provide (1) interior, overhead mounted, presence sensor.
   10. Radio controls: Provide one (1) radio receiver and (1) three-button remote per door. Remotes to , “Open”, “Close”, and “Stop” doors with three buttons.
   11. Timer Activation Loop Detectors (fire station applications): Provide “pulse on exit type” loop detector to activate auto close timer once loop has been activated and cleared, include hand/auto switch to deactivate timer. G.C. to coordinate installation of preformed loop with installer prior to exterior apron being poured.

12. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

2.11 FINISHES, GENERAL

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Door Finish: Custom color, as specified herein, including the following:
1. Steel Framework:
2. Exterior Facing Material.
3. Finish of Interior Facing Material: Finish as indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections and confirm power is available for connection to electrical operators.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal bi-fold doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.

C. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

D. Tracks:
1. Fasten horizontal track assembly to opening jambs and framing, spaced not more than 24 inches (610 mm) apart.
2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway

bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

E. Accessibility: Install horizontal bi-fold doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.

B. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

C. Lubricate bearings and sliding parts as recommended by manufacturer.

D. Adjust doors and seals to provide weathertight fit around entire perimeter.

E. Align and adjust motors, belts, sprockets, chains, and controls according to manufacturer's written instructions.

F. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780/A780M.

3.5 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain horizontal bi-fold doors.

END OF SECTION 08 3421

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SECTION 08 3613 – SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Aluminum and glass exterior sectional doors.

B. Electrical operating motor, hardware, and supports.

1.3 RELATED SECTIONS

A. Section 05 5000 - Metal Fabrications: Miscellaneous steel supports.

B. Section 08 3323 - Overhead Coiling Doors.

C. Section 08 3421 - Horizontal Bi-Fold Doors.

D. Section 08 7100 - Door Hardware: Lock cylinders and keying.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.6 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory. Include the following:
   1. Summary of forces and loads on walls and jambs.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Show locations of replaceable fusible links.
   3. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.
   1. Curtain Glass: 12 inches (305 mm) long.
   2. Bottom Bar: 6 inches (150 mm) long.

3. Guides: 6 inches (150 mm) long.
4. Brackets: 6 inches (150 mm) square.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
   b. Provide total weight of products provided.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
4. For field-applied touch up primers, paints, clear coatings, and galvanizing agents, include printed statement of VOC content and chemical components.
5. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e. from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
6. GreenGuard Gold Certified Certificate.
7. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
8. CDPH Standard Method v1.1 testing report.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain sectional doors through one source from a single manufacturer.
1. Obtain operators and controls from sectional door manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that do not comply with requirements or that fail in materials, fabrication, or installation 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. Failure of components or operators before reaching required number of operation cycles.
   c. Faulty operation of hardware.
   d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
   1. Steel: Average recycled content of steel to be a minimum 60 percent.
   2. Aluminum: Average recycled content of aluminum to be a minimum of 70 percent.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

2.2 MANUFACTURERS

A. Basis-of-Design Product: The design for the exterior sectional doors is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Basis-of-Design:
      a. Building 2: Clopay Commercial Model 903.
      b. Buildings 4 and 8: Clopay Model 520.
   2. Cookson Company.
   3. Northwest Door Co.
   4. Overhead Door Co.
   5. R & S Manufacturing, Inc.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Frames: Construct door sections with stiles and rails formed from extruded-aluminum shapes, complying with ASTM B221, alloy and temper recommended by manufacturer for type of use and finish indicated, with wall thickness not less than 0.065 inch (1.7 mm) for door section 1-3/4 inches (44 mm) deep. Fabricate sections with stile and rail dimensions and profiles shown on Drawings. Join stiles and rails by welding or with concealed, 1/4-inch- (6-mm-) minimum diameter, aluminum or nonmagnetic stainless-steel through bolts, full height of door section. Form meeting rails to provide a weathertight-seal joint.
   1. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.
   2. Provide reinforcement for hardware attachment.

B. Full-Vision Sections: Manufacturer's standard, tubular, aluminum-framed section fully glazed and set in vinyl, rubber, or neoprene glazing channel and with removable extruded-vinyl or aluminum stops.
   1. Glass Thickness: 1/2-inch insulated glass.
   2. Locations: Apparatus Bay, Buildings 1 (north wall) & 2 (south & east walls).

C. Safety Glass: ASTM C1048, fully tempered with horizontal tempering, Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; conforming to ANSI Z97.1; thickness as indicated.

2.4 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances shown on Drawings, and complying with ASTM A653/A653M for minimum G90 zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device. Slope tracks at proper angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.

B. Track Reinforcement and Supports: Galvanized-steel track reinforcement and support members, complying with ASTM A36/A36M and ASTM A123/A123M. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
   1. Vertical Track Assembly: Manufacturer’s standard.
   2. Horizontal Track Assembly: Track with continuous reinforcing angle attached to track and supported at points from curve in track to end of track by laterally braced attachments to overhead structural members.

C. Weatherseals: Do not include weatherseals at doors in Building 8. Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

D. Windows: Manufacturer's standard window units of type and size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors as required.

2.5 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- (2.01-mm-) nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges where required, for doors over 16 feet (4.88 m) wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- (76-mm-) diameter roller tires for 3-inch- (76-mm-) wide track and 2-inch- (51-mm-) diameter roller tires for 2-inch- (51-mm-) wide track.

D. Push/Pull Handles: For push-up or emergency-operated doors, provide galvanized-steel lifting handles on each side of door.

2.6 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
   1. Lock Cylinders: Provide cylinders standard with manufacturer and keyed to building keying system.
   2. Keys: Three for each cylinder.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A229/A229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.
1. Operation Cycle: 100,000 minimum.

B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet (4.88 m) long and two additional brackets at one-third points to support shafts more than 16 feet (4.88 m) long unless closer spacing is recommended by door manufacturer.

C. Cables, cable safety device, and brackets.

D. Cables: Galvanized-steel lifting cables with cable safety factor of at least 5 to 1.

E. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

F. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

G. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.8 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
1. Comply with NFPA 70.
2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
1. Jackshaft, Center Mounted: Jackshaft operator mounted on the inside front wall above door and connected to torsion shaft with an adjustable coupling or drive chain.

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.
1. Electrical Characteristics:

a. Phase: Polyphase.
b. Volts: 208 V or as required by door manufacturer.
c. Hertz: 60.

2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
6. Use adjustable motor-mounting bases for belt-driven operators.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Provide one (1) radio receiver and (1) three-button remote per door. Remotes to, “Open”, “Close”, and “Stop” doors with three buttons.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.9 DOOR ASSEMBLY

A. Full-Vision Aluminum Sectional Door: Sectional door formed with hinged sections.
1. Insulating Glass: Manufacturer's standard.

B. Aluminum Sections: Full vision, tempered.

C. Track Configuration: High-lift track; continuous angle-mounted configuration unless indicated otherwise on Drawings.

D. Weatherseals: Fitted to bottom and top and around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.

E. Roller-Tire Material: Manufacturer's standard.

F. Locking Devices: Equip door with locking device assembly and chain lock keeper.
1. Locking Device Assembly: Cremone type, both jamb sides, locking bars, operable from inside and outside, with cylinders.

G. Counterbalance Type: Torsion spring.

H. Electric Door Operator:
1. Usage Classification: Heavy duty, 60 to 90 cycles per hour.
2. Operator Type: Jackshaft, center mounted.
3. Motor Exposure: Interior, clean, and dry.
4. Emergency Manual Operation: Chain type.
5. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom bar; self-monitoring type.
a. Sensor Edge Bulb Color: Black.
6. Remote-Control Station: Interior, located where shown on Drawings.
7. Other Equipment: Audible and visual signals.

I. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color and gloss as selected by Architect from manufacturer's full range.
2. Finish of Interior Facing Material: Finish as selected by Architect from manufacturer's full range.

2.10 FABRICATION

A. Fabricate door sections to provide units not more than 24 inches high, with rolled horizontal meeting edges forming a weather seal. Enclose ends and provide intermediate stiles and horizontal and diagonal reinforcing as required for stability.

2.11 FINISHES, GENERAL

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.
   1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections and confirm power is available for connection to electrical operators.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

E. Tracks:
   1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches (610 mm) apart.
   2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
   3. Repair galvanized coating on tracks according to ASTM A780/A780M.

F. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.2 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust doors and seals to provide weathertight fit around entire perimeter.

D. Align and adjust motors, pulleys, belts, sprockets, chains, and controls according to manufacturer's written instructions.

E. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780/A780M.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 08 3613

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SECTION 08 4113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Storefront framing system for the following:
1. Storefront framing for window walls.
2. Storefront framing for ribbon walls.
3. Storefront framing for punched openings.
4. Storefront framing for interior walls.

B. Exterior manual-swing entrance doors.

C. Interior manual-swing entrance doors.

D. Solid aluminum entrance doors.

1.3 RELATED SECTIONS

A. Section 07 9200 – Joint Sealants: Perimeter sealants around installed storefront system.

B. Section 08 4123 - Steel-Framed Entrances and Storefronts

C. Section 08 5113 – Aluminum Windows.

D. Section 08 5123 – Steel Windows.

E. Section 08 7100 – Door Hardware: Installation of lock cylinders.

F. Section 08 8100 – Glass Glazing.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each aluminum entrance and storefront system required, including:
1. Manufacturer's standard details and fabrication methods.
2. Data on finishing, hardware and accessories.
3. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop Drawings: For each aluminum entrance and storefront system required, including layout and installation details, relationship to adjacent work, elevations at 1/4-inch scale, detail sections of typical composite members, anchors and reinforcement, hardware mounting heights, and glazing details.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Deferred-Approval Submittal: For systems spanning 10-feet or more specific approval of shop drawings and calculations by DSA is required.
1. Contractor shall submit engineered shop drawings for this specific project; wet-stamped and signed by a qualified professional engineer licensed in the State of California, showing layouts, elevations, attachments to structure, component attachments, and component properties.
2. Provide 2 sets of drawings, full size, including DSA-specific signature block for drawings to be reviewed for acceptance by the Design Professional in general responsible charge but prepared by others.
3. Contractor shall submit engineering calculations indicating code compliance of the system depicted in the Shop Drawings, 2 sets, wet-stamped and signed.
4. No components of the system may be installed until Shop Drawings and calculations are approved by DSA. Contractor shall allow a minimum of 6 weeks in their schedule for DSA review and approval (not including review time for Architect specified in Division 1). Contractor shall allow for one re-submittal specifically to address DSA comments (not including Architect’s review of comments which may have been provided previously).

1.6 INFORMATIONAL SUBMITTAL

A. 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.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

C. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

D. Source quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

B. Warranty: Special warranty specified in this Section.

1.8 QUALITY ASSURANCE

A. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer's Qualifications: Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.

C. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of aluminum entrances and storefront systems that are similar to those indicated for this Project in material, design, and extent.

E. Single Source Responsibility: Obtain aluminum entrance and storefront systems from one source and from a single manufacturer.

F. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
   1. Do not revise intended aesthetic effects, as judged solely by Architect, without Architect's approval. If revisions are proposed, submit comprehensive explanatory data comparing proposed substitution to named system, with substitution request to Architect for review.

G. Preinstallation Conference: Conduct conference at Project site.

H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging.

B. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.

C. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

1.10 SITE CONDITIONS

A. Field Measurements: Verify storefront openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating storefront components without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.11 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, fabrication, or installation 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. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. 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, fabrication, or installation within specified warranty period. Warranty does not include normal weathering.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:

1. Steel: Average recycled content of steel to be a minimum 60 percent.
2. Aluminum: Average recycled content of aluminum to be a minimum of 70 percent.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Adhesives and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide glazed storefront systems, including anchorage, capable of withstanding, without failure, the effects of the following:
1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:
   a. Deflection exceeding specified limits.
   b. Thermal stresses transferred to building structure.
   c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
   d. Noise or vibration created by wind and thermal and structural movements.
   e. Loosening or weakening of fasteners, attachments, and other components.
   f. Sealant failure.

B. Performance Requirements: At a minimum provide the following:
1. Strength: Design system to withstand loads as required by California Building Code but not less than following minimum loading.
   a. Wind: Uniform inward and outward wind pressures based on 115 mph wind speed, Exposure 'C'; pressures as calculated per current code requirements.
   b. Seismic: Conform with applicable codes. Size, fabricate, assemble and erect work to accommodate interstory drift (horizontal displacement) during a major seismic event. Interstory drift values for this building are calculated as follows:
      1) Maximum Ds (delta S) displacement values vary, but do not exceed ¼" on any floor.
      2) Dm (delta M) values are as calculated per current code requirements.
   c. Building Deflections: Size primary members to accommodate building deflections. Fabricate, assemble and erect work to accommodate following limitations:
      1) Post-tensioned concrete slabs: Allow for vertical deflection. Calculated vertical deflection is 3/8-inches up or down beginning immediately following slab construction.
      2) Metal Framed Openings: Allow for live load deflection. Calculated vertical floor displacement under live loading is L/700 at joists and non-bearing locations.
2. Window System Deflections and Thermal Movements: Size primary members for temperature variations as follows; fabricate, assemble and erect work to maintain limitations.

a. Design for normal-to-wall deflection of L/175 of span; except L/250 of span for glass supporting members.
b. Parallel-to-wall deflection of less than 75% of glass edge clearances.
c. Thermal expansion and contraction movements resulting from not less than ambient temperature range of 100 degrees F, which may cause a material temperature range of 160 degrees F.

3. Water and Air Leakage: Installed system shall be free of leakage of both water and air.
   a. Water leakage is defined as uncontrolled penetration of water (not including condensation) to interior of building.
   b. Air leakage is defined as infiltration of air at any area of window wall, at a rate in excess of 0.06 cfm/sf of area, based on measurement of single complete module of system.
4. Condensation: Provide minimum tested Condensation Resistance Factor (CRF) of 45.
5. Energy Performance: Provide minimum U-Factor value of 0.57 for glazed window wall system, including frame, glazing and operable windows and doors.
6. Acoustical: Provide minimum tested acoustical rating (STC) for residential unit window, gasket, and frame assemblies.

2.3 MANUFACTURERS

A. Basis-of-Design Product: The design for the aluminum storefront system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Basis-of-Design:
      a. Exterior: Oldcastle FG-3000 Thermal Multiplane
      b. Interior: Oldcastle FG-3000.
   2. CR Laurence; U.S. Aluminum.
   3. Kawneer Company, Inc.

2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Sheet and Plate: ASTM B209.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
   3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
   4. Structural Profiles: ASTM B308/B308M.

2.5 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Construction: Thermally broken.
   2. Glazing System: Retained mechanically with gaskets on four.
   3. Glazing Plane: As indicated.
   4. Framing: Shear-block system.
   5. Finish: 3-coat fluoropolymer, color as selected by Architect from manufacturer’s full color range including metallics.

B. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A123/A123M.

1. Where fasteners screw-anchor into aluminum members less than 0.125 inches thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.

C. Fasteners: Provide corrosion-resistant, nonstaining, nonbleeding fasteners of aluminum, nonmagnetic stainless steel, zinc plated steel, or other material warranted by the manufacturer to be non-corrosive and compatible with aluminum components, hardware, anchors and other components and adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Where exposed fasteners are unavoidable, use countersunk Phillips screw heads, finished to match framing system.
4. Exposed fasteners must have bonded neoprene washers or be sealed.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A123/A123M or ASTM A153/A153M.

E. Concealed Flashing: 0.0179-inch (26 gage) minimum dead-soft stainless steel, or 0.026-inch-thick minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components and adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 GLAZING SYSTEMS

A. Glazing: As specified in Section 08 8100.

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type in hardness recommended by system and gasket manufacturer to comply with system performance requirements.
1. Color: Black.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
1. Weatherseal Sealant: ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Glass to Mullion Sealant Color: Black.
c. Butt-joint Glass Sealant Color: Clear.

F. Secondary Sealants and Joint Fillers: For use as weatherseal at perimeter of entrance and storefront systems, compatible with structural sealant and other system components with which it comes in contact, as listed in Section 07 9200.
   1. Exterior Finish: Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.
      a. Color: As selected by Architect from manufacturer's full color range.
   2. Interior Finish: AA-M12C22A31, Class II Clear Anodized Finish. AA-M12C22A31, Class II Clear Anodized Finish, Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating (0.010 mm or thicker) complying with AAMA 607.1.

2.7 ENTRANCE DOOR SYSTEMS

A. Stile-and-Rail Type Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
   1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch-(3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods or j-bolts.
   2. Design: As follows:
      a. Stile Design: Wide stile; 6-inches nominal width.
   3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
   4. Bottom Rails: 10-inches.

B. Solid Aluminum Doors:
   1. Basis-of-Design Product: Special-Lite, Inc.; SL-16 Aluminum Flush Door, or accepted equivalent.
   2. Provide solid aluminum doors for curtain wall system.
   3. Face Sheet Material: 0.062-inch thick aluminum, produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes: ASTM B221.
      a. Texture: Smooth.
   4. Core:
      a. Material: Poured-in-place polyurethane foam.
      b. Density: Minimum of 5 pounds per cubic foot.
      c. R-Value: Minimum of 9.
      d. ASTM E84: Class A.
   5. Stiles and Rails: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes, minimum of 2-5/16-inch depth.
   6. Corners: Mitered.
   7. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom integral to standard tubular shaped stiles and rails reinforced to accept hardware as specified.
   8. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
   9. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
   10. Rail caps or other face sheet capture methods are not acceptable.
   11. Extrude top and bottom rail legs for interlocking continuous weather bar.
   12. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
   13. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.

14. Glue: Use of glue to bond sheet to core or extrusions is not acceptable.
15. Hardware:
    a. Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
    b. Factory-install hardware.

C. Entrance Door Hardware: As specified in Section 08 7100.

2.8 FABRICATION

A. Fabricate aluminum entrance and storefront components to designs, sizes and thicknesses indicated and to comply with indicated standards.
1. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
2. Provide sub-frames and reinforcing of types indicated or, if not indicated, as required for a complete system.
3. Sizes and profile requirements are indicated on the Drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work.

B. Welding: Comply with AWS recommendations.
1. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finished surfaces.
2. Grind exposed welds smooth to remove weld spatter and welding oxides from exposed surfaces by descaling or grinding. Restore mechanical finish.

C. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.

D. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
8. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.

E. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

F. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

G. Storefront Framing: Fabricate components for assembly using shear-block system. Stick framing is not permitted.

H. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.
2. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
3. At exterior doors, provide compression weather stripping at fixed stops.
4. Provide for wiring within framing system to accommodate power-operated hardware. Include cutouts, raceways, conduits, and other such provisions to permit a complete operating hardware system.

I. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. For exterior doors, provide compression weather stripping against fixed stops.
3. At exterior doors, provide weather sweeps applied to door bottoms.
4. Pre-glaze door units to greatest extent possible.

J. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
1. Do not drill and tap for surface-mounted hardware items until time of installation at Project Site.

K. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

L. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a non-absorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.

2.9 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to application and designations of finishes.

B. Class I, Color Anodic Finish: AA-M12C22A42/A44 (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.
1. Color: Dark Bronze.

2.10 ACCESSORIES

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07 9200.
1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions affecting performance of the Work.

B. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels.
1. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.

C. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact mortar, concrete, or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
3. Paint dissimilar metals where drainage from them passes over aluminum.

D. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

E. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

F. Install glazing as specified in Section 08 8100.
1. Structural-Sealant Glazing:
a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
b. Install weatherseal sealant according to Division 07 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Install entrances plumb and true in alignment with established lines and grades without warp or rack.

3. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
   a. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
4. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Section 079200 to produce weathertight installation.

I. Erection Tolerances: Install aluminum entrance and storefront to comply with the following maximum tolerances:
1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment:
   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

J. Refer to Section 08 8100 for installation of glass and other panels indicated to be glazed into framing and doors that are not pre-glazed by manufacturer.
1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
2. Install structural silicone sealant according to sealant manufacturer's written instructions.
3. Mechanically fasten glazing in place until structural sealant is cured.
4. Remove excess sealant from component surfaces before sealant has cured.

K. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.

L. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C1401.
   a. Destructive Test Method A, "Hand Pull Tab (Destructive)," in ASTM C1401, Appendix X2, shall be used.
      1) A minimum of six areas on each building face shall be tested.
      2) Repair installation areas damaged by testing.

2. Structural-Sealant Glazing Inspection: After installation of aluminum-framed systems is complete, structural-sealant glazing shall be inspected and evaluated according to recommendations in ASTM C1401.
3. Water Penetration: Areas shall be tested according to ASTM E1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft. (200 Pa), and shall not evidence water penetration.
4. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.
1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

3.5 CLEANING

A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings. Remove excess sealant and glazing compounds, and dirt from surfaces.

B. Clean glass surfaces after installation, complying with requirements contained in Section 088100 for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.6 DEMONSTRATION

A. Water Penetration Test: After completion of the installation and nominal curing of sealants, test entrances and storefronts for water leaks in accordance with ASTM E1105 at a minimum uniform static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft. (200 Pa), and shall not evidence water penetration.

B. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Conduct tests in presence of Architect and Owner. Correct deficiencies observed as a result of this test.

D. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

E. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Prepare test and inspection reports.

3.7 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08 4113

SECTION 08 4413 – GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Prefinished aluminum curtain wall system, complete with glass and glazing and required structural anchors, attachments and shims.

B. Entrance doors, frames, and hardware.

C. Perimeter weatherseals.

1.3 RELATED SECTIONS

A. Section 07 2100 - Building Insulation: Insulation materials field installed with glazed aluminum curtain-wall systems

B. Section 07 9200 - Joint Sealants: Installation of joint sealants installed with glazed aluminum curtain-wall systems and for sealants to the extent not specified in this Section.

C. Section 08 4113 – Aluminum-Framed Entrances and Storefronts.

D. Section 08 8100 – Glazing: Insulating-glass requirements.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
1. Manufacturer's standard details and fabrication methods.
2. Data on finishing, hardware and accessories.
3. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of glazed aluminum curtain wall systems. Include the following:
1. System and component dimensions and components within assembly.
2. Framed opening requirements and tolerances.
3. Operable windows set into curtain wall system.
4. Anchorage and fasteners.
5. Glass and infills.
6. Door hardware requirements and affected related work.
7. Load calculations verifying adequate steel reinforcement provided.
8. Connection details to building tube steel system.

9. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

E. Fabrication Samples: Of each vertical-to-horizontal intersection of systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
1. Joinery.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Deferred-Approval Submittal: For systems spanning 10-feet or more specific approval of shop drawings and calculations by DSA is required.
1. Contractor shall submit engineered shop drawings for this specific project; wet-stamped and signed by a qualified professional engineer licensed in the State of California, showing layouts, elevations, attachments to structure, component attachments, and component properties.
2. Provide 2 sets of drawings, full size, including DSA-specific signature block for drawings to be reviewed for acceptance by the Design Professional in general responsible charge but prepared by others.
3. Contractor shall submit engineering calculations indicating code compliance of the system depicted in the Shop Drawings, 2 sets, wet-stamped and signed.
4. No components of the system may be installed until Shop Drawings and calculations are approved by DSA. Contractor shall allow a minimum of 6 weeks in their schedule for DSA review and approval (not including review time for Architect specified in Division 1). Contractor shall allow for one re-submittal specifically to address DSA comments (not including Architect’s review of comments which may have been provided previously).

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

1.7 CLOSEOUT SUBMITTALS

A. Warranty: Executed special warranty specified in this Section.

1.8 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.

B. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer.
   1. Engineering Responsibility: Preparation of data for glazed aluminum curtain-wall systems including the following:
      a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of glazed aluminum curtain walls that are similar to those indicated for this Project in material, design, and extent.

D. Single Source Responsibility: Obtain aluminum entrance and storefront systems from one source and from a single manufacturer.

E. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

F. Welding Standards: As follows:
   1. AWS D1.2, "Structural Welding Code—Aluminum".
   2. AWS D1.3, "Structural Welding Code—Steel Sheet".
   3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

G. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Field testing shall be performed on mockups according to requirements in Part 3 "Field Quality Control" Article.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 3119. Review methods and procedures related to glazed aluminum curtain-wall systems including, but not limited to, the following:
   1. Review structural load limitations.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review required testing, inspecting, and certifying procedures.

1.9 SITE CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain-wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum curtain-wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 WARRANTY

A. Special Manufacturer's 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, fabrication, or installation 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. Adhesive or cohesive sealant failures.
      e. Water leakage through fixed glazing and framing areas.
      f. Failure of operating components.
      g. Failure of glass seal on insulating glass units, including interpane dusting or misting.
   2. Warranty Period:
      a. Installation: Two years from date of Substantial Completion.
      b. Glazing Units: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
   1. Steel: Average recycled content of steel to be a minimum 60 percent.
   2. Aluminum: Average recycled content of aluminum to be a minimum of 70 percent.

B. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Adhesives and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 018113 - Sustainable Design Requirements.

1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Glazed aluminum curtain walls shall withstand movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal and structural movements.
      d. Loosening or weakening of fasteners, attachments, and other components.
      e. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. General: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:
   1. Structural loads.
   2. Thermal movements.
   3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   4. Dimensional tolerances of building frame and other adjacent construction.
   5. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferred to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
      d. Noise or vibration created by wind and thermal and structural movements.
      e. Loosening or weakening of fasteners, attachments, and other components.
      f. Sealant failure.

D. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Glazed aluminum curtain walls shall withstand movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal and structural movements.
      d. Loosening or weakening of fasteners, attachments, and other components.
      e. Failure of operating units.

3. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
4. Structural Loads:
   a. Wind Loads:
      1) Basic Wind Speed: As indicated on Structural Drawings.
      2) Importance Factor: As indicated on Structural Drawings.
      3) Exposure Category: As indicated on Structural Drawings.
5. Structural-Test Performance: Test according to ASTM E330/E330M as follows:
   a. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   b. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
   c. Test Durations: As required by design wind velocity, but not less than 10 seconds.
6. Deflection of Framing Members: At design wind pressure, as follows:
   a. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
   b. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
   c. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
7. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.
8. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
   a. Component Importance Factor is indicated on Structural Drawings.
9. Story Drift: Accommodate design displacement of adjacent stories indicated.
   a. Design Displacement: As indicated on Drawings.
   b. Test Performance: Meeting criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.
10. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
    a. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.
11. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
    a. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
    b. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).
12. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.
13. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. (1.50 L/s per sq. m) of fixed wall area as determined according to ASTM E283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

2.3 MANUFACTURERS

A. Basis-of-Design Product: The design for the aluminum curtain wall system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: Oldcastle Reliance System.
2. CR Laurence; U.S. Aluminum.
3. Kawneer Company, Inc.

2.4 FRAMING SYSTEMS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B209.
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221.
3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

2.5 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
2. Glazing System: 4-sided tape glazed.
3. Glazing Plane: Front set, exterior glazed.
4. Framing: Shear-block system.
5. Finish: 3-coat fluoropolymer, color as selected by Architect from manufacturer’s full color range including metallics.

2.6 GLAZING SYSTEMS

A. Glazing: As specified in Section 08 8100.

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type in hardness recommended by system and gasket manufacturer to comply with system performance requirements.
1. Color: Black.

2.7 ENTRANCE DOOR SYSTEMS

A. Stile-and-Rail Type Entrance Doors: See Section 08 4113.

B. Solid Aluminum Doors: See Section 08 4113.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
   2. Reinforce members as required to receive fastener threads.
   3. Finish exposed portions to match framing system.
   4. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

E. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
   1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Framing Gaskets and Sealants: As recommended by manufacturer for joint type.
   1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 CURTAIN WALL SYSTEM COMPONENTS

A. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.

B. Anchorages: Anchorage attachments and shims required to secure window walls to building tube steel structural system; complete with matching flush stops of profile to suit frames and of adequate size to provide sufficient bite on glass panels; drilled holes, deflector plates and internal flashings to accommodate internal weep and drainage system.

C. Structural Steel Reinforcement and Tubular Framing: ASTM A653/653M, hot-dip galvanized after fabrication. Touch up abraded surfaces after installation.

D. Glazing Materials: Type recommended by window wall manufacturer to suit locations and applications. Tempered glass shall be manufactured by a tongless method.

E. Anchorage Devices: Type recommended by window wall manufacturer to suit locations and applications.

F. Spacers and Setting Blocks: Manufacturer's standard elastomeric type in hardness recommended by system and gasket manufacturer to comply with system performance requirements.
   1. Color: Black.

2.9 GLAZING SYSTEMS

A. Glazing: As specified in Section 08 8100.

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
   1. Weatherseal Sealant: ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
      a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      b. Glass to Mullion Sealant Color: Black.
      c. Butt-joint Glass Sealant Color: Clear.

D. Structural Glazing Tape: 3M™ VHB™ B23F or G23F (SGT) closed cell, double sided acrylic foam tape required for application of interface to the insulating glass unit.

E. Internal Sealants: Types recommended by system manufacturer to remain permanently elastic, tacky, non-drying, non-migrating and weather-tight.

F. Secondary Sealants and Joint Fillers: For use as weatherseal at perimeter of entrance and storefront systems, compatible with other system components with which it comes in contact, as listed in Section 07 9200.
   1. Color: As selected by Architect from manufacturer's full range of colors.

2.10 ACCESSORY MATERIALS

A. Perimeter Fire-Containment Systems (Safing Insulation): Specified in Section 07 2100.

B. Insulating Materials: Specified in Section 07 2100.

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

D. Fasteners:
   1. Non-magnetic stainless steel or other non-corrosive plating, compatible with materials being fastened for non-exposed locations.
   2. Series 300 stainless steel for exposed locations.
   3. Provide nuts or washers of design having the means to prevent disengagement; deforming of fastener threads is not acceptable.
   4. Provide concealed fasteners wherever possible.
   5. For exposed locations, provide countersunk flathead fasteners with finish matching item fastened.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

F. Shims: Non-staining, non-ferrous, type as recommended by system manufacturer.

G. Protective Coatings: Cold applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

H. Glazing Gaskets:
   1. Compression type design, Interior is a dense EPDM [closed cell EPDM sponge] gasket.

2. Comply with ASTM C509 or C864.
3. Profile and hardness as necessary to maintain uniform pressure for watertight seal.
4. Manufacturer's standard black color.

2.11 FABRICATION

A. Take accurate field measurements to verify required dimensions prior to fabrication.

B. Location of exposed joints is subject to Architect's acceptance.

C. Provide dense EPDM continuous isolator at pressure plated members to separate exterior pressure plates and interior framing members.

D. Form aluminum shapes before finishing.

E. Fabricate components that, when assembled, have the following characteristics:
1. Sharp profiles, straight and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
6. Provisions for reglazing from interior for vision glass and exterior for spandrel glazing or panels.

F. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

G. Fabricate curtain wall system to allow for adequate clearances around perimeter of system to enable proper installation. Fabricate to allow for thermal movement within curtain wall construction.

H. Fabricate curtain wall components allowing for accurate and rigid fit of joints and corners. Match components carefully ensuring continuity of line and design. Ensure joints and connections will be flush, hairline and weatherproof.

I. Provide structural reinforcing within framing members where required to maintain rigidity and as required to accommodate design loads.

J. System shall provide weep drainage to the outside.

K. Make provision for hardware and provide required internal reinforcing.

L. Apply coat of bituminous paint on concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.12 FINISHES

A. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

B. Hardware Finish: US25 polished stainless steel.

C. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A123 to 2.0 oz/sq ft.

2.13 STEEL PRIMING

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.

B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.

C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide anchors to be installed in other work, and setting details, in time for proper installation by trades concerned. Verify correct placement before beginning curtain wall installation.

B. Verify wall openings are ready to receive work of this Section.

C. Clean and prepare aluminum prior to glazing to insure complete seal of glass to aluminum.

3.3 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight, unless otherwise indicated.

B. Install curtain wall system assembly plumb, level and free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

C. Install sufficient anchorage devices to securely and rigidly fasten curtain wall system to building structural system.

D. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

E. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

F. Install components plumb and true in alignment with established lines and grades.

G. Install glass in accordance with manufacturer's specifications and as specified Section 08 8100. Wet seal all exterior glass to aluminum joints.

H. Install structural sealants and related backing materials around perimeter of curtain wall system, in accordance with fabrication and installation requirements indicated in Section 07 9200.
1. Wet seal each horizontal aluminum framing joint with structural sealant.

I. Install insulation materials as specified in Section 07 2100.

J. Install perimeter fire-containment systems (safing insulation) as specified in Section 07 2100.

K. Erection Tolerances: Install glazed aluminum curtain-wall systems to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet (3 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
2. Level: 1/8 inch in 20 feet (3 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (13 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (13 to 25 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
   c. Where surfaces are separated by reveal or protruding element of 1 inch (25 mm) wide or greater, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

3.4 INSTALLATION OF ENTRANCES

A. Coordinate with the installation of aluminum entrance doors and frames.

B. Use anchorage devices to securely attach frame assembly to structure.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances aligning with adjacent work.

D. Install hardware using templates provided. Refer to Section 08 7100 for installation requirements.

E. Install glass and infill panels in accordance with Section 08 8100.

F. Install perimeter type sealant and backing materials in accordance with Section 07 9200.

G. Adjust operating hardware.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
   1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C1401.
      a. Destructive Test Method A, "Hand Pull Tab (Destructive)," in ASTM C1401, Appendix X2, shall be used.
         1) A minimum of six areas on each building face shall be tested.
         2) Repair installation areas damaged by testing.
   2. Structural-Sealant Glazing Inspection: After installation of aluminum-framed systems is complete, structural-sealant glazing shall be inspected and evaluated according to recommendations in ASTM C1401.
   3. Water Penetration: Areas shall be tested according to ASTM E1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft. (200 Pa), and shall not evidence water penetration.
   4. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Water Penetration Test: After completion of the installation and nominal curing of sealants, test entrances and storefronts for water leaks in accordance with ASTM E1105.

B. Conduct tests in presence of Architect and Owner. Correct deficiencies observed as a result of this test.

3.7 ADJUSTING

A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.
   1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

3.8 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings. Remove excess sealant and glazing compounds, and dirt from surfaces.

C. Clean glass surfaces after installation, complying with requirements contained in Section 088100 for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

D. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

E. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

F. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.9 PROTECTION

A. Protect finished Work from damage.

END OF SECTION 08 4413

SECTION 08 5113 – ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fixed aluminum windows.

B. Electrically-operated clerestory windows.

1.3 RELATED SECTIONS

A. Section 08 4113 – Aluminum-Framed Entrances and Storefronts: Storefront system for installation of aluminum windows.

B. Section 08 5123 – Steel Windows

C. Section 08 8100 – Glass Glazing.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of window and door required, including construction details and fabrication methods; profiles and dimensions of individual components; data on hardware, accessories, and finishes. Include recommendations for maintaining and cleaning exterior surfaces.

B. Shop Drawings: Show fabrication and installation of each type of window and door required. Include layout and installation details, elevations at 1/4 inch = 1 foot scale, typical window unit elevations at 3/4 inch = 1 foot scale, and full-size section details of typical composite members.

C. Samples: For initial color selection on 12 inch long sections of window and door members. Where finishes involve normal color variations, include sample sets showing the full range of variations expected.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

1.6 INFORMATIONAL SUBMITTALS

A. Test Reports: From a qualified independent testing agency indicating that each type, grade, and size of window unit complies with performance requirements indicated. Test results based on use of down-sized test units will not be accepted.

B. Product Substitutions: The Drawings indicate sizes, profiles, dimensional requirements, and aesthetic effects of aluminum windows and are based on the specific window types and models indicated. Other manufacturers whose products have equal performance characteristics may be considered provided deviations in size, profile, and dimensions are minor and do not alter the aesthetic effect.

1.7 CLOSEOUT SUBMITTALS

A. Warranty: Executed special warranty specified in this Section.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

B. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

C. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/A440, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," most current version, for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

G. Mockups: Incorporate aluminum windows into site-built, free-standing exterior mockup to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Coordinate these mockup requirements with the site-built, free-standing exterior mockup requirements in Section 01 4339.
2. Include supporting construction cleats, seams, attachments, underlayment, and accessories. Do not proceed with the installation until the mock-ups are approved by the Architect in writing.

3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Incorporate flashings specified in this Section with mockups specified under other sections of this Project as shown on Drawings.
5. Obtain Architect's approval of mockups before starting modular unit fabrication.
6. If Architect determines mockups do not comply with requirements, reconstruct mockups until mockups are approved.
7. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
8. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 SITE CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating steel windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials, fabrication, or installation within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
e. Failure of insulating glass.
2. Warranty Period:
a. Window: Two years from date of Substantial Completion.
b. Glazing: Five years from date of Substantial Completion.
c. Metal Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
1. Aluminum: Average recycled content of aluminum to be a minimum of 70 percent.

B. VOC Content: Adhesives and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 PERFORMANCE REQUIREMENTS

A. Provide windows engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard window assemblies representing types, grades, classes, and sizes required for Project according to test methods indicated.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
   1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
   2. Obtain design wind velocity at Project site from Owner to use in design and fabrication of windows.
      a. Basic Wind Speed: See Structural Drawings.
      b. Importance Factor: See Structural Drawings.
      c. Exposure Category: See Structural Drawings.

C. Obtain design wind velocity at Project site from Owner to use in design and fabrication of windows.

D. Heights of window units above grade at window centerline are indicated on or can be determined from the Drawings. Consult with the Owner, if necessary, to confirm required loading and test pressures.

E. Provide current certified AAMA test report that reflects the window configuration and type specified.

F. Air Leakage: Test each type and size of required window unit through a recognized testing laboratory or agency, in accordance with ASTM E330/E330M for structural performance, with ASTM E283 for air infiltration and with both ASTM E331 and ASTM E547 for water penetration. Provide certified test results.

G. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

2.3 MANUFACTURERS

A. Basis-of-Design Product: The design for the aluminum windows is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Basis-of-Design: Oldcastle Zero Sightline Windows inside of FG 3000 frame and Clear Line operators.
   2. Oldcastle Zero Sightline 30P Windows inside of FG 3000 Thermal Multiplane frame as specified in Section 08 4113.
      a. Outward Projecting Awning with Clear Line operators.
      b. Casement with standard manual (hand crank) operators.

3. CR Laurence; U.S. Aluminum.
4. Kawneer Company, Inc.

2.4 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, and for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength and not less than 0.062 inch thick at any location for main frame and sash members complying with the requirements of standards indicated below.
1. Sheet and Plate: ASTM B209.
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221.
3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
4. Bars, Rods, and Wire: ASTM B211.
5. Welding Rods and Bare Electrodes: AWS A5.10.

2.5 WINDOW TYPES

A. Awning Windows:
1. Operator: Electric operator located on jamb at sill.
2. Hinges: Concealed four- or six-bar friction hinge located on each jamb near top rail; two per ventilator.
3. Provide with 2 balance-support arms.
4. Latches; provide 2 for windows over 42 inches wide.
5. Lock: Combination handle and cam-action lock and keeper.
6. Pole Operators: As specified; for windows located higher than 8 feet above finished floor.
7. Limit Device: As specified.

B. Casement Windows:
1. Operator: Gear-type rotary single-arm operator located on jamb at sill.
2. Hinge: Heavy-duty, concealed, four- or six-bar friction hinge with adjustable-slide friction shoe; designed to permit ventilator operation for inside cleaning of outside glass face; two per ventilator.
3. Lock: Concealed multipoint lock operated by single lever handle or lift-type throw; three per ventilator.
4. Friction Shoes: As specified.

C. Fixed windows: Storefront. See Section 08 4113.

2.6 WINDOW ACCESSORIES

A. Manufacturer's standard accessories that comply with indicated standards.

B. Insect Screens: For each operable exterior sash or ventilator. Locate on inside or outside of window, depending on window type, coated aluminum wire, complying with FS RR-W-365, Type VII.

C. Insect Screen Frames: Tubular-shaped, extruded- or formed-aluminum members of 0.040 inch minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match window units.
1. Provide removable PVC spline-anchor concealing edge of screen frame.

D. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.
   1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.

2.7 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
   1. Awning Windows: AP-35CW
   2. Casement Windows: C-35CW.

B. Units to comply with indicated standards. Include a complete system for assembly of components and anchorage of units. Provide units that are reglazable without dismantling framing.

C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
   1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
   2. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.

D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
   1. Horizontal-Sliding Windows: Provide operable sash with a double row of sliding weather stripping in horizontal rails and single- or double-row weather stripping in meeting or jamb stiles, as required to meet specified performance requirements. Provide compression-type weather stripping at perimeter of each movable panel where sliding-type weather stripping is not appropriate.

E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

F. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Section 088100 and with AAMA/WDMA 101/I.S.2/NAFS.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. 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.

2.9 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Color Anodic Finish: AA-M12C22A42/A44 (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.
1. Color: . As selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
1. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WINDOW INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING

A. Adjust operating sashes and ventilators, screens, hardware, operators, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.4 CLEANING

A. Clean aluminum promptly after installing windows. Avoid damage to finishes. Remove excess glazing and sealant compounds, dirt, and other substances.

B. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior plywood panel surfaces during construction for presence of sealer overspray, deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 08 5113

SECTION 08 5123 – STEEL WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Cold-formed, welded steel windows.

1.3 RELATED SECTIONS

A. Section 07 9200 – Joint Sealants: Sealing perimeter joints between windows and adjacent materials.

B. Section 08 5113 – Aluminum Windows.

C. Section 08 8100 – Glass Glazing: Glazing requirements for steel windows, including those specified to be factory glazed.

D. Section 09 9100 – Painting: Field painting of factory prime-coated windows.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for steel windows.

B. Shop Drawings: Include plans, elevations, sections, details, attachments to other work, and the following:
   1. Layout and installation details, including anchors.
   2. Elevations of continuous work at 1/4 inch = 1 foot (1:50) scale and typical window unit elevations at 3/4 inch = 1 foot (1:20) scale.
   3. Full-size section details of typical composite members, including reinforcement.
   4. Accessories.
   5. Glazing details.

C. Samples for Initial Selection: For units with factory-applied color finish.
   1. Include Samples of window hardware and accessories involving color selection.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.

3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for steel window manufacturer's standard products to determine compliance with performance requirements.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to steel window manufacturer for installation of units required for this Project.

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E548.

C. SWI Publication: Comply with applicable requirements in SWI's "The Specifier's Guide to Steel Windows" except where more stringent requirements are indicated.

D. Fire-Test-Response Characteristics: 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 the test method indicated.
1. Positive-Pressure Test: NFPA 257, conducted so that within the first 10 minutes of test, furnace pressure is adjusted to place at least two-thirds of the test specimen above the neutral-pressure plane and to maintain this plane for the balance of test.
2. Fire-Protection Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
3. Provide steel windows labeled with appropriate markings of applicable testing and inspecting agency.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.9 SITE CONDITIONS

A. Field Measurements: Verify steel window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating steel windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Formed Steel Window Members: Provide frame and ventilator members mechanically formed from metallic-coated, low-carbon, cold-rolled steel sheet complying with ASTM A653/A653M. For combined weight of frame and ventilator members and front-to-back depth of frame or ventilator members, comply with the following requirements:
   1. Commercial and Industrial Windows: Not less than 2.75 lb/ft. (4.09 kg/m) in combined weight, and not less than 1-1/4 inches (32 mm) deep.
   2. Finished: 3-coat fluoropolymer, color to be selected by Architect.

B. Glazing: Provide at windows at Building 4.

C. Trim members, screen frames, retainers for weather stripping, flashing, and similar items shall be formed steel.

D. Glazing beads shall be formed steel.

E. Fasteners: Provide fasteners of bronze, brass, stainless steel, or other metal, that are warranted by manufacturer to be noncorrosive and compatible with trim, hardware, anchors, and other components of steel windows.

F. Anchors, Clips, and Window Accessories: Provide units of stainless steel, hot-dip zinc-coated steel, bronze, brass, or iron complying with ASTM A123/A123M. Provide units with sufficient strength to withstand design pressure indicated.

G. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and to be completely concealed when steel window is closed.
   1. Weather-Stripping Material: Manufacturer's standard material.

H. Sealant: For sealants required within fabricated windows, provide manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.2 GLAZING

A. Glass and Glazing Materials: Refer to Section 08 8100 for glass units and glazing requirements for steel windows.

2.3 FABRICATION

A. General: Fabricate steel windows of type and in sizes indicated to comply with SWI standards. Include a complete system for assembly of components and anchorage of window units.
   1. Provide units that are reglazable without dismantling ventilator framing.

B. Window Types: Provide the following types of steel windows:
   1. Fixed windows.

C. Provide weep holes and internal water passages to conduct infiltrating water to the exterior.

D. Subframes: Formed of cold-formed steel of profile indicated. Miter or cope corners, and mechanically fasten and seal joints.

1. Repair galvanized coating damaged by fabrication, according to ASTM A780/A780M.

E. Preglazed Fabrication: Preglaze window units at the factory where possible and practical for applications indicated. Refer to Section 08 8100 for glass units and glazing requirements.

2.4 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Surface Preparation: Clean surfaces of dirt, oil, grease, scale, and other contaminants; follow with a zinc-phosphate pretreatment applied according to window manufacturer's written recommendations.

C. Shop Prime Coat Finish: After fabrication, provide manufacturer's standard epoxy prime coat of 1.0-mil (0.03-mm) dry film thickness, and oven dry for 30 minutes at 300 deg F (150 deg C).

D. High-Performance Organic Coating: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; comply with AAMA 2605.
2. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances, rough opening dimensions, levelness of sill plate, coordination with wall flashings and vapor retarders, and other conditions affecting performance of work.
1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, operators, accessories, and other components.

B. Install windows level, plumb, and true to line, without distortion. Anchor securely to surrounding construction with approved fasteners.
1. Separate corrodible surfaces subject to electrolytic action at points of contact with other materials.

C. Set sill members in a bed of sealant or with gaskets, as indicated, for weathertight construction.
1. Seal exterior joints between window frame and opening substrate with sealant.

D. Repair abraded areas of factory-applied finishes.

3.3 ADJUSTING

A. Adjust operating sashes and ventilators, screens, hardware, [operators,] and accessories for a tight fit at contact points and weather stripping, for smooth operation and a weathertight closure. Lubricate hardware and moving parts.

B. Remove and replace glass in pre-glazed units that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.4 CLEANING

A. Clean factory-finished steel surfaces immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

B. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 08 5123

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SECTION 08 71 00

DOOR HARDWARE – BUILDING 1

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:

1. Door Hardware, including electric hardware.
2. Storefront and Entrance door hardware.
3. Gate Hardware.
4. Digital keypad access control devices.
5. Hold-open closers with smoke detectors.
6. Wall or floor-mounted electromagnetic hold-open devices.
7. Power supplies for electric hardware.
8. Low-energy door operators plus sensors and actuators.
9. Thresholds, gasketing and weather-stripping.
10. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.

1. Division 8: Section - Steel Doors and Frames.
2. Division 8: Section - Wood Doors.
3. Division 8: Section - Aluminum Storefront
4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

A. 2016 California Building Code, CCR, Title 24.

B. BHMA – Builders' Hardware Manufacturers Association

C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

D. DHI – Door and Hardware Institute

E. NFPA - National Fire Protection Association.

1. NFPA 80 - Fire Doors and Other Opening Protectives
2. NFPA 105 - Smoke and Draft Control Door Assemblies

F. UL - Underwriters Laboratories.

1. UL 10C - Fire Tests of Door Assemblies
2. UL 305 - Panic Hardware

G. WHI - Warnock Hersey Incorporated

H. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit six (6) copies of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Include a Cover Sheet with;
   a. Job Name, location, telephone number.
   b. Architects name, location and telephone number.
   c. Contractors name, location, telephone number and job number.
   d. Suppliers name, location, telephone number and job number.
   e. Hardware consultant's name, location and telephone number.

2. Job Index information included;
   a. Numerical door number index including; door number, hardware heading number and page number.
   b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
   c. Manufacturers' names and abbreviations for all materials.
   d. Explanation of abbreviations, symbols, and codes used in the schedule.
   e. Mounting locations for hardware.
   f. Clarification statements or questions.
   g. Catalog cuts and manufacturer’s technical data and instructions.

3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)						
			(a) 1 Single Door #1 - Exterior from Corridor 101		(b) 90°	(c) RH
				(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea		(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea		Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.

F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.

I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

J. LEED Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification; coordinate and cooperate with Owner and Architect in providing information necessary for required LEED rating.

1.05 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Responsible for detailing, scheduling and ordering of finish hardware.
2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.06 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.07 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:

1. Electronic: One (1) year.
2. Closers: Thirty (30) years --except electronic closers shall be two (2) years.
3. Exit devices: Three (3) years.
4. All other hardware: Two (2) years.

1.08 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.02 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.

1. Hinges shall be sized in accordance with the following:
   a. Height:
      1) Doors up to 42" wide: 4-1/2" inches.
      2) Doors 43" to 48" wide: 5 inches.
   b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
   c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.

2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Floor Closers: Shall be equipped with compression springs, cam and roller operating mechanism and a one piece spindle-cam for maximum operating performance and longevity.

C. Pivots: High strength forgings and castings with precision bearings for smooth operation. Positive locking vertical adjustment mechanism to allow installer to precisely position the door and balance the load.

D. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.

E. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of ¼" diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.

F. Exit devices: Von Duprin as scheduled.

1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
3. Mechanism case shall have an average thickness of .140".
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
12. Furnish glass bead kits for vision lites where required.
13. All Exit Devices to be sex-bolted to the doors.
14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
    a. The unlatching force shall not exceed ~~15 lbs~~ **5 lbs.per Section 11B,** applied in the direction of travel.

G. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
5. Closers shall be installed to permit doors to swing 180 degrees.
6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.

7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

H. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.

1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
2. Provide dust proof strikes at openings using bottom bolts.

I. Door Stops:

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

J. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

K. Thresholds: As Scheduled and per details.

1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.
3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
4. Thresholds shall comply with CBC Section 11B-404.2.5.

L. Seals: Provide silicone gasket at all rated and exterior doors.

1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on “S” labeled Positive Pressure door assemblies.

M. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

N. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

A. Furnish all cylinders in the Best Full Size Interchangeable Core (FSIC).

B. Furnish Key System Management Software (SM01-287 Windows on CD)

C. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.

1. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.
2. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
3. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

D. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.

1. Furnish CL100PB for use with non-I/C Schlage cylinders.
2. Furnish CL77R for use with FSIC Schlage cylinders.
3. Furnish CL721G for use with SFIC Schlage cylinders.

2.04 FINISHES

A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2013 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.

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 sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.

K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.

L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area 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.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which 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.

3.04 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.

C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

ADA	=	Adams Rite Mfg.	Aluminum Door Hardware
GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
JOH	=	L.E. Johnson	Sliding Door Hardware
LCN	=	LCN	Door Closers
SCE	=	Schlage Electronics	Electronic Door Components
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
TRI	=	Trimco	Signs
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

HARDWARE GROUP NO. 01

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	WELDABLE HINGE	1850	630	HAG
1	EA	DOOR CORD	788-18	626	SCE
1	EA	ELEC PANIC HARDWARE	EL-AX-98-L-NL-17-WH 24 VDC	626	VON
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	POWER SUPPLY	PS914 900-2RS 900-BBK		VON

READER AND WIRING BY ACCESS CONTROL VENDOR

HARDWARE GROUP NO. 02

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	EL-AX-98-L-NL-17	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	PER DETAIL		
1	EA	POWER SUPPLY	PS914 900-2RS 900-BBK		VON

READER AND WIRING BY ACCESS CONTROL VENDOR

HARDWARE GROUP NO. 03

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	LATCHSET	93K0N 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	MOUNTING PLATE	4040XP-18	689	LCN
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	THRESHOLD	PER DETAIL		
1			WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

HARDWARE GROUP NO. 04

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	EL-3547A-NL-OP-388 **AX Mode**	626	VON
1	EA	ELEC PANIC HARDWARE	EL-3547A-EO	626	VON
1	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	RIM CYLINDER	1E72	626	BES
2	EA	90 DEG OFFSET PULL	8190HD 12" O	630	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	SURF. AUTO OPERATOR	9153 LONG2 WMS	ANCLR	LCN
2	EA	ACTUATOR	8310-836T	630	LCN
2	EA	MOUNTING PLATE	4040XP-18	689	LCN
2	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	THRESHOLD	PER DETAIL		
1	EA	KEY SWITCH	653-04	626	SCE
1	EA	POWER SUPPLY	PS914 900-2RS 900-BBK		VON
			WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

READER AND WIRING BY ACCESS CONTROL VENDOR

HARDWARE GROUP NO. 05

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	EL-3547A-EO **AX Mode**	626	VON
1	EA	ELEC PANIC HARDWARE	EL-3547A-NL-OP-388	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
2	EA	90 DEG OFFSET PULL	8190HD 12" O	630	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	MOUNTING PLATE	4040XP-18	689	LCN
2	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	THRESHOLD	PER DETAIL		
1	EA	POWER SUPPLY	PS914 900-2RS 900-BBK		VON
1			WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

READER AND WIRING BY ACCESS CONTROL VENDOR

HARDWARE GROUP NO. 06

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	PUSH BUTTON LOCK	L1021B	626	SIM
1	EA	PERMANENT CORE	1C-7	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 07

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	STORAGE LOCK	93K7D 14D S3	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	5050B	BRN	NGP
1	SET	ASTRAGAL	9115A	CL	NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 08

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ELEC CYLNDRICAL LOCK	93K7DEU 14D S3	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
	SET	SEALS	5050B	BRN	NGP
	SET	ASTRAGAL	9115A	CL	NGP
	EA	DOOR SWEEP	200NA	CL	NGP
	EA	THRESHOLD	PER DETAIL		

READER, POWER SUPPLY AND WIRING BY ACCESS CONTROL VENDOR

HARDWARE GROUP NO. 09

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PULL PLATE	8302 8" 4" X 16"	630	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	SET	SEALS	5050B	BRN	NGP
	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 10

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PRIVACY LOCK	93K0L 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	SET	SEALS	5050B	BRN	NGP
	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 11

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC CYLNDRICAL LOCK	93K7DEU 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	SET	SEALS	5050B	BRN	NGP
	EA	THRESHOLD	PER DETAIL		

READER, POWER SUPPLY AND WIRING BY ACCESS CONTROL VENDOR

HARDWARE GROUP NO. 12

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	LATCHSET	93K0N 14D S3	626	BES
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
	EA	THRESHOLD	PER DETAIL		
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 13

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC CYLNDRICAL LOCK	93K7DEU 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	WALL STOP	WS401/402CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

READER, POWER SUPPLY AND WIRING BY ACCESS CONTROL VENDOR

HARDWARE GROUP NO. 14

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STORAGE LOCK	93K7D 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
	EA	THRESHOLD	PER DETAIL		
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 15

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STORAGE LOCK	93K7D 14D S3	626	BES
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 16

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	LATCHSET	93K0N 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	WALL STOP	WS401/402CCV	626	IVE
	EA	THRESHOLD	PER DETAIL		
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 17

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	AX-98-L-BE-17	626	VON
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	35VA	CL	NGP
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 18

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STORAGE LOCK	93K7D 14D S3	626	BES
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 19

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	OFFICE LOCK	93K7B 14D S3	626	BES
1	EA	WALL STOP	WS401/402CCV	626	IVE

HARDWARE GROUP NO. 20

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	LATCHSET	93K0N 14D S3	626	BES
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP	689	LCN
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 21

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	LATCHSET	93K0N 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	WALL STOP	WS401/402CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 22

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
		HARDWARE BY DOOR MANUFACTURER		

HARDWARE GROUP NO. 23

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
		HARDWARE BY DOOR MANUFACTURER		

HARDWARE GROUP NO. 24

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC CYLNDRICAL LOCK	93K7DEU 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
	SET	SEALS	5050B	BRN	NGP
	EA	DOOR SWEEP	200NA	CL	NGP
	EA	THRESHOLD	PER DETAIL		

READER, POWER SUPPLY AND WIRING BY ACCESS CONTROL VENDOR

HARDWARE GROUP NO. 25

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STORAGE LOCK	93K7D 14D S3	626	BES
1	EA	SURFACE CLOSER	4040XP	689	LCN
	SET	SEALS	5050B	BRN	NGP
	EA	DOOR BOTTOM	35VA	CL	NGP
	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 27

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	EL-AX-98-L-NL-17	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	PER DETAIL		
1	EA	POWER SUPPLY	PS914 900-2RS 900-BBK		VON

READER AND WIRING BY ACCESS CONTROL VENDOR

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE – BUILDING 5

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:

1. Door Hardware, including electric hardware.
2. Storefront and Entrance door hardware.
3. Gate Hardware.
4. Digital keypad access control devices.
5. Hold-open closers with smoke detectors.
6. Wall or floor-mounted electromagnetic hold-open devices.
7. Power supplies for electric hardware.
8. Low-energy door operators plus sensors and actuators.
9. Thresholds, gasketing and weather-stripping.
10. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.

1. Division 8: Section - Steel Doors and Frames.
2. Division 8: Section - Wood Doors.
3. Division 8: Section - Aluminum Storefront
4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

A. 2016 California Building Code, CCR, Title 24.

B. BHMA – Builders' Hardware Manufacturers Association

C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

D. DHI – Door and Hardware Institute

E. NFPA - National Fire Protection Association.

1. NFPA 80 - Fire Doors and Other Opening Protectives
2. NFPA 105 - Smoke and Draft Control Door Assemblies

F. UL - Underwriters Laboratories.

1. UL 10C - Fire Tests of Door Assemblies
2. UL 305 - Panic Hardware

G. WHI - Warnock Hersey Incorporated

H. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit six (6) copies of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Include a Cover Sheet with;
   a. Job Name, location, telephone number.
   b. Architects name, location and telephone number.
   c. Contractors name, location, telephone number and job number.
   d. Suppliers name, location, telephone number and job number.
   e. Hardware consultant's name, location and telephone number.

2. Job Index information included;
   a. Numerical door number index including; door number, hardware heading number and page number.
   b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
   c. Manufacturers' names and abbreviations for all materials.
   d. Explanation of abbreviations, symbols, and codes used in the schedule.
   e. Mounting locations for hardware.
   f. Clarification statements or questions.
   g. Catalog cuts and manufacturer’s technical data and instructions.

3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)						
			(a) 1 Single Door #1 - Exterior from Corridor 101		(b) 90°	(c) RH
				(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea		(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea		Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.

F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.

I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

J. LEED Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification; coordinate and cooperate with Owner and Architect in providing information necessary for required LEED rating.

1.05 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Responsible for detailing, scheduling and ordering of finish hardware.
2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.06 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.07 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:

1. Locksets: "F" Lifetime.
2. Electronic: One (1) year.
3. Closers: Thirty (30) years – 1461 twenty (20) years.
4. Exit devices: Three (3) years.
5. All other hardware: Two (2) years.

1.08 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.02 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.

1. Hinges shall be sized in accordance with the following:
   a. Height:
      1) Doors up to 42" wide: 4-1/2" inches.
      2) Doors 43" to 48" wide: 5 inches.
   b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
   c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.

2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Floor Closers: Shall be equipped with compression springs, cam and roller operating mechanism and a one piece spindle-cam for maximum operating performance and longevity.

C. Pivots: High strength forgings and castings with precision bearings for smooth operation. Positive locking vertical adjustment mechanism to allow installer to precisely position the door and balance the load.

D. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.

E. Schlage “F” Series residential single and multi-family lever lockset with “Jazz” lever design.

1. Locksets to comply with ANSI A156.2,1996, Series 4000, Grade 2.
2. Latch shall have 1” x 2-1/4”, ¼” radius corner faceplate, 7/8” housing diameter, ½” throw.
3. Strike shall have 1-5/8” x 2-1/4” radius corner with a full lip.
4. Locksets shall fit 2-3/8” or 2-3/4” backsets
5. Locksets must be able to fit 1-3/8” – 1-3/4” doors.

F. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of ¼” diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3” long screws. ANSI A156.5, 2001 Grade 1 certified.

G. Exit devices: Von Duprin as scheduled.

1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
3. Mechanism case shall have an average thickness of .140".
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with ¾” throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. Lever Trim: “Breakaway” design, forged brass or bronze escutcheon with a minimum of .130” thickness, match lockset lever design.
11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
12. Furnish glass bead kits for vision lites where required.
13. All Exit Devices to be sex-bolted to the doors.
14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
    a. The unlatching force shall not exceed ~~15 lbs.~~ **5 lbs.per Section 11B,** applied in the direction of travel.

H. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16” steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.

4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
5. Closers shall be installed to permit doors to swing 180 degrees.
6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

I. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.

1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
2. Provide dust proof strikes at openings using bottom bolts.

J. Door Stops:

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

K. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

L. Thresholds: As Scheduled and per details.

1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.
3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
4. Thresholds shall comply with CBC Section 11B-404.2.5.

M. Seals: Provide silicone gasket at all rated and exterior doors.

1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on “S” labeled Positive Pressure door assemblies.

N. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

O. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

A. Furnish all cylinders in the Best Full Size Interchangeable Core (FSIC).

B. Furnish Key System Management Software (SM01-287 Windows on CD)

C. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.

1. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.
2. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
3. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

D. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.

1. Furnish CL100PB for use with non-I/C Schlage cylinders.
2. Furnish CL77R for use with FSIC Schlage cylinders.
3. Furnish CL721G for use with SFIC Schlage cylinders.

2.04 FINISHES

A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2013 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.

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 sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.

K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.

L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer’s technical documentation.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area 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.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which 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.

3.04 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.

C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

ADA	=	Adams Rite Mfg.	Aluminum Door Hardware
GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
JOH	=	L.E. Johnson	Sliding Door Hardware
LCN	=	LCN	Door Closers
SCE	=	Schlage Electronics	Electronic Door Components
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
TRI	=	Trimco	Signs
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

HARDWARE GROUP NO. 01

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	ENTRANCE LOCK	CS210-B500TD NEP PLY	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 02

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
		HARDWARE BY DOOR MANUFACTURER		

HARDWARE GROUP NO. A

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	CS210-B500TD NEP PLY	626	SCH
1	EA	SURFACE CLOSER	1461	689	LCN
1	EA	DOOR STOP	060 OR 70 AS REQ	652	IVE
2	EA	KICK PLATE	8400 10″ X 2″ LDW B-CS	630	IVE
	EA	THRESHOLD	PER DETAIL		

REMOVE RUBBER SLEEVE FROM DOOR STOP

HARDWARE GROUP NO. B

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5PB1	652	IVE
1	EA	PRIVACY LOCK	F40 JAZ	626	SCH
1	EA	DOOR STOP	060 OR 70 AS REQ	652	IVE
2	EA	KICK PLATE	8400 10″ X 2″ LDW B-CS	630	IVE

REMOVE RUBBER SLEEVE FROM DOOR STOP

HARDWARE GROUP NO. C

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5PB1	652	IVE
1	EA	PASSAGE SET	F10 JAZ	626	SCH
1	EA	DOOR STOP	060 OR 70 AS REQ	652	IVE
2	EA	KICK PLATE	8400 10″ X 2″ LDW B-CS	630	IVE

REMOVE RUBBER SLEEVE FROM DOOR STOP

HARDWARE GROUP NO. D

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5PB1	652	IVE
2	EA	BALL CATCH	347	626	IVE
2	EA	SINGLE DUMMY TRIM	F170 JAZ	626	SCH

HARDWARE GROUP NO. E

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	PASSAGE SET	F10 JAZ	626	SCH
1	EA	ONE WAY DEADBOLT	B661HD	626	SCH
1	EA	DOOR STOP	060 OR 70 AS REQ	652	IVE
1	EA	THRESHOLD	PER DETAIL		
2	EA	KICK PLATE	8400 10″ X 2″ LDW B-CS	630	IVE

REMOVE RUBBER SLEEVE FROM DOOR STOP

END OF SECTION

SECTION 08 8100 – GLASS GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Glass in the following locations:
1. Aluminum and steel windows.
2. Storefront systems.
3. Exterior doors.
4. Interior borrowed lites and interior doors.

B. Glass of the following types:
1. Monolithic.
2. Insulated.
3. Laminated.
4. Fire-rated.
5. Mirror glass.
6. Bird safe glass.

1.3 RELATED SECTIONS

A. Section 08 1113 – Hollow Metal Doors and Frames: Glazing stops.

B. Section 08 1116 – Aluminum Door and Window Frames.

C. Section 08 1416 – Flush Wood Doors: Glazing stops.

D. Section 08 4113 – Aluminum-Framed Entrances and Storefronts: Glazing stops.

E. Section 08 5113 – Aluminum Windows: Glazing stops.

F. Section 10 1100 – Visual Display Units: Back-painted marker glass.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

B. Deterioration of Laminated Glass: Development of manufacturing defects including edge separation or delamination which materially obstructs vision through glass.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

1.6 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Shop Drawings: Show location of exterior glass units required to be heat strengthened based on glass stress analysis calculations.

C. Samples for Verification:
1. Glass: 12-inch-square samples of each type of glass indicated except for clear monolithic glass products,
2. Sealant: 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.

1.7 INFORMATIONAL SUBMITTALS

A. Calculations: Furnish calculations showing glass stresses based on glass lites and shading patterns. Calculations shall be prepared by the glass manufacturer and shall be signed by a registered professional engineer licensed in the State of California.

B. Product Certificates: Signed by glazing materials manufacturers certifying that their products comply with specified requirements.
1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

C. Glazing Schedule: Indicate glass types and thicknesses for each size opening and location. Use same designation indicated on the Drawings.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

B. Warranty: Sample of special warranty.

1.9 QUALITY ASSURANCE

A. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that required for this Project, with a record of successful in-service performance.

B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. FGMA Publications: "FGMA Glazing Manual."
   2. LSGA Publications: "LSGA Design Guide."
   3. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

C. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:
   1. Primary glass of each (ASTM C1036) type and class indicated.
   2. Heat-treated glass of each (ASTM C1048) condition indicated.
   3. Laminated glass of each (ASTM C1172) kind indicated.
   4. No visible strain pattern to the naked eye under various lighting conditions as judged solely by the Architect.

D. Fabricator Qualifications: Shop that employs skilled, manufacturer-certified workers who custom fabricate glass similar to that required for this Project and whose products have a record of successful in-service performance.

E. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction
   1. Label shall indicate manufacturer’s name, type of glass, thickness, and safety glazing standard with which glass complies.

F. Insulating Glass Certification Program: Provide insulating glass units permanently marked with appropriate Insulating Glass Certification Council (IGCC) certification label.

G. Fire-Protection Rated Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
   1. Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire resistive assemblies.

H. Fire-Protection Rated Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
   1. Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire resistive assemblies.

I. Fire Resistance Rated Glazing for Fire Rated Wall Assemblies: Glazing for assemblies 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 251

J. Mockups: Before installing glazing, build mockups for each type of glass and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects, quench pattern visibility both under natural viewing and polarized viewing conditions, and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.

a. Use full size glass units to demonstrate fabrication techniques and quality.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effect, fabrication, and installation.
4. Obtain Architect's approval of mockups before starting glass fabrication.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.
7. Rejection: If strain pattern or any other pattern that is not intended or approved is visible to the naked eye, as judged solely by the Architect, the glass will be rejected.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.11 SITE CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

B. Install liquid sealants only when ambient and substrate temperatures are above 40 deg F (4.4 deg C).

1.12 WARRANTY

A. Laminated Glass: Furnish written warranty signed by glass manufacturer, agreeing to furnish replacements for those laminated glass units which develop manufacturing defects as defined.
1. Warranty Period: 5-years from date of Substantial Completion.

B. Insulating Glass: Furnish written warranty signed by glass manufacturer, agreeing to furnish replacements for those insulating glass units developing manufacturing defects as defined.
1. Warranty Period: 10-years from date of Substantial Completion.

C. Mirror Glass: Furnish written warranty agreeing to furnish replacement mirrors for those units developing silver spoilage.
1. Warranty Period: 15-years from date of Substantial Completion.

D. Bird Safe Glass: Furnish written warranty signed by glass manufacturer, agreeing to furnish replacements for those bird safe glass units which develop manufacturing defects as defined.
1. Warranty Period: 30-years from date of Substantial Completion.

E. These warranties shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
   1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120-deg. F. and from a consequent temperature range within glass and glass framing members of 180-deg. F.

B. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   3. For laminated-glass lites, properties are based on products of construction indicated.
   4. Tempered Glass Coatings: Apply Low-E, frit, and other specified coatings to glass only after tempering to minimize quench pattern visibility.

C. Provide mirrored glass that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

2.3 PRIMARY FLOAT GLASS PRODUCTS

A. Uncoated Clear Float Glass: ASTM C1036, Condition A (uncoated surfaces), Type I (transparent glass, flat), Quality q3 (glazing select), class and kind as indicated in schedule at the end of Part 3.

B. Tinted Glass: Float type, heat strengthened, tempered, or annealed as required, light reducing in color indicated in schedule at the end of Part 3; thickness as indicated.

C. Mirror Glass: ASTM C1503, Type I (transparent glass, flat), Class 1 (clear), and Quality q2 (mirror), with silvering, electro-plated copper coating, and protective organic coating, beveled edges.

D. Laminated Glass: ASTM C1172; laminated with polyvinyl butyral interlayer with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

E. Bird Safe Glass: ASTM C1036, Condition A (uncoated surfaces), Type I (transparent glass, flat), Quality q3 (glazing select).
   1. Basis-of-Design Product: GlasPro Bird Safe Glass.
   2. Meets American Bird Conservancy Avoidance Index of 79%.

3. Useable Flights:77 MT Score: 21
4. Confidence Interval: 68% - 88% (p<0.001)
HEAT-TREATED FLOAT GLASS

F. Heat-Treated Float Glass: ASTM C1048, Type I (transparent glass, flat), Quality q3 (glazing select), class and kind as indicated in schedule at the end of Part 3.

G. Safety Glass: ASTM C1048, fully tempered with horizontal tempering, Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; conforming to ANSI Z97.1; thickness as indicated.

2.4 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 for window assemblies; NFPA 252 for door assemblies.

B. Monolithic Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch (5-mm) nominal thickness.
1. Basis-of-Design Product: The design for the system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
a. Basis-of-Design: Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); Standard FireLite.
b. Safti First; SuperLite C/P.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.
1. Basis-of-Design Product: The design for the insulated glass is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
a. Basis-of-Design: PPG Industries, Inc., Solarban 70XL
b. Guardian Industries.
c. Viracon.
d. All punched windows on the Second Level of Building 1 will be glazed with Solargrey (VLT = 40%, SHGC = 0.46)
2. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
3. Spacer: Thermally broken aluminum with black, color anodic finish or black powdered metal paint finish.
4. Desiccant: Molecular sieve or silica gel, or blend of both.

2.6 ELASTOMERIC GLAZING SEALANTS

A. Compatibility: Select glazing compounds and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

B. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.

C. Elastomeric Glazing Sealants: Comply with ASTM C920, Class A, and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates capable of water immersion without loss of properties; cured Shore A hardness of 15-25; color as selected.
   1. 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 (EPA Method 24).
   2. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
      a. Dow Corning Corporation; 999.
      b. GE Silicones; SCS1200.
      c. Tremco; Proglaze.

D. Silicone Sealant for Fire-rated Glazing Materials: As recommended by fire-rated glass manufacturer for compatibility with their system.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with ASTM C1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Glazing Tape for Fire-rated Glazing Materials: As recommended by fire-rated glass manufacturer for compatibility with their system and as supplied by manufacturer.

2.8 GLAZING GASKETS

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded neoprene, EPDM, or silicone gaskets of profile and hardness required to maintain watertight seal; complying with ASTM C864, D.S. Brown Co., Maloney, Tremco or approved equal.

B. Soft Compression Gaskets: Extruded or molded closed cell, integral-skinned neoprene, EPDM, or silicone of profile and hardness required to maintain watertight seal; complying with ASTM C509, Type II, black; D.S. Brown Co., Maloney, Tremco or approved equal.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Glazing Stops: Screw applied or snap on type (beads) coordinated with glass section indicated, finished to complement exterior window finish.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Mirror Mastic: Adhesive setting compound manufactured specifically for setting mirrors on wall with support channel at bottom edge.
   1. VOC Content: Not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Stainless Steel Mirror Trim: Continuous stainless steel 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), fastened with stainless steel screws.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.10 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Pre-Glazed Units: Fabricate glass and other glazing products in sizes required to preglaze units at the factory, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

B. Field-Glazed Units: Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

2.11 MIRROR FABRICATION

A. Mirror Sizes: To suit Project conditions, and before tempering, cut mirrors to final sizes and shapes.
   1. Fabricate mirrors in single piece wherever possible.
   2. Where mirror length exceeds practical shipping and installation limits, follow seam pattern indicated on Drawings.
   3. Fabricate adjoining mirror units to be installed with hairline seams.

B. Cutouts: Fabricate cutouts before tempering 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. General: Watertight and airtight installation of each piece of glass exposed to the weather is required. Each installation must withstand normal temperature changes, wind loading, and impact loading with no failure of any kind, including loss or breakage of glass, failure of sealants or gasketing to remain air and water tight, deterioration of glazing materials or other defects in the materials or their application.

B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

C. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

D. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

E. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

F. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

G. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

H. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

I. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

J. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

K. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

L. Comply with manufacturer's specifications and recommendations for installation of glazing in window units.

M. Do not allow sealants to come in contact with edges of laminated glass units.

3.4 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.5 MIRROR INSTALLATION

A. Securely fasten chrome j-mold directly above backsplash of countertops. Clean j-mold and remove any construction debris before installing mirror glass.

B. Affix mirror glass to interior walls where indicated on Drawings using specified mastic.

C. Apply a bead of clear silicone sealant to space between mirror glass and j-mold to create a seal against water penetration from adjacent plumbing fixtures.

3.6 INSTALLATION – FIRE-RATED GLAZING

A. Comply with FGMA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.

D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.
   1. Install glazing tape in a straight line so that visibility is minimized in the finished installation.

E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.

F. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

G. Place glazing tape on free perimeter of glazing in same manner described above.

H. Install removable stop and secure without displacement of tape.

I. Use specified glazing compound, without adulteration; bed glazing material in glazing compound; entirely fill all recess and spaces. Provide visible glazing compound with smooth and straight edges.

J. Install in vision panels in fire-rated doors in accordance with requirements of NFPA 80.

K. Install so that appropriate approved testing agency and manufacturer's markings remain permanently visible.

3.7 ADJUSTING

A. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, during construction period, including natural causes, accidents and vandalism.

3.8 CLEANING

A. Examine glass surfaces adjacent to or below exterior concrete at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

B. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass using non-abrasive soft cloths as recommended by glass manufacturer.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.9 PROTECTION

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

3.10 CLEANING FIRE-RATED GLASS

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
   1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
   2. Do not use any of the following:
      a. Steam jets
      b. Abrasives
      c. Strong acidic or alkaline detergents, or surface-reactive agents
      d. Detergents not recommended in writing by the manufacturer
      e. Do not use any detergent above 77 degrees F
      f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
      g. Metal or hard parts of cleaning equipment must not touch the glass surface

B. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.11 GLAZING SCHEDULE – SEE DRAWINGS

END OF SECTION 08 8100

SECTION 08 9100 – WALL LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fixed metal louvers and frames at exterior locations.

B. Blank off panels.

1.3 RELATED SECTIONS

A. Section 03 3000 – Cast-in-Place Concrete: Prepared exterior wall opening.

B. Division 23 – HVAC Fans.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blank off areas required, and frames.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
4. For field-applied touch up primers, paints, clear coatings, and galvanizing agents, include printed statement of VOC content and chemical components.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."

2. AWS D1.3, "Structural Welding Code - Sheet Steel."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal louvers so as not to be damaged or deformed. Package louvers for protection during transportation and handling.

B. Store louvers vertically, covered with suitable weathertight and ventilated covering. Store louvers to ensure dryness, with positive slope for drainage of water. Do not store louvers in contact with other materials that might cause staining, denting, or other surface damage.

C. Protect strippable protective covering on louvers from exposure to sunlight and high humidity, except to extent necessary for period of louver installation.

1.8 SITE CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
1. Steel: Average recycled content of steel to be a minimum 60 percent.

B. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Adhesives, sealants, paints, welding, and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 018113 - Sustainable Design Requirements.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. The Airolite Company.
2. Construction Specialties, Inc.

2.3 MATERIALS

A. Galvanized-Steel Sheet: ASTM A653/A653M, G90 (Z275) zinc coating, mill phosphatized.

B. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners, unless otherwise indicated.
3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
4. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E488/E488M, conducted by a qualified independent testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Flashings: Of same material as louver frame.

F. Sealants: As recommended by louver manufacturer.

2.4 FIXED, FORMED-METAL LOUVERS

A. Horizontal, Drainable-Blade Louver: Factory welded assembly complete with steel storm-resistant blades, bird screen, steel sills, integral structural supports and blade braces.
1. Blade Profile: Single, drainable.
2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.052 inch (1.32 mm) for frames and 0.040 inch (1.02 mm) for blades.
3. Material: Galvanized steel.
4. Finish: Baked-enamel or powder-coat as standard with manufacturer, color to be selected.
5. Free Area Requirements: 50 percent net free area.
6. Louver Depth: As indicated on Drawings.
7. Mullion Type: As indicated on Drawings.
8. Basis-of-Design Product: TBD.
9. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

B. Blank-off Panels: Manufacturer's standard insulated panels of same material and finish as louver.
1. R-value of Blank-off Panels: Match R-value of adjacent wall construction.

C. Gasketing: PVC compression gaskets, 1/2- by 1/2-inch, or 1/4-inch bead of silicone sealant.

2.5 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6-inches (150 mm) from each corner and at 12-inches (300 mm) oc.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
1. Metal: Same kind and form of metal as indicated for louver to which screens are attached.

2. Finish: Mill finish, unless otherwise indicated.
3. Type: Non-rewirable, U-shaped frames for permanently securing screen mesh.

D. Louver Screening for Aluminum Louvers:
1. Bird Screening: Aluminum, 1/2-inch- (12.7-mm-) square mesh, 0.063-inch (1.6-mm) wire.

E. Louver Screening for Galvanized-Steel Louvers:
1. Bird Screening: Galvanized steel, 1/2-inch- (13-mm-) square mesh, 0.041-inch (1.04-mm) wire.

2.6 FABRICATION

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
1. Louver Frame: Channel shape, welded corner joints.
2. Louver Panel Thickness: 6-inches deep.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Where indicated, provide subsills made of same material as louvers or extended sills for recessed louvers.

F. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

G. Head and Sill Flashings: Roll formed or extruded to required shape, single length in one piece per location.

2.7 GALVANIZED-STEEL SHEET FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish louvers after assembly.

C. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair according to ASTM A780/A780M.

D. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on Shop Drawings.

3.2 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

C. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

D. Form closely fitted joints with exposed connections accurately located and secured.

E. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

F. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 for sealants applied during louver installation.

I. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

J. Secure louvers in opening framing with concealed fasteners.

K. For mechanical intake and exhaust louvers, provide insulated blank-off panels for all unused sections of louver.

3.3 ADJUSTING

A. Strip protective finish coverings.

B. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

3.4 CLEANING

A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 08 9100

SECTION 09 2216 – NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Non-load-bearing steel framing members for the following applications:
1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
3. Resilient channel installation for acoustical construction.
4. Flat strap and backing plate for support of wall mounted equipment and fixtures.

1.3 RELATED SECTIONS

A. Section 05 4000 - Cold-Formed Metal Framing: Exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

B. Section 09 2119 – Cavity Shaft-Wall Assemblies: Non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

C. Section 09 2900 – Gypsum Board: Application of gypsum board over non-load bearing steel framing.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
1. Brand.
2. Stud sizes.
3. Stud gauge.

B. Shop Drawings: Show provision for fixture and equipment anchorage to stud systems different from typical systems or details indicated.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

4. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e.s, from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.

1.6 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Test-Response Characteristics: Provide components that comply with rating requirements specified for fire-rated assemblies under UL 2079 for non-load bearing wall systems.
   1. Deflection Clips and Firestop Track: Connections and/or top runner provided in fire-resistance-rated assemblies shall be certified by UL 2079 for cyclic movement requirements.

C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

D. Structural supports and blocking for light fixtures and miscellaneous wall- or ceiling-mounted items shall be designed and engineered by Contractor.

E. Performance Requirements:
   1. Loads: Comply with CBC requirements for design of metal framing systems for gypsum board wall assemblies.
   2. Deflection:
      a. Partitions to Receive Gypsum Board: L/240.
      b. Partitions to Receive Tile Backer Board: L/360.
      c. Framed Ceilings: L/360. L/240 maximum, typical.
   3. Seismic Requirements: Comply with code requirements for seismic bracing.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
   1. Light Gage Metal Framing: Minimum 28 percent total recycled content, and minimum 16 percent post-consumer recycled content.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

2.2 MANUFACTURERS

A. Steel Framing and Furring Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Gold Bond Building Products Div., National Gypsum Co.
   2. United States Gypsum Co.

B. Steel Slip-Type Head Joints: Subject to compliance with requirements, provide products by one of the following:
   1. Brady Construction Innovations, Inc., Sliptrack Systems.
   2. ClarkDietrich Building Systems, SLP-TRK Slotted Track.

C. Grid Suspension Assemblies: Subject to compliance with requirements, provide products by one of the following:
   1. Chicago Metallic Corp.
   2. USG Interiors, Inc.

D. Steel Headers: Subject to compliance with requirements, provide products by one of the following:
   1. ClarkDietrich Building Systems, ProX Header.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
   1. Steel Studs and Runners: Comply with ASTM C645 requirements for metal and profiles shown on Drawings, unless otherwise indicated.
   2. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).
      a. If stud thickness is not indicated, provide thickness as required for specified deflection criteria, based on stud depth and spacing indicated and partition height required.
      b. If stud spacing is not indicated, space studs at 16-inches oc.
   3. Flange Edges of Studs: Bent back 90 deg and doubled over to form 3/16-inch-wide minimum lip (return) and complying with the requirements indicated on Drawings for depth indicated.
   4. Protective Coating: ASTM A653/A653M, G60 (Z180) minimum, hot-dip galvanized zinc coating, unless otherwise indicated.

B. Slip-Type Head Joints: Where indicated, provide the following:
   1. Slotted Slip Track: ASTM C645 top runner with 2-1/2-inch- (63.5-mm-) deep flanges in thickness not less than indicated for studs; with 1-1/2-inch x 1/4-inch vertical slots.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated and where required by Owner for Owner-installed items. Where backing is not indicated on Drawings comply with the following:
   1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).
   2. Install continuous plate across minimum 3 studs, attaching to each stud.
   3. Notch channel at studs.
   4. For Loads Under 50 lbs/ft:
      a. Plate Size: 6" x 1-1/4", 16 gage track channel.
      b. Attachment: No. 8 flat head screws, three at each stud.
   5. For Loads 51 lbs/ft to 100 lbs/ft:
      a. Plate Size: 6" x 1-1/4", 16 gage track channel.
      b. Attachment: Welding.
   6. For Loads 101 lbs/ft to 250 lbs/ft:
      a. Plate Size: 6-inch wide 14 gage plate with 4" x 1-1/4" 16 gage track channel stiffeners welded to back.

D. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
   1. Depth: 1-1/2 inches (38.1 mm) minimum, unless noted otherwise on Drawings.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C645.
1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
2. Finish: Galvanized, G90 at exterior locations, G60 at interior locations.
3. Depth: 7/8 inch (22.2 mm).

F. Resilient Furring Channels and Clips: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Manufacturer: Unimast, RC-2 Pro, Cemco RC-2 or Dale/Incor RFC-2.
2. Configuration: Hat shaped.
3. Isolation Clips: Kinetics IsoMax.

2.4 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.0625-inch-(1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:
1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488/E488M by an independent testing agency.
a. Type: Postinstalled, expansion anchor.
2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by an independent testing agency.

C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2-inch- (12.7-mm-) wide flanges.
1. Depth: 2 inches (51 mm).

E. Furring Channels (Furring Members): As specified herein.

F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Acceptable Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; 640 Drywall Ceiling Suspension.
c. USG Corporation; Drywall Suspension System.

2.5 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. Shot Pins: 0.140-inch diameter low velocity powder-actuated drive pins equivalent to Ramset/Red Head No. 1508, or equal, with 7/8-inch minimum penetration into concrete.

C. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

D. Acoustical Gasket at Window System/Framing Interface: ASTM D1065, Type 1, Class A; flexible cellular neoprene gasket.

E. Acoustical Flute Closure: Flexible cellular neoprene closure shaped to fit underside of deck flutes at steel deck/head of framing interface.

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, installation tolerances, and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

B. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.
1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
2. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Cutting:
1. General: Cut framing components squarely or on angle as required to fit tightly with proper bearing against abutting members.
2. Cutting Studs: If stud web is cut more than 50-percent, or stud flanges are cut, restore stud to original strength by wire-tying, or welding on steel reinforcement.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

1. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

D. Backing Plates:
1. Install as indicated and specified for support of wall-hung cabinets, toilet partitions and accessories, and other items to be mounted on vertical surfaces.
2. Welding shall comply with AWS D1.3.
3. Paint welds with a rust-inhibitive paint.

E. Install bracing at terminations in assemblies.

F. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

G. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.

H. Partitions must securely abut to building mullions and walls. Do not use mechanical fasteners to connect framing to mullions; provide closed cell neoprene gasket between mullion and end stud.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, 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 connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
1. Maximum Spacing: On center spacing in conformance with CBC and DSA requirements.

F. Grid Suspension Systems for Use with Gypsum Board: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install steel studs and furring in sizes and at spacings indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified:
1. Space studs as indicated on Drawings.
2. Install studs so flanges within framing system point in same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.

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. Deflection 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: Frame door openings to comply with details indicated and with applicable published recommendations of gypsum board manufacturer. 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. Extend jamb studs through suspended ceilings and attach to underside of overhead structure, where indicated on Drawings.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

D. Shot Pins: 0.140-inch diameter low velocity powder-actuated drive pins equivalent to Ramset/Red Head No. 1508, or equal, with 7/8-inch minimum penetration into concrete.

E. Stud Wall Lateral Bracing: Comply with requirements of the CBC. Laterally brace walls extending above ceiling height by means of braces installed at not more than 45 degrees from horizontal as follows:
1. 3-5/8 in x 25 gauge studs at 8 feet oc on each side of wall (in tension only).
2. 12 gauge wire at 6 feet oc on each side of wall (in tension only).
3. 3-5/8 inch x 1-1/4 inch x 16 gauge studs at 8 feet oc acting in either tension or compression. They may be on one side of wall only.
   a. Maximum length is 7 feet when in compression.
   b. For lengths from 7 to 10 feet (when in compression) form box studs built from two studs welded toe to toe for lengths from 10’ to 16’ (when in compression).
   c. Form “T” sections of 4” x 1-5/8” x 18 gauge studs welded together.

4. Attach stud braces at middle third of beams, purlins or joists.

F. Provide horizontal 3/4 inch channel track and web stiffeners continuous at all walls over 17 feet high.

G. Install noncombustible void closures in metal decking flutes where walls abut decking.

H. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) in 10 feet in any direction from the plane formed by faces of adjacent framing.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) in 10 feet in any direction from the plane formed by faces of adjacent framing.

3.6 RESILIENT CHANNEL CONSTRUCTION

A. Erect in accordance with manufacturer's recommendations.

B. Attaching Channels:
1. Attach USG RC-1 resilient channels at 24-inch center-to-center spacing perpendicular to the framing. Use 16-inch spacing for fire-rated assemblies.
2. Use USG 1-inch type S Bugle Head drywall screws.
3. Attach channels with mounting flanges facing in only one direction. For walls, the gypsum board mounting flange should face upward and pre-punched holes downward.
4. Hold back ends of channels 1-inch from intersecting surfaces.
5. Splice channels only at studs and overlap butt ends. Screw attach through both flanges.
6. Locate channels a maximum of 3-inches from framing at base and head of wall.

C. Isolate top and bottom runners from direct contact with structure by installing over either:
1. Continuous compression or isolation strips as specified, or
2. Two continuous 1/4-inch beads of acoustical sealant specified in Section 07 92 19 applied at quarter points of track width.

D. Studs at terminal ends of partitions abutting intersecting walls or partitions, and studs that would otherwise contact intermediate structural columns shall be similarly installed over strips or sealant.

3.7 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 09 2216

SECTION 09 2219 – CAVITY SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Steel shaft-wall framing and gypsum liner board for the following:
1. Shaft enclosures.
2. Stair enclosures.

1.3 RELATED SECTIONS

A. Section 09 2216 – Non-Structural Metal Framing.

B. Section 09 2900 - Gypsum Board: Application and finishing of gypsum board assemblies in other than shaft-wall assemblies.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.6 ACTION SUBMITTALS

A. Product Data: For each gypsum board shaft-wall assembly indicated.

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
4. Environmental Product Declaration (EPD): Manufacturer’s Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e.s, from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.

1.7 INFORMATIONAL SUBMITTALS

A. Fire-Test-Response Reports: From a qualified independent testing and inspecting agency substantiating each gypsum board shaft-wall assembly's required fire-resistance rating.

B. Include data substantiating that elevator entrances and other items that penetrate each gypsum board shaft-wall assembly do not negate fire-resistance rating.

1.8 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory." or GA-600, "Fire Resistance Design Manual".

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

1.10 SITE CONDITIONS

A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in Section 09 2900 - Gypsum Board.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content:
1. Provide gypsum board products with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50 percent.
2. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
a. Light Gage Metal Framing: Minimum 28 percent total recycled content, and minimum 16 percent post-consumer recycled content.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Gold Bond Building Products Div., National Gypsum Co.
2. United States Gypsum Co.

2.3 ASSEMBLY MATERIALS

A. General: Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

B. Steel Framing: C-H studs, 20 gage minimum or as indicated on Drawings.
1. Steel Sheet Components: Comply with ASTM C645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A653/A653M, G60 (Z180) minimum, hot-dip galvanized zinc coating, unless otherwise indicated.

C. Gypsum Liner Panels: ASTM C442/C442M, manufacturer's proprietary Type X liner panels in 25.4-mm thickness and with moisture-resistant paper faces.
1. Edges: Square.
2. Size: 48- inches wide by lengths that will result in minimum footage of joints.

D. Gypsum Wallboard: As specified in Section 09 2900.

E. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.

F. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

G. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Section 09 2900 that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

H. Gypsum Wallboard Joint-Treatment Materials: ASTM C475 and as specified in Section 09 2900.

I. Steel Drill Screws: ASTM C1002, unless otherwise indicated.

J. Track (Runner) Fasteners: Powder-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

K. Acoustical Sealant: As specified in Section 07 9200.

L. Sound Attenuation Blankets: See Section 07 2100.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum shaft-wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft-wall assemblies to comply with requirements specified in Division 7 Section "Sprayed Fire-Resistive Materials."

B. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24-inches (600 mm) oc.

C. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLING SHAFT-WALL ASSEMBLIES

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
1. ASTM C754 for installing steel framing.
2. Section 09 2900 for applying and finishing panels.
3. Section 072116 for installation of acoustical insulation.

B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

D. At elevator hoistway door frames, provide jamb struts on each side of door frame.

E. Where handrails directly attach to gypsum board shaft-wall assemblies, provide galvanized steel reinforcing strip with 0.0312-inch (0.79-mm) minimum thickness of base (uncoated) metal, accurately positioned and secured behind at least 1 face-layer panel.

F. Integrate stair hanger rods with gypsum board shaft-wall assemblies by locating cavity of assemblies where required to enclose rods.

G. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

H. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.

I. Install control joints where indicated on Drawings to maintain fire-resistance rating of assemblies.

J. Install acoustical insulation in shaft wall assemblies to provide minimum STC rating of 50.

K. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C919, whichever is more stringent.
   1. Leave a 1/8- to 1/4-inch space between gypsum wallboard and adjacent construction to provide a space for acoustical sealant.
   2. Seal airtight with acoustical sealant material specified in Section 07 92 00.
   3. Seal penetrations through walls, or cuts in one face of walls, with a full bead of sealant at perimeter; this includes provisions for electrical outlet and switch boxes, pipes, ducts and similar items.
   4. Install mild steel sleeves where required, fiberglass packing between sleeve or framing, service and cover plates. Seal on both sides to render airtight.
   5. Tolerances: 1/8-inch between wall boarding and sleeve, 3/8- to 5/8-inch between sleeve and service

L. In elevator shafts install a bead of acoustical sealant to prevent dislocation by air pressure differential.
   1. Where gypsum board shaft-wall assemblies cannot be positioned within 2-inches (51 mm) of the shaft face of structural beams, floor edges, and similar projections into shaft, install 1/2- or 5/8-inch- (12.7- or 15.9-mm-) thick, gypsum board cants covering tops of projections.
   2. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24-inches (610 mm) oc with screws fastened to shaft-wall framing.
   3. Where steel framing is required to support gypsum board cants, install framing at 24-inches (610 mm) oc and extend studs from the projection to the shaft-wall framing.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 09 2219

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SECTION 09 2400 – PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Metal furring and lathing.

B. Portland cement plaster systems of the following types:
1. 3-coat system over metal stud framing.

1.3 RELATED SECTIONS

A. Section 09 2900 – Gypsum Board: Exterior sheathing substrate for cement plaster system.

B. Section 099100 – Painting.

1.4 ACTION SUBMITTALS

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

B. Samples for Verification:
1. Accessories: For each type of accessory specified.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's code compliance report.

1.6 CLOSEOUT SUBMITTALS

A. Warranty: Executed special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with Northwest Wall and Ceiling Bureau's Stucco Resource Guide.

B. Mockups: Before plastering, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Install mockups for each type of color and finish indicated.
2. Architect will select representative surfaces and conditions for application of plaster.
3. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
4. Notify Architect seven days in advance of dates and times when mockups will be constructed.
5. Demonstrate the proposed range of aesthetic effects, fabrication, and installation.

6. 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 surface blemishes to match adjacent undamaged surfaces.
7. Obtain Architect's approval of mockups before starting application of plaster system.
8. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
9. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.9 SITE CONDITIONS

A. Exterior Plasterwork:
1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

PART 2 - PRODUCTS

2.1 FIELD MIXED PLASTER MATERIALS

A. Base-Coat Cements: Type as indicated below:
1. Portland cement, ASTM C150/C150M, Type I or II.
2. Masonry cement, ASTM C91/C91M, Type N.

B. Lime: ASTM C206, Type S or special hydrated lime for masonry purposes, ASTM C207, Type S.

C. Sand Aggregate for Base Coats: Natural or manufactured sand, in accordance with ASTM C897.

D. Alkali-Resistant Fiber Reinforcement: ASTM C1116/C1116M Type III 4.1.3, 100% virgin homopolymer micro-fibers; 1/2- to 3/4-inch long, free of contaminants, containing no reprocessed olefin materials, engineered and designed to be added to stucco scratch coat.
1. Acceptable Manufacturers:
a. Fibercast 500 (formerly Harbourite), manufactured by SI Concrete Systems, (423) 892-8080 www.fibermesh.com.
b. Grace Micro Fiber manufactured by Grace Construction Products (877) 423-6491 www.graceconstruction.com.
c. Stucco-Bond manufactured by Forta Corp. (800) 245-0306 www.fortacorp.com.

E. Bonding Agent:
1. Exterior Plaster: ASTM C932, resinous emulsion which will provide bond for gypsum or Portland cement, plaster, concrete, masonry, old or new surfaces
2. Interior Plaster: ASTM C631, non-oxidizing, non-crystallizing, and unaffected by reapplication of water.

F. Primer: 100% BMI acrylic color primer: Water-based, pigmented acrylic primer applied over the cured plaster base coat, minimum 7 days, to improve adhesion and provide more uniform finish appearance.

G. Water: Clean, fresh, potable and free of mineral or organic matter that can affect plaster.

H. Field Mixed Plaster Finish Materials:
1. Cement: As specified for plaster base coat, white color.
2. Lime: As specified for plaster base coat.

I. Ready-Mixed Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; anti-bacterial, anti-fungal, and with ultraviolet screening agents, for use over Portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
1. Products:
a. La Habra Stucco.
b. California Stucco Products Corp.
c. ChemRex.
d. United States Gypsum Co.
2. Color Pigment: Mineral oxide type, color as selected; factory mixed.
3. Color: Match Architect's sample.

2.2 WEATHER BARRIERS

A. Weather-Resistive Barrier: See Section 07 2727.
1. First Layer: See Section 07 2727.
2. Second Layer:
a. Building Paper: FS UU-B-790a, Type 1, Grade D, Style 2 vapor-permeable, 60 minute building paper, 6-inch vertical laps, 2-inch minimum horizontal laps.
b. Fortifiber; Super Jumbo Tex or accepted equivalent.

2.3 LATHING AND CONTROL JOINT MATERIALS

A. General: Comply with ASTM C1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Flat Rib Lath: Rib depth of not more than 1/8 inch (3.1 mm), 3.4 lb/sq yd (1.8 kg/sq. m).

C. Galvanize metal lath as follows:
1. Flat Rib Lath: ASTM A653/A653M, G90 (Z275), Grade 33, hot-dip galvanized zinc coating.
2. Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
3. Flat-Ceiling and Horizontal Framing: Install 3/8-inch (9.5-mm) rib lath.
4. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.

D. Casing Bead: Formed sheet steel; minimum 25 gage thick; depth governed by plaster thickness; maximum possible lengths; “J” style with expanded metal flanges, with square edges.

1. Product: Cemco, #66, or equal.

E. Control Joint Accessories: Fabricated from hot-dip galvanized steel sheet, ASTM A653/A653M, G90 (Z275) zinc coating, unless noted otherwise.
1. Vertical Control Joint: Keene XJ15-3, CEMCO #XJ15, or equal; one-piece, 25 gage galvanized steel, expanded 2-inch solid sheet metal flanges each side.
2. Solid-Leg, Horizontal Control Joint: CEMCO #15, Keene #40, or equal, two-piece, 25 gage galvanized steel, 2-inch solid sheet metal flanges each side.
3. Two-Piece Expansion Joints: Formed to product slip-joint and square-edged reveal that is adjustable from 1/4-to-5/8-inch wide; with perforated flanges.
4. External Corner Bead: Stockton Wire Products, Corneraid, galvanized, welded wire exterior corner reinforcement, or equal.
5. Internal Expansion Joint: CEMCO #30 Corner Expansion Joint, or equal; double-V expansion joint formed to 90-degrees for inside corners, fabricated for movement due to expansion and contraction.
6. Foundation Sill/Weep Screed: CEMCO, #35, perforated, or equal.
7. Soffit Screed: CEMCO, #6; Superior Metal Trim, SSC Superior Soffit Corner; or equal; drip head screed with 3-1/4-inch vertical flange without holes.
8. Soffit Drip Edge: CEMCO, #12, or equal.
9. Soffit Vents: Provide soffit vents with width as indicated on Drawings, ASTM C1047, sheet steel zinc coated by hot-dip process. Flanges shall be free of dirt, grease and other materials that may adversely affect bond of joint treatment.
   a. Product: Cor-A-Vent, or equal.

F. Extruded Aluminum Accessories: Aluminum channel screed, non-vented
1. Reveal: Fry, PCS Series, one-piece extruded aluminum, clear anodized finish.
2. Reveal Width: As indicated on Drawings.
3. Provide manufacturer's prefabricated watertight corners and transitions, and splice plates.

G. Expanded Metal Strip Lath: ASTM C847 with ASTM A653/A653M, G90 (Z275), hot-dip galvanized zinc coating.

H. Corner Mesh Reinforcement: Fabricated from metal lath with ASTM A653/A653M, G90 (Z275), hot-dip galvanized zinc coating.

I. Anchorage Methods: Screws or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

2.4 CEMENT PLASTER MIXES – FIELD MIX

A. General: Comply with ASTM C926 for applications indicated.
1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. ft. (16 kg of fiber/cu. m) of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

B. Base Coat and Brown Coat: One part plastic cement, 3-1/2 to 4 parts aggregate, 0.5% by weight plastic cement synthetic fibers, and 1/2 part (maximum) potable water.

C. Finish-Coat Mixes: For ready-mixed finish-coat plasters acrylic-based finish coatings, comply with manufacturer's written instructions.

D. Mix only as much plaster as can be used prior to initial set.

E. Mix materials dry, to uniform color and consistency, before adding water.

F. Protect mixtures from freezing, frost, contamination, and evaporation.

G. Do not retemper mixes after initial set has occurred.

H. Do not use all plastic cement mixes.

2.5 FINISH

A. General: Provide finishes described in Technical Services Information Bureau's - Plaster Textures & Acrylic Finishes.
1. Exterior Finish: Number 30 mesh, fine sand float surface finish.

2.6 ACCESSORIES

A. Exterior Joint Sealant: ASTM C920, also ASTM C1193 and tested under ASTM C719; Type S, Grade NS, Class 100/50, Use NT, M, G, A, and O; single component, low-modulus, non-sag sealant,
1. Acceptable Sealants:
a. Tremco; Spectrem 3 or Spectrem 4.

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.

B. Ensure that the installation of the windows and sheet metal flashings, including the associated self-adhesive flashings is completed prior to cement plaster installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Clean and remove surface projections, and apply bonding agent.

C. Verify support framing is tied together at specified spacing with 16 gage wire.

3.3 WEATHER BARRIER MEMBRANE INSTALLATION

3.4 BUILDING PAPER INSTALLATION

A. Building Paper Installation: Starting at bottom of wall, apply one layer of building paper horizontally over substrate. Use small staples so that paper is taut and flat.
1. Overlap successive sheets minimum of 3-inches in weatherboard fashion to shed water without interception by any exposed sheet edges.

B. At Openings:

1. Apply sill flashing over sheathing, extending a minimum of 4-inches beyond opening. Do not attach the bottom of the sill flashing to permit subsequent application of building paper.
2. Apply a continuous bead of caulking on the back side of the window flange.
3. Install window over rough opening and sill flashing.
4. Install jamb flashing over the window flange on each side.
5. Install the jamb flashing even with the bottom of the sill flashing.
6. Extend jamb flashing 4” above the rough opening.
7. Install head flashing over the window flange and the jamb flashing.
8. Extend the head flashing 8” beyond the rough opening.
9. Install building paper beneath the unattached portion of the sill flashing.
10. Finish attaching sill flashing to the building paper.
11. Continue installing building paper from the bottom to the top wall.
12. Install the building paper over the flashing and window flange fitting tightly against the window frame.

C. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

D. At end of each working day, seal top edge of membrane to substrate with termination mastic.

E. Repair punctures, voids, and deficient lapped seams in weather barrier. Slit and flatten fishmouths and blisters. Patch with weather barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.

F. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply weather barrier components.

G. Patch any holes in paper before proceeding with installation of metal lath.

3.5 INSTALLATION OF METAL LATH

A. Install metal lath in accordance with ASTM C1063.
1. Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
2. Flat-Ceiling and Horizontal Framing: Install 3/8-inch (9.5-mm) rib lath.
3. Curved-Ceiling Framing: Install welded-wire lath.
4. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.

B. Apply metal lath taut, with long dimension perpendicular to supports. Secure side laps with tie wire where they occur between supports. Lap ends and sides.
1. Lap ends of lath minimum 1-inch in accordance with ASTM C933. Where end laps occur between supports provide additional framing support in order to anchor lath to structure, and secure with tie wire.
2. Lap sides of lath 1/2-inch minimum.
3. Run lath continuously at internal corners or terminate with casing bead.
4. Secure self-furred type lath to framing at furring points as much as possible.
5. Fasteners: Spaced maximum 6-inches oc. All ceiling lath to be wire-tied to 3/4-inch cold rolled channels. Screw attachment of overhead lath will not be permitted.

C. Discontinue lath at all control joint and expansion joint locations. Fully back the discontinued sheets of lath at these locations with blocking for edge fasteners; ensure control joints are located over studs or sheet metal backer plates.
1. Embed end of control joints in sealant during installation.

D. Attach metal lath to metal supports using 18-gage tie wire at maximum 6 inches oc.

3.6 INSTALLING ACCESSORIES

A. Install according to ASTM C1063 and at locations indicated on Drawings.

B. General: Anchor cement plaster accessories through the sheathing to the stud supports using appropriate fasteners.

C. Reinforcement for External Corners:
1. Install lath-type, external-corner reinforcement at exterior locations.
2. Install cornerbead at interior locations.

D. Control Joints: Install control joints at locations indicated on Drawings. Where not indicated comply with the following:
1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
2. At distances between control joints of not greater than 18 feet (5.5 m) oc.
3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
4. Where control joints occur in surface of construction directly behind plaster.
5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

E. Place 6" x 18" strip lath diagonally at corners of lathed openings and 12" around penetrations such as lighting fixtures. Secure rigidly in place.

F. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to the angle reinforcement; fasten at perimeter edges only.

G. Place Corneraid at corners; fasten at outer edges only.

H. Place casing beads at terminations of plaster finish. Stop ends 1/4 inch away from top of wall. Caulk with silicone sealant.

I. Reinforce interior angles and flat joints with joint tape and embedding material recommended by manufacturer.

J. Position the layering of sheet membrane products and self-adhesive flashings so that plaster does not come in direct contact with self-adhesive flashing at horizontal locations including floor lines, reveals and sills.

3.7 PLASTER APPLICATION

A. Inspect building paper, after lath and accessory installation and before plastering, to identify and repair open holes, tears or other water intrusion pathways.

B. General: Comply with ASTM C926 and manufacturer's instructions.
1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.

2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

C. Do not install stucco during extremely hot, dry, or windy conditions. Do not install stucco during freezing conditions or on frozen substrates.

D. Mechanically mix cementitious and aggregate materials for plasters to comply with recommendations of plaster manufacturer.

E. Vertical Framed and Sheathed Surfaces: Apply scratch coat to a nominal thickness of 3/8 inch over metal lath, brown coat to a nominal thickness of 3/8 inch, and a finish coat to a nominal thickness of 1/8 inch.
1. When scratch coat is firm, score in one direction.
2. Apply scoring in brown coat to adequately key finish coat into base and as required to achieve required finished texture in approved mockup.
3. Premixed Plaster Material: BMI 690 Plaster carries an ICC-ES Report #2535 which allows for application of the scratch and brown coat for Type I-V construction by any of the following:
   a. Traditional scratch and brown application.
   b. Double-back method.
   c. Single pass of the scratch and brown coat 3/4" - 7/8" in thickness.

F. Apply the stucco in discrete panels without interruption to avoid cold joints and differences in appearance.

G. Abut wet stucco to set stucco at natural or architectural breaks in the wall such as expansion joints, pilasters, terminations, or changes in plane.

H. Do not install stucco onto grounds of accessories.

I. Completely embed lath and flanges of accessories and completely cover attachments with stucco.

J. Three-Coat Field-Mix Application:
1. Scratch Coat: 3/8-inch.
2. Brown Coat: 3/8-inch.
3. Finish Coat: 1/8-inch.

K. Curing: Use fine fog spraying for curing operations.
1. Scratch Coat: Minimum 48 hours moist cure and as frequently as required under Project's environmental conditions before application of brown coat.
2. Brown Coat: Minimum 48 hours moist cure; 7 days before application of finish coat.
3. After 48 hours, review with plastering superintendent to determine need for any further moist curing.
4. Additionally, moist cure base coats a minimum of 48 hours if required by climatic conditions if over 77 degrees F, when the ambient relative humidity is below 70%, and when conditions are windy.

L. After curing, dampen previous coat prior to applying finish coat.

3.8 SCRATCH COAT APPLICATION

A. Apply from architectural break to architectural break with sufficient pressure to ensure keying into lath. No cold joints shall be allowed.

B. Apply in sufficient thickness to substantially cover the lath.

C. Immediately score (scarify) in a predominately horizontal direction.

D. Wipe down all corners and leave no cement protrusions that will interfere with application of brown coat.

E. Let scratch coat cure 48 hours and moist cure with water. Contractor will determine moist-cure procedures based on climate conditions.

F. Keep scratch coat hydrated. Follow ASTM and/or TSIB recommendations for curing.

G. Do not apply brown coat until scratch coat is firm and hard, 48 hours minimum moist cure.

3.9 BROWN COAT APPLICATION

A. Pre-wet the scratch coat or concrete/masonry substrate (if required) to avoid excessive suction of moisture from brown coat to avoid accelerated evaporation.

B. Apply from architectural break to architectural break. No cold joints will be allowed.

C. Brown coat shall be applied and fill to the grounds. Surface to be immediately darbied and/or rodded to a level and plumb plane.

D. When the initial moisture has left brown coat, “hard” float the brown coat to “densify”, consolidate and prepare for a finish coat. Sponge floats are not acceptable. A hard float shall be considered made from wood shingle, cork, plastic, compact felt or neoprene

3.10 FINISH COAT APPLICATION

A. General: Apply 1/8-inch (3 mm) thick finish coat and steel trowel to a smooth and consistent finish to match approved mockup.

B. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.
1. Trowel-apply acrylic finish, maintaining a wet edge at all times.
2. Do not moist cure acrylic finish.
3. Protect finished surface from climatic conditions until dry.

C. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.

D. Ensure finished installation is true, plumb and square. Remove excess stucco from within control and expansion joints before the stucco sets.

3.11 CUTTING AND PATCHING

A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections.

B. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed. Match adjacent finish texture so no evidence of patching is visible.

C. Upon completion of application, point up plaster around trim and other locations where plaster meets dissimilar materials.

3.12 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 coating operations are being conducted:
   1. The Owner may engage the services of a qualified independent testing and inspecting agency to sample materials used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in presence of the Contractor.
   2. The testing and inspecting agency will perform appropriate tests, as required by the Owner.
   3. If results show materials do not comply with requirements, the Contractor may be directed to stop work, remove noncomplying materials, pay for testing, recoat surfaces coated with rejected materials, or remove rejected materials from previously coated surfaces if, on recoating with specified materials, the 2 materials are not compatible.

B. pH Testing: Between each coat of plaster and prior to application of paint finish.
   1. Testing performed by Contractor; observed by Owner's QA/QC representative.
      a. Results: pH equal to or less than 13 is acceptable.

3.13 ADJUSTING

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from doorframes, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

3.14 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal.

END OF SECTION 09 2400

SECTION 09 2900 – GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Gypsum wallboard, rated and non-rated.

B. Ceramic tile backing wallboard.

C. Abuse-resistant wallboard.

D. Exterior sheathing.

E. Gypsum board trims and accessories.

1.3 RELATED SECTIONS

A. Section 05 4000 - Cold-Formed Metal Framing: Load-bearing steel framing.

B. Section 07 8400 – Firestopping.

C. Section 07 9200 - Joint Sealants: Acoustical sealant.

D. Section 09 2216 – Non-Structural Metal Framing.

E. Section 09 2119 - Cavity Shaft-Wall Assemblies: Non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C11 and GA-505 for definitions of terms related to gypsum board assemblies not defined in this Section or in other referenced standards.

1.6 ACTION SUBMITTALS

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

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.

2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
3. For installation adhesives and sealants, including printed statement of VOC content and chemical composition of each product used.
4. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e.s, from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
5. GreenGuard Gold Certified Certificate.
6. CDPH Standard Method v1.1 testing report.

1.7 INFORMATIONAL SUBMITTALS

A. Product Certificates: Signed by manufacturers of gypsum board certifying that their products comply with specified requirements.

1.8 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Sound Transmission Characteristics: For gypsum board with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.10 SITE CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C840 and with gypsum board manufacturer's recommendations.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours prior to application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces, as required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. VOC Content: Adhesives and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Provide gypsum board materials having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. GreenGuard Gold Certified
3. Type III Environmental Product Declaration.

2.2 MANUFACTURERS

A. Gypsum Board and Related Products:
1. Gold Bond Building Products Div., National Gypsum Co.
2. United States Gypsum Co.

2.3 GYPSUM BOARD PRODUCTS

A. Acceptable Manufacturers: Provide gypsum board materials manufactured by one of the following:
1. Gold Bond Building Products Div., National Gypsum Co.
2. United States Gypsum Co.

B. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end butt joints.

C. Gypsum Wallboard: ASTM C1396/C1396M except where noted otherwise:
1. Fire-Rated Gypsum Board: ASTM C1396/C1396M; Type X . Throughout unless indicated otherwise on Drawings.
2. Gypsum Ceiling Board: ASTM C1396/C1396M; High-strength, sag-resistant type for ceiling surfaces.
3. Long Edges: Tapered.
4. Thickness: ASTM C840, 5/8-inch throughout unless indicated otherwise on Drawings.
5. Finish Levels: Level 4 throughout unless indicated as Level 5 on Drawings

D. Abuse-Resistant Fiber Board: ASTM C1629/C1629M, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.
1. Acceptable Products: Fiberock VHI (very high impact) by US Gypsum or Hi-Impact XP Wallboard by National Gypsum Co.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10.
5. Abuse Level 3

E. Exterior Gypsum Sheathing: ASTM C1177/C1177M, Georgia-Pacific, Dens-Glass Gold Exterior Sheathing, 5/8-inch- (15.8-mm-) thick water-resistant treated gypsum core board with inorganic glass mats both sides and long edges, gold color alkali resistant surface coating, for exterior applications.

2.4 CERAMIC TILE BACKING PANELS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Water-Resistant Gypsum Backing Board: ASTM C1178/C1178M.
1. Manufacturer: Georgia Pacific; DensShield Tile Backer.
2. Core: 1/2-inch Type X.
3. Mold Resistance: ASTM D3273, score of 10.
4. Locations: At Toilet wet walls and shower ceilings; maximum framing at 16-inches oc.

C. Cementitious Backer Units: Complying with ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.
1. Thickness: 5/8-inch.
2. Width: Manufacturer's standard width, but not less than 32 inches.
3. Manufacturer: Durock, Cement Board; include interior tape, reinforcing mesh, trim and bead.
4. Locations: At Shower walls.

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation: Corner beads, edge trim, and control joints complying with ASTM C1047.
1. Material: Formed metal or metal combined with paper, with metal sheet steel zinc-coated by hot-dip or electrolytic processes, or with aluminum or rolled zinc.

B. Square Corner Bead Reinforcement: One of the following or accepted equivalent:
1. Dur-A-Bead as manufactured by USG or accepted equivalent.
2. Wallboard corner bead with 1 1/4-inch flanges as manufactured Gold Bond Building Products Div., National Gypsum Co. or accepted equivalent.

C. Metal Casing Bead: One of the following or accepted equivalent:
1. No. 200A Metal Trim manufactured by USG or accepted equivalent.
2. No. 100 wall board casing manufactured by Gold Bond National Gypsum Company.

D. Control Joints: One of the following or accepted equivalent:
1. No. 093; as manufactured by USG or accepted equivalent.
2. E-Z expansion joint 0.093 zinc control joint, manufactured by Gold Bond National Gypsum Company.

2.6 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: ASTM C475 and as follows:
1. Interior Gypsum Board: Paper reinforcing tape, one grade for bedding tapes and filling depressions, and one for topping and sanding, unless otherwise indicated.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Setting-Type Joint Compounds for Gypsum Board:
   1. Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
   2. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.

D. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by the gypsum board manufacturer for this purpose.

E. For topping compound, use sandable formulation.

F. Drying-Type Joint Compounds for Interior Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
   1. Ready-Mixed Formulation: Factory-mixed product.
   2. All-purpose compound formulated for both taping and topping compounds.

G. Joint Compound for Exterior Applications:
   1. Basis-of-Design Product: G-P Gypsum; "ToughRock Setting Compound."
   2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

2.7 AUXILIARY MATERIALS

A. Spot Grout: ASTM C475, setting-type joint compound recommended for spot grouting hollow metal door frames.

B. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.
   1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Multipurpose Construction Adhesives: 70 g/L.

C. Steel Drill Screws: ASTM C1002, unless otherwise indicated.
   1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
      a. Gold Bond, Type-S, 1-inch drywall screws.
      b. U.S. Gypsum Type-S, panhead, 1-inch.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Drywall Adhesive: APA AFG-01; Liquid Nails or PL400.
   1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Gypsum Board and Panel Adhesives: 50 g/L.

E. Other Fasteners: As required and recommended by gypsum wallboard manufacturer and in accordance with the specified Standards. Space fasteners in accordance with CBC Table 47 G and 47 H.

F. Acoustical Accessories:
   1. Acoustic Insulation: See Section 07 2100.
   2. Acoustical Sealant: See Section 07 9200.

3. Rated Acoustical Sealant: See Section 07 9200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C840 and GA-216.

B. When cutting gypsum drywall is required, work from the face side. When cutting by scoring, cut through the face paper and then snap the panel back away from the cut face. Then break the back paper by snapping the gypsum board in the reverse direction or by cutting the back paper.
1. Smooth all cut ends and edges of panels where necessary to obtain a smooth joint.

C. Install wall/partition board panels to minimize the number of abutting end joints or avoid them entirely. Stagger abutting end joints not less than one framing member in alternate courses of board. At high walls, install panels horizontally with end abutting joints over studs and staggered.

D. Install control joints at locations indicated on Drawings, or if not indicated, install according to ASTM C840 in specific locations as directed by Architect.

E. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

F. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

G. Locate both edge or end joints over supports. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Avoid joints at corners of framed openings where possible.

H. Attach gypsum panels to studs so that the leading edge or end of each panel is attached to nailing members except where joints are at right angles to framing members.

I. For cut-outs in panels for pipes, fixtures, or other small openings, make holes and cut-outs by sawing or by such other method that will not fracture the core or tear the covering and with such accuracy that plates, escutcheons, trim, etc., will cover all edges.
1. Attach gypsum panels to framing provided at openings and cutouts.
2. Use of “score and knock out” method will not be permitted.

J. Where partitions intersect open roof trusses and other structural members projecting below underside of roof structure, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4-to-1/2-inch-wide joints to install sealant.

K. Apply wall board first to ceilings and then to walls, using maximum practical lengths to minimize end joints.

L. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4-inch-to-1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

M. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

N. Where gypsum wallboard is applied to metal ceiling framing or furring, attach with 1 inch Type S screws at 16 inches oc in field and with 1-1/4 inch Type S screw at 12 inches oc at edges.

O. Treat cut edges and holes in moisture resistant gypsum board with sealant.

P. Place control joints to be consistent with lines of building spaces.
1. Provide where system abuts structural elements.
2. Provide at dissimilar materials.
3. Provide where lengths in partitions exceed 30'-0".

Q. At recesses for equipment and accessories in fire rated walls, line recess with fire rated gypsum board to maintain specified fire rating of wall.

R. For partitions, apply full height sheets with long dimension parallel to framing members with abutting edges over supports. Where ceiling heights exceed 10'-0" and where required by fire resistive ratings, apply sheets with long dimension perpendicular to framing members. For ceilings, apply sheets with long dimension either perpendicular or parallel to framing members to result in fewest joints. For fire-rated assemblies, apply gypsum board in accordance with CBC Tables 720.1(2) and 720.1(3) as applicable.

3.3 INSTALLATION OF FASTENERS

A. Start screws at the center of the gypsum board sheet.

B. Do not locate fasteners less than 3/8-inch from edges or ends of sheets. Do not locate fasteners less than one-inch from edges or ends in horizontal applications.

C. Fire-Rated Partitions: Install fasteners in accordance with the more restrictive of either CBC Table 720.1(2) or the Underwriters' Laboratories assemblies as denoted on partition schedule.

D. Non-Fire-Rated Partitions: Install fasteners in accordance with GA-216 and ASTM C840.

E. Fire-Rated Ceilings: Install fasteners in accordance with CBC Table 720.1(3).

F. Non-Fire-Rated Ceilings: Install fasteners spaced not more than 12-inches on center.

G. Install screws using powered screw guns with adjustable screw-depth control head. Drive shank perpendicular to gypsum board surface. Do not hammer screws.

H. Set fastener heads slightly below surface of gypsum board, but do not break or strip paper face around fastener.

I. Stagger fasteners opposite each other on adjacent ends and edges.

J. Omit fasteners at edges where metal edge trim will be installed.

3.4 ACOUSTICAL INSTALLATION REQUIREMENTS

A. Sound-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 C919 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.

B. Install batt insulation before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Double Layer Application:
1. Joints: Stagger 24-inches between layers.
2. Sound-Rated Construction: Tape face layer.
3. Allow 3/16-inch (4.7 mm) gap at panel joints, and 3/8-inch (9.5 mm) space at floors, ceilings and inside corners.
4. Use metal drywall screws; attach 12-inches oc along panel edges and 24-inches oc along all intermediate framing. Screws must be of sufficient length to penetrate 3/4-inch (19 mm) into framing.
5. Apply 3/8-inch beads of adhesive to gypsum wall board in single vertical serpentine beads that are in between the studs. Stagger gypsum drywall so edges do not fall onto studs.
6. Using #10 x 1-1/2-inch bugle head screws, secure the gypsum drywall directly to the sound barrier panels every 8-inches oc around the panel edges and 12-inches oc on intermediate sections of the panel, missing the studs.

D. Sound-Rated Edge Condition: Stagger (i.e. shiplap) gypsum board layers at vertical intersections. Provide a 1/4-inch nominal gap around the gypsum board face layer at floor and ceiling intersections. Fill the 1/4-inch gap with acoustical sealant to form an airtight seal.

E. Penetrations:
1. Make cut-outs regular without fracturing core or tearing covering of gypsum board.
2. Minimize penetrations of insulated wall and ceiling constructions. Penetrate only where necessary and fully seal airtight at the perimeter using acoustical sealant.
3. Where ducts and piping greater than 3-inch diameter penetrate insulated wall or ceiling construction, provide a clearance of 1-inch $\pm$ 1/4-inch at the perimeter of the penetration.
4. Where conduit piping 3-inch diameter and less (including mechanical, hydraulic, plumbing, etc.) pass through insulated wall or ceiling construction, provide a clearance of 1/4-inch $\pm$ 1/8-inch between the conduit or piping and the structure, unless otherwise indicated.
5. After ductwork, conduit or piping has been installed, repair the gypsum board perimeter clearance to the specified tolerance as required. Where the clearance exceeds 3/4-inch, provide a sheet metal sleeve within the partition packed with safing insulation batts and caulk both sides airtight with an acoustical sealant. Where the perimeter clearance exceeds 3/8-inch, use a flexible backing rod to caulk against.

6. Where penetration clearance are 3/8-inch or less, caulk airtight with acoustical sealant at gypsum board.
7. Cut and fit neatly around outlets and switches. Back-to-back wall penetrations shall be at least two stud spaces apart for acoustic isolation.
8. All gypsum board penetrations (including those resulting from wiring, cables, and electrical junction boxes) are to be sealed airtight with acoustical sealant.
9. The back and sides of junction boxes in sound-rated construction must be sealed airtight with sheet caulking. Caulk perimeter face at gypsum board with acoustical sealant.
10. Recessed panel boards, equipment, boxes, etc. with penetration area greater than 25 sq. in. at sound-rated partitions are to be fully enclosed and sealed with 5/8-inch thick gypsum board or 2 psf sheet lead.
11. Seal multiple conduit penetrations airtight with expanding fire foam sealant.
12. Seal other sound-rated conditions with spray-applied (40 pcf) cementitious sealant equal to Monokote Z-146.

F. Application on Resilient Channel:
1. Use the appropriate length gypsum board attaching screws as recommended by the manufacturer. Screws shall not contact studs or framing.
2. Resilient channel only to bear load of gypsum board, unless indicated otherwise.
3. Surface-mount all fixtures and attach using molly-type fasteners. The fasteners shall not contact resilient channels or structure.
4. Adhere trim and baseboards to avoid “short-circuiting.”

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install corner beads at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed or semi-exposed. Provide edge trim type with face flange formed to receive joint compound except where other types are indicated.

D. Control Joints:
1. Ceilings: Maximum area for ceilings with perimeter relief shall be 2,500-sq. ft.; maximum area for ceilings without perimeter relief shall be 900-sq. ft. Do not exceed 50-feet between control joints in ceilings with perimeter relief; 30-feet between control joints in ceilings without perimeter relief.
2. Walls and Partitions: Maximum spacing between control joints shall not exceed 30-feet.
3. Control joint locations shall occur only where indicated on reviewed layout drawings.

E. Install L-bead where edge trims can only be installed after gypsum panels are installed.

3.6 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated.

B. Carefully inspect the Drawings and verify the desired location of metal trim. Install all metal trim in strict accordance with the approved submittal of the manufacturer's recommendations, paying particular attention to make all trim installations plumb, level and true to line with firm attachment to supporting members.

C. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

D. Apply joint tape over gypsum board joints and to trim accessories with concealed face flanges as recommended by trim accessory manufacturer and as required to prevent cracks from developing in joint compound at flange edges.
   1. Taping is not required under wainscot surfaces, except at moisture-resistant type and fire-rated type walls.

E. Fold reinforcing tape along its centerline and apply to all interior angles, following the same procedure for all joints.

F. Lightly sand and dry compound with fine sandpaper between coats to remove all irregularities.

G. Apply a second coat of compound to all joints, feathering approximately 3 inches beyond edges of the tape. Also apply a second coat to all nail recesses, leaving flush with the adjacent surface. When compound is dry, sand again.

H. Apply final skim coat, feathering out approximately 2 inches beyond the second coat. Third coat nail recesses and metal trims. Skim coat interior angles. After drying, lightly sandpaper surfaces, using caution not to excessively damage the face paper of the gypsum drywall.

I. Examine surfaces to ensure against defects. Touch up as required for uniformity. Provide smooth, un-textured sanded finish suitable to receive specified paint system.

J. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C840:
   1. Level 0: In areas of temporary construction, no taping or accessories are required.
   2. Level 1: Ceiling plenum areas and concealed areas. Provide higher level of finish as required to comply with fire-resistance ratings and acoustical ratings.
   3. Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.
   4. Level 3: Gypsum board surfaces, where textured finishes will be used.
   5. Level 4: Gypsum board surfaces, except where another finish level is specified.
   6. Level 5: . Where indicated on Drawings.

K. Interior Gypsum Board Finishing:
   1. Corners: Square.
   2. Taping (Level 1):
      a. Use taping or all-purpose compound.
      b. Butter taping compound into inside corners and joints.
      c. Center tape over joints and press down into fresh compound.
      d. Remove excess compound. Tape joints of gypsum board above suspended ceilings.
   3. First Coat (Level 2):
      a. Use taping or all-purpose drying-type compound or setting-type joint compound.
      b. Immediately after bedding tape, apply skim coat of compound over body of tape and allow to dry completely in accordance with manufacturer's instructions.

c. Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.

4. Second Coat (Level 3):
   a. Use all purpose or topping drying type joint compound.
   b. After first coat treatments is dried, apply second coat of compound over tape and trim, feathering compound 2-inches beyond edge of first coat.
5. Third Coat (Level 4):
   a. Use all purpose or topping drying type joint compound.
   b. After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 2-inches beyond edge of second coat.
   c. Allow third coat to dry. Apply additional compound, and touch-up and sand, to provide surface free of visual defects, tool marks, and ridges, ready for application of finish.
   d. Finish Texture: Smooth.

3.7 INSTALLATION OF EXTERIOR GYPSUM SHEATHING

A. Comply with GA-253 and manufacturer's written instructions.

B. Cut boards at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
   1. Install boards with a 3/8-inch (9-mm) setback where non-load-bearing construction abuts structural elements.
   2. Install boards with a 1/4-inch (6.4-mm) setback where they abut masonry or similar materials that might retain moisture, to prevent wicking.

C. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.

D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

F. 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 stud flanges, and stagger end joints of adjacent boards not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud.
   1. Space fasteners approximately 8 inches (200 mm) oc. and set back a minimum of 3/8 inch (9 mm) from edges and ends of boards.

G. Vertical Installation: Install board vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud.
   1. Space fasteners approximately 8 inches (200 mm) oc and set back a minimum of 3/8 inch (9 mm) from edges and ends of boards.

3.8 EXTERIOR SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written recommendations.

1. Apply elastomeric sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.9 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.10 PROTECTION

A. Take all means necessary to prevent spilling and splashing compound. Promptly remove any residual joint compound from adjacent surfaces.

B. Do not allow the accumulation of scrap and debris resulting from the gypsum drywall installation and finishing operations.

C. Provide final protection and maintain conditions, in a manner suitable to Installer that ensures gypsum board assemblies remain without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 2900

SECTION 09 3000 – TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Unglazed ceramic mosaic tile.

B. Glazed wall tile.

C. Stone pavers.

1.3 RELATED SECTIONS

A. Section 07 9200 - Joint Sealers: Sealing of expansion, contraction, control, and isolation joints in tile surfaces.

B. Section 09 2900 - Gypsum Board: Gypsum backing board and cementitious backing board installed as part of gypsum wallboard systems for use under tile installations.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

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

B. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required.
2. Grout of each type and for each color required.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
3. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
4. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e.s, from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
5. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
6. CDPH Standard Method v1.1 testing report.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.7 QUALITY ASSURANCE

A. Installer's Qualifications: A minimum of 3-years' experience installing ceramic tile of the types specified, and a minimum of 5 installations of a magnitude similar to or larger than the work of this Section.

B. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, and variety of tile from a single source with resources to provide products of consistent quality in appearance without delaying progress of the work.

C. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

D. Floor tile shall have a minimum dry coefficient of friction (DCOF) of 0.42 determined in accordance with ANSI A137.1 DCOF AcuTest.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.9 SITE CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide ceramic tile products with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Adhesives, sealants, and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 81 13 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Provide tile materials having the following certifications and labels:
   1. CDPH Standard Method V1.1 compliant
   2. Type III Environmental Product Declaration.
   3. Declare Label.

2.2 TILE PRODUCTS

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated. See schedule at end of Part 3.

B. Floor Tile: ASTM C1028, unglazed ceramic tile and the following:
   1. Coefficient of Friction, Dry (DCOF): 0.42 or greater per ANSI A137.1.
   2. Nominal Facial Dimensions: As indicated on Drawings.
   3. Thickness: 1/4-inch.
   4. Face: Plain with cushion edge.

C. Glazed Wall Tile: Provide flat tile complying with the following requirements:
   1. Nominal Facial Dimensions: As indicated on Drawings.
   2. Nominal Thickness: 5/16-inch.
   3. Face: Plain with cushion edge.
   4. Finish: Bright and matte series.

D. Shapes and Trim: Selected from manufacturer's standard shapes and trim units:
   1. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:
      a. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
      b. Base: Coved.
      c. Wainscot Cap: Bullnose cap.
      d. Internal Corners: Field-butted square corners, except use coved base and cap angle pieces designed to member with stretcher shapes.

E. Tile Products:
   1. Floor Tile #1 (Sink/Toilet and Locker Room Areas): DalTile, Plaza Nova Gray FG PN98, 12" x 12", 3/8" thick.
   2. Floor Tile #2 (Showers): DalTile Keystones; D200, 2" x 2".
   3. Wall Base #1 (Restroom): DalTile; Plaza Nova White Image PN94 6" x12" coved tile.
   4. Wall Tile (Restroom): DalTile; Plaza Nova White Image PN94, 6" x 24" tile
   5. Elevator Cab Floor: DalTile Portfolio PF04 Dove; 12" x 12" x 3/8" thick.
   6. Sealed Floor Paver #1: Stepstone, Inc.; Granada White 1801 (sandblasted) with Retrocrete Matte sealer.
   7. Sealed Floor Paver #2 – Stepstone, Inc. French Gray #1804 light sandblast with Retroplate matte sealer.

2.3 SETTING MATERIALS

A. Latex-Portland Cement Mortar: ANSI 118.4, composition as follows:
1. Prepackaged dry mortar mix composed of Portland cement, graded aggregate, and manufacturer's standard dry polymer additive in the form of a re-emulsifiable powder to which only water is added at the job site.

B. Water: Clean, potable.

2.4 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6, Portland cement, latex additive, and water; latex- Portland cement type; un-sanded.
1. Latex additive (water emulsion) serving as replacement for part or all of gaging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:
2. Latex Type: Manufacturer's standard.

B. Color Admixture: Cementitious type, color as selected by Architect from manufacturer's Standard and Designer Series as manufactured by Custom Building Products, or approved equal.

C. Application: Use commercial Portland cement grout combined with latex additive for grouting joints in floor tile unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Marble Thresholds (Showers): ASTM C503/C503M, with a minimum abrasion resistance of 12 per ASTM C1353/C1353M or ASTM C241/C241M and with honed finish; color to coordinate with floor tile.
1. Size: 1/2 inch high by width of jamb by full width of wall or frame opening.
2. Edges: Beveled one side as indicated on Drawings, radiused edges from bevel to vertical face.
3. Product: DalTile Thassos White M420, polished, double threshold profile.

B. Ceramic Tile Backing Panels: See Section 09 2900.

C. Metal Edge Strips: Schluter Systems:
1. Tile-to-Carpet and Top of Tile Wainscot: Schiene.
2. Tile-to-Resilient Flooring: Reno-V.
3. Tile Corners: Finec
4. Tile Cove for Inside Wall Corners and Floor/Wall Transitions: Dilex-AHK.
5. Finish: Stainless steel.

2.6 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

2.7 WATERPROOFING FOR TILE INSTALLATIONS

A. Chlorinated Polyethylene Sheet (CPE) (on Shower Floors): Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch (0.76-mm) nominal thickness.
   1. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
      a. Noble Company; Chloraloy Shower Pan Liner.

B. Chlorinated Polyethylene Sheet (CPE) (on Toilet Room Floors): ANSI A118.10; nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch (0.76-mm) nominal thickness.
   1. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
      a. Noble Company; NobleSeal TS.

C. PVC Sheet Waterproofing (on Shower Walls): ANSI A118.10; composite sheet membrane made from PVC with polyester fabric laminated to both sides.
   1. Basis-of-Design Product: Noble Company; Wall Seal.

D. Provide manufacturer's weep protector, preformed corners, curbs, drain flashings and other accessories for a complete waterproof installation.

E. Bonding Adhesive: Type recommended by sheet membrane manufacturer to suit application.

F. Seam Sealant and Perimeter Sealant: Type recommended by sheet membrane manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

B. Level and smooth subfloor, incorporating slopes as required on Drawings. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.

C. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.

D. Do not start work until grounds, anchors, recessed frames, plugs, hangers, bucks, electrical and mechanical work in or behind tile have been installed. Do not proceed until adjoining work is protected.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile

units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 SHEET WATERPROOFING INSTALLATION

A. Clean and prepare substrate as if thin setting tile without sheet. Bond sheet to concrete using manufacturer's bonding agent or latex modified thin set mortar following manufacturer's written instructions.

B. Unroll sheet into bonding agent before it begins to form 'skin'. Embed sheet into bond coat flattening all trowel ridges. Work from center of sheet to edges. Pull roller edge-to-edge in overlapping passes. Start at end of first sheet installed, progressing to area installed last. Use rubber hand roller or flat side of trowel with heavy pressure for vertical or small areas.
   1. Complete coverage of substrate and full penetration of bond coat into the fabric is required. Prior to curing, lift sheet and inspect for full contact. If rows or ridges of bonding agent are seen, membrane has not been properly embedded and additional rolling or bonding agent is necessary. 100% coverage is required.

C. Seam sheets together using manufacturer's seaming agent.
   1. Overlap sheets 2-inches minimum.
   2. Apply one 3/16-inch bead of manufacturer's sealant 3/4-inch from edge of sheet being overlapped.
   3. Overlap sheets and flatten with roller or by pressing with flat edge of trowel or had roller.
   4. Beads must be continuous without skips or voids. Seam may be water-tested after curing.

D. Flashings, Upturns and Corners:
   1. Turn sheet up vertical surface 1- to 2-inches higher than flood plain. Shower waterproofing membrane must be flashed 3-inches higher than the finished dam, when installed behind backer board.
   2. Corners: Lap corners. Bond overlap and seal inside corner with sealant. Use preformed units where recommended by sheet membrane manufacturer.
   3. Bond preformed corners to sheet and substrate with sealant. Install outside corners prior to sheet membrane.

E. Drains: Install drains with clamping ring to secure membrane to drain body. Inspect floor to ensure that proper slope has been provided to eliminate ponding of water on top of membrane.
   1. Remove strainer and clamping ring.
   2. Place sheet membrane over drain body pressing to feel outline of drain opening. Cut drain opening.
   3. Carefully punch or notch openings for clamping ring bolts through sheet.
   4. Apply bead of sealant on the drain body under the membrane.
   5. Install sheet as specified.
   6. Install clamping ring and firmly tighten bolts.
   7. Install strainer and adjust to proper height for tile.

F. Flood Testing: Flood test waterproofing installation to ensure watertightness. Make any required repairs to ensure waterproofing is watertight prior to installation of tile.

3.4 INSTALLATION, GENERAL

A. TCNA Installation Guidelines: TCNA "Handbook for Ceramic Tile Installation"; comply with TCNA installation methods indicated.

B. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

D. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.

E. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.

H. Locate joints in tile surfaces directly above joints in concrete substrates.

3.5 CLEANING

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

B. Remove latex-Portland cement grout residue from tile as soon as possible.

C. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

E. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.6 PROTECTION

A. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensure that tile is without damage or deterioration at time of Substantial Completion.

C. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

D. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

3.7 INSTALLATION SCHEDULE

A. General: Install tile according to most current edition of the TCNA Handbook using method numbers as indicated below.

B. Floor Tile over Concrete Floor: TCNA Handbook, No. F113.

C. Floor Tile Thin-Set over Waterproof Membrane: TCNA Handbook, No. F122.

D. Thin-set over Concrete Slab with Epoxy Grout: TCNA Handbook, No. F115.

E. Wall Tile over Wood or Metal Studs and Gypsum Wallboard: TCNA Handbook, No. W243.

F. Shower Receptor: TCNA Handbook, No. B415.

G. Thresholds: TCNA Handbook, No. TR611.

H. Expansion Joints: TCNA Handbook, No. EJ171.
1. Exterior: Provide expansion joints at 12- to 16-feet on center in both directions, over cold joints and saw-cut control joints, and where tile abuts restraining surfaces. Joint width shall be minimum 3/8-inch wide for joints spaced 12-feet on center and 1/2-inch wide for joints spaced 16-feet on center.
2. Interior: Provide expansion joints at 24- to 36-feet on center in both directions, over cold joints and saw-cut control joints, and where tile abuts restraining surfaces. Joint spacing for tile exposed to direct sunlight or moisture shall be 12-to 16-feet on center. Joint width for paver tile shall be minimum 1/4-inch wide; ceramic mosaic tile and glazed wall tile shall be minimum 1/8-inch.
3. Sealant Materials: As specified in Section 07 9200.

END OF SECTION 09 3000

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SECTION 09 5123 – ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Acoustical tile ceilings.

B. Suspended metal grid ceiling system and perimeter trim.

1.3 RELATED SECTIONS

A. Section 09 2900 – Gypsum Board: Suspended gypsum board ceilings.

B. Division 21: Sprinkler heads in acoustical ceilings.

C. Division 23: Grilles, registers, and diffusers in acoustical ceilings.

D. Division 26: Lighting fixtures in acoustical ceilings.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including the following:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Ceiling suspension members.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members.
   2. Method of attaching hangers to building structure.
   3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Shop Drawings: Submit reflected ceiling plans on which the following items are shown and coordinated with each other for the fabrication and installation of the Work, based on input from installers of the items involved for Architect's action.
   1. Layout of suspension systems, location of hangers, seismic braces and trapezes.
   2. Hanger spacing and fastening details.
   3. Trapeze details.
   4. Splicing method for main and cross runners.
   5. Method of attaching hangers to building structure.

6. Support at ceiling fixtures and air diffusers.
7. Change in level details.
8. Locations and dimensions of access panels, light fixtures, supply and exhaust grilles and diffusers, sprinkler heads, speakers, and detection devices.
9. Seismic control details.
10. Develop and coordinate location of all Work which is to be located in ceiling with the Sections involved per Section 013300 prior to making shop drawing submittal.

D. Samples for Verification: Submit samples of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work.
1. Furnish sufficient samples to establish full range of colors and textures for materials exposed in the finished Work. Label samples to indicate product and location in the Work. Samples will be reviewed for appearance only. Compliance with other requirements is the responsibility of the Contractor.
2. Ceiling Tiles: Samples of each acoustical tile type, pattern, and color; 12” x 24” minimum.
3. Set of 12-inch-long samples of suspension system members.

E. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. Show values which demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004.
4. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
5. Indicate methods to be used for ensuring a reduction of indoor air quality problems in order to help sustain the comfort and well-being of construction workers and building occupants.
6. For sealants, including printed statement of VOC content.
7. Environmental Product Declaration (EPD): Manufacturer’s Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e., from cradle to cradle) that is verified by an ISO/IEC 17065 accredited certification body.
8. CDPH Standard Method v1.1 testing report

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical tile ceiling.

B. Calculations: Submit for Architect's information. Submit calculations prepared by a qualified Structural Engineer, registered in State of California, for details other than as shown or specified.

C. Research/Evaluation Reports: For each acoustical tile ceiling and components and anchor and fastener type.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.
   1. Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
   2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
   3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

1.9 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
   1. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E1264 for Class A materials as determined by testing identical products per ASTM E84:
      a. Smoke-Developed Index: 450 or less.

C. Seismic Standard: Provide acoustical tile ceilings designed and installed to withstand the effects of earthquake motions according to requirements of authorities having jurisdiction.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.11 SITE CONDITIONS

A. Install acoustical units after interior wet work is dry.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. VOC Content: Sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Provide ceiling panels having the following certifications and labels:
   1. CDPH Standard Method V1.1 compliant
   2. Type III Environmental Product Declaration.

2.2 MATERIALS

A. Acoustic Tiles (AC1): ASTM E1264, conforming to the following:
   1. Basis of Design: Armstrong Ultima High HRC.
   2. Item No.: 1942
   3. Type: IV, Form: 2, Pattern: E.
   4. Size: 24 x 24 inches.
   5. Thickness: . 7/8-inches
   6. Composition: Mineral Fiber
   7. Light Reflectance: . 0.87
   8. NRC Range: 0.80
   9. CAC Range: 35
   10. Edge: Beveled Tegular.
   11. Surface Color: White.
   12. Surface Texture: Non-directional fissured.
   13. Surface Finish: Factory-applied latex paint.
   14. Grid: 9/16-inch.

B. Acoustic Tiles (AC3): ASTM E1264, conforming to the following:
   1. Basis of Design: Armstrong Ultima.
   2. Item Number: 1912HRC.
   3. Type: IV, Form: 2, Pattern: E.
   4. Size: 24 x 24 inches.
   5. Thickness: 3/4 inches.
   6. Composition: Mineral Fiber
   7. Light Reflectance: 0.90.
   8. NRC Range: 0.75
   9. CAC Range: 35
   10. Edge: Beveled Tegular.
   11. Surface Color: White.
   12. Surface Texture: Non-directional fissured.
   13. Surface Finish: Factory-applied latex paint.
   14. Grid: 9/16-inch.

2.3 SUSPENSION SYSTEM COMPONENTS

A. Suspension System: ASTM C635/C635M, Armstrong World Industries, Inc., Silhouette XL Bolt Slot Tee with 1/8” reveal.
   1. Exposed Grid Surface Width: 9/16.
   2. Finish: White, low gloss , hot-dipped galvanized coating, color to match ceiling tiles exactly.
   3. Main Runners: 9/16-inch flange, 1-11/16-inch high, double web construction.
   4. Cross Runners: 9/16-inch flange, double web construction.
   5. Wall Angle, Reveals, and Miscellaneous Trim: Roll-formed from electro-galvanized steel strip to profiles indicated.

B. Attachment Devices: Size for 5 times design load indicated in ASTM C635/C635M, Table 1, Direct Hung, double web, Intermediate-Duty System, unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A641/A641M, Class 1 zinc coating, soft temper.
   1. Gage: Provide wire sized so that stress at 3 times hanger design load (ASTM C635/C635M, Table 1, Direct-Hung) will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12-gage).

D. Support Hangers and Channels: Mild steel, zinc coated, or protected with rust-inhibitive paint, size and shape to suit application and seismic requirements.
   1. Hanger Wires: Connection device capable of carrying not less than 100-pounds.
   2. Bracing Wires: Connection device capable of carrying not less than 200-pounds or the actual design load, whichever is greater, with a safety factor of 2 without yielding.

E. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
   2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in-place.

H. Hold-Down Clips: Armstrong World Industries, Inc., BERC2; where indicated, provide manufacturer's standard hold-down clips spaced 24-inches (610 mm) oc on all cross tees.

I. Buildings 1, 2, : Install in accordance with CBC and current edition of DSA IR 25.2
   1. For Hanger and Lateral Bracing Wires: Install expansion bolts or ceiling clips as required.
   2. Hanger Wires:
      a. Insert hanger wires around expansion bolts or through ceiling clips in accordance with Code and secure as specified for hanger wires following in this Article. Load test hanger wires as specified in Article titled “Field Quality Control” in this Section.
      b. Plumb hanger wires.
      c. Add counterbrace wires when hanger wires are more than 1 in 6 out of plumb.
      d. Provide additional metal framing and hanger wires to clear furred-area interferences with suspension system. Do not penetrate ductwork with hanger wires.
      e. Ceiling wires and unbraced ducts, pipes and similar type items shall be separated by at least 6 inches.
      f. Provide hanger wires at intersection of grid members.
      g. Provide hanger wire supports for all recessed light fixtures and mechanical items as required for total support independent of acoustical ceiling systems.
      h. Use of scrap or short-cut members is not permitted.
      i. Connect grid members with positive interlocking method as standard with reviewed manufacturer.

j. Secure ends of suspension system members at 2 adjacent walls as indicated and leave floating at other 2 adjacent walls.
k. Interconnect carriers over 12 inches not interconnected to walls near free end with 16 gauge tie wire or a metal strut securely attached to prevent spreading.
l. Level grid assembly in each area after installation of mechanical and electrical equipment within 1/8inch in 12 inches or conforming to slope as appropriate to area of installation.

2.4 ACOUSTICAL SEALANT

A. Acceptable Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.
2. Acoustical Sealant for Concealed Joints:
a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
b. Pecora Corporation; BA-98.
c. Tremco, Inc.; Tremco Acoustical Sealant.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION, GENERAL

A. General: Install linear metal ceilings to comply with CBC seismic requirements, following manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
1. Standard for Ceiling Suspension System Installations - ASTM C636

2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E 580
3. Additionally, at Buildings 1, 2, follow requirements in current edition of DSA IR 25.2

B. Arrange acoustical units and orient directionally patterned units (if any) in manner shown by reflected ceiling plans.

3.4 INSTALLATION, SUSPENSION SYSTEM

A. Suspend ceiling hangers from building's structural members and as follows:
1. Install attachments plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Install hangers plumb and free from contact with insulation or other objects within plenum that are not part of supporting structure or of ceiling suspension system.
3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
5. Secure flat, angle, and channel to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Secure wire hangers to ceiling suspension members and to supports above with a minimum of four tight turns. Connect hangers directly to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) oc along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.

B. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

C. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

D. Ceiling grid members shall be attached to not more than 2 adjacent walls in accordance with ASCE 7, Section 13.5.6.2(b). Ceiling grid members shall be at least 3/8-inch and not more than 3/4-inch free of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners shall be free, and a minimum of 3/4-inch clear of wall.

E. The width of the perimeter supporting closure angle shall be not less than 7/8-inch.

F. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

G. Install suspension system carriers so they are square and securely interlocked with one another. Remove and replace dented, bent, kinked or otherwise damaged runners.

H. Provide expansion joints in the ceiling at intersections of corridors and at junctions of corridors with lobbies or other areas.

I. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges and ends of linear metal pans.
   1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) oc and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

J. Provide lateral-force bracing assemblies consisting of a compression strut and four 12-gauge splayed bracing wires oriented 90-degrees from each other at the following spaces:
   1. Place sets of bracing wires spaced not more than 12-feet by 12-feet on center.
   2. Provide bracing wires at locations not more than 1/2 the specified spacing from each perimeter wall and at the edge of vertical ceiling offsets.
   3. The slope of these wires shall not exceed 45-degrees from the plane of the ceiling and shall be taut without causing the ceiling to lift. Splices in bracing wires are not permitted.
   4. Compression struts shall not be more than 1 (horizontal) in 6 (vertical) out of plumb.

K. Provide seismic separation joints for ceiling areas greater than 2,500-square feet.

L. Testing of Concrete Anchors:
   1. When drilled-in concrete anchors or shot-in anchors are used in reinforced concrete for hanger wires, 1 out of 10 shall be field tested for 200-pounds of tension.
   2. When drilled-in concrete anchors are used for bracing wires, 1 out of 2 shall be field tested for 440-pounds in tension. Shot-in anchors in concrete are not permitted for bracing wires.

M. Support of Light Fixtures and Air Terminals: Comply with ASTM C635/C635M.
   1. Ceiling suspension systems that support light fixtures, air-ventilation grilles or partitions shall have a classification of heavy-duty.
   2. Recessed or drop-in light fixtures and grilles shall be supported directly from the fixture housing to the structure above with a minimum of two 12-gauge wires located at diagonally opposite corners. Fixture support wires may be slightly loose to allow the fixture to seat in the grid system.
   3. Fixture shall not be supported from main runners or cross runners if the weight of the fixtures causes the total dead load to exceed the deflection capability of the ceiling suspension system.

N. Perimeter Trim:
   1. Provide in longest lengths available and combinations of lengths to minimize number of joints required.
   2. Do not use pieces shorter than 48-inches.
   3. Miter joints at corners.
   4. Install to neatly close with adjoining vertical surfaces.

3.5 INSTALLATION OF ACOUSTICAL SEALANT

A. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

B. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

C. Screw attach moldings to substrate at intervals not more than 16-inches (400 mm) oc and not more than 3-inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12-feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.

D. Do not use exposed fasteners, including pop rivets, on moldings and trim.

3.6 INSTALLATION, CEILING TILES

A. Install units after above-ceiling work is complete.

B. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

C. Install acoustical tile in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so that every tile-to-tile joint is closed by double lap of material.

D. Install acoustical units level, in uniform plane, and free from twist, warp and dents.

E. Arrange directionally patterned acoustical tiles as follows:
1. As indicated on reflected ceiling plans.

F. Fit adjoining tile to form flush, tight joints and to fit irregular grid and perimeter edge trim. Scribe and cut for accurate fit at borders and around penetrating work.

G. Trim cut tiles at wall junctures so that tegular edges fit properly into grid and edge moldings. Trim edges of tegular tiles to match edges on untrimmed sides as indicated on Drawings. Paint cut edges to match ceiling tile face.

H. Install hold-down clips to retain panels tight to grid system within 20-feet of exterior doors.

I. Conform to State safety orders and applicable codes, including the seismic bracing requirements of CBC and DSA.
1. Maximum Spacing: On center spacing in conformance with CBC and DSA requirements.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections at Buildings 1, 2.

B. Acoustical Ceiling Connection Devices: Test devices for capability to support the following loads:
1. Hanger Wires: 100 pounds in accordance with requirements of CBC and DSA IR 25.2.

2. Lateral Force Bracing Wires: 200 pounds or actual design load whichever is greater, with safety factor of 2, in accordance with CBC and DSA IR 25.2.

3.8 ADJUSTING

A. Adjust hangers as required. Addition of kinks or bends in hanger are not acceptable; take up in ties only.

B. When complete, grid members of each assembly shall be mutually parallel/square, accurately aligned, with joints neatly formed and closely fitted and aligned flush; each assembly shall be securely anchored and braced to structure to prevent movement.

3.9 CLEANING

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.

B. Exposed surfaces of grids shall be clean and free from scratches, dents, tool marks, stains, discoloration, fingerprints, and other defects and damage.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

D. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 09 5123

SECTION 09 5423 – LINEAR METAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Strip, decorative, aluminum linear metal pans and suspension systems for ceilings.

1.3 RELATED SECTIONS

A. Section 07 4113 – Metal Roof Panels: Metal soffit panels installed at exterior and interior locations.

B. Section 09 5123 - Acoustical Tile Ceilings: Ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.

C. Divisions 21, 23, and 26 Sections for sprinklers, air-distribution components, and light fixtures.

D. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.4 LEED REQUIREMENTS

A. Refer to Section 018113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

1.6 COORDINATION

A. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 ACTION SUBMITTALS

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

B. Performance Data: For installed products indicated to comply with design loads and other criteria, include structural analysis and other analytical data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
1. Linear pattern.
2. Joint pattern.

3. Ceiling suspension members.
4. Method of attaching hangers to building structure.
   a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
5. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
6. Ceiling perimeter and penetrations through ceiling; trim and moldings.
7. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48).

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
1. Linear Metal Pan: Set of 12-inch- (300-mm-) long Samples of each type and color and a 12-inch- (300-mm-) long spliced section.
2. Suspension System Members: 12-inch- (300-mm-) long Sample of each type.
3. Exposed Molding and Trim: Set of 12-inch- (300-mm-) long Samples of each type, finish, and color.
4. Filler Strips: Set of 12-inch- (300-mm-) long Samples of each type, finish, and color.
5. Sound Absorber: 12 inches (300 mm) long.
6. End Cap: Full size.

E. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Product Data for Credit EA 1: Show values which demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004.
2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. Product Data for Credit MR 5: For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
4. Product Data for Credit EQ 3.1 and Credit EQ 3.2: Indicate methods to be used for ensuring a reduction of indoor air quality problems in order to help sustain the comfort and well-being of construction workers and building occupants.
5. Product Data for Credit EQ 4.1: For sealants, including printed statement of VOC content.

F. CALGreen Submittals: Provide product data for the following:
1. For CALGreen 5.504.4.1 – Finish Material Pollutant Control; Adhesives, Sealants, and Caulks: For adhesives, sealants, and caulks, including printed statement of VOC content.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each linear metal ceiling.

C. Research/Evaluation Reports: For linear metal ceiling and components and anchor type.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.10 MAINTENANCE MATERIAL SUBMITTALS

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. Linear Metal Ceiling Components: Quantity of each pan, carrier, accessory, and exposed molding and trim equal to 2.0 percent of quantity installed.

1.11 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory with the experience and capability to conduct the testing indicated, as documented according to ASTM E48. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations: Obtain each set of linear metal pans and suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.

C. Fire-Test-Response Characteristics: Provide linear metal ceilings with surface-burning characteristics complying with ASTM E1264 for Class A materials, as determined by testing identical products per ASTM E84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver linear metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

1.13 SITE CONDITIONS

A. Environmental Limitations: Do not install linear metal ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Provide linear metal ceilings designed and installed to withstand the effects of earthquake motions according to the following:
1. 2013 CBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."

B. Install linear metal panels in accordance with CBC and current edition of DSA IR 25.2

2.2 LINEAR METAL CEILING PANS

A. Basis-of-Design Product: The design for the linear metal ceiling is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Basis-of-Design: Hunter Douglas Linear Plank Metal Ceiling System, Type 300C.
   2. ALPRO, Division of Gordon, Inc.
   3. Or approved equal.

B. Acoustical Metal Pan Standard: Provide manufacturer's standard linear metal pans of configuration indicated that comply with ASTM E1264 classifications as designated by types, acoustical ratings, and light reflectances, unless otherwise indicated.
   1. Classification: Type XIII, aluminum strips with mineral- or glass-fiber-base backing;
      a. Exterior: . Form 2, non-perforated
      b. Interior: . Form 1, perforated
   2. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E795.

C. Sheet Metal Characteristics: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.
   1. Aluminum Sheet: Roll-formed aluminum sheet, complying with ASTM B209; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

D. Panel Profile Type: Roll formed .028” thick aluminum; 11.811” (300 mm) wide, fabricated to provide a beveled edge joint between panels when installed.
   1. Length: 12’-0”.
   2. Color: 1015P Arctic White
      a. Panel #1: Non-perforated, with suspension carrier rail and panel for exterior applications.
      b. Panel #2:
         1) Perforation Pattern: #160, 23 percent open area.
         2) Perforation Diameter: 0.060-inch

E. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated to snap on and be securely retained on carriers without separate fasteners, and finished to comply with requirements indicated.

F. Pan Splices: Construction same as pans, in lengths 8 to 12 inches (200 to 300 mm); with manufacturer's standard finish.

G. End Caps: Metal matching pans; fabricated to fit and conceal exposed ends of pans.

H. Filler Strips: Manufacturer's standard material; fabricated to uninterruptedly close voids between pans.

I. Moldings and Trim: Provide manufacturer's standard moldings and trim for exposed members, and as indicated or required, for edges and penetrations of ceiling, around fixtures, at changes in ceiling height, and for other conditions; of same metal and finish as linear metal ceiling pans.

2.3 LINEAR METAL CEILING SUSPENSION SYSTEMS

A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM C635/C635M requirements.

B. Suspension Systems: Provide systems complete with carriers, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.

C. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.
1. Post-installed Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
a. Type: Post-installed expansion anchors.
b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).

D. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:
1. Zinc-Coated Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at 3 times the hanger design load (ASTM C635/C635M, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Linear Metal Ceiling Carriers: Factory finished with matte-black baked finish.
1. Formed, inverted V-shaped, 0.95 mm (0.040”) thick roll-formed aluminum, by 62 mm (2.45”) high carrier sections. Carrier cross sections receiving ceiling panels pre-punched with prongs for snap attachment and support of panel side edges.
2. Flexible Radial Carriers: Manufacturer's standard radial carriers.

G. Linear Metal Ceiling Carrier Splices: Same metal, profile, and finish as indicated for carriers.

H. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers at regular intervals and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated; and factory finished with matte-black baked finish.

I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

J. Buildings 1, 2, 3, 6: Install in accordance with CBC and current edition of DSA IR 25.2
1. For Hanger and Lateral Bracing Wires: Install expansion bolts or ceiling clips as required.
2. Hanger Wires:
a. Insert hanger wires around expansion bolts or through ceiling clips in accordance with Code and secure as specified for hanger wires following in

this Article. Load test hanger wires as specified in Article titled “Field Quality Control” in this Section.

b. Plumb hanger wires.
c. Add counterbrace wires when hanger wires are more than 1 in 6 out of plumb.
d. Provide additional metal framing and hanger wires to clear furred-area interferences with suspension system. Do not penetrate ductwork with hanger wires.
e. Ceiling wires and unbraced ducts, pipes and similar type items shall be separated by at least 6 inches.
f. Provide hanger wires at intersection of grid members.
g. Provide hanger wire supports for all recessed light fixtures and mechanical items as required for total support independent of acoustical ceiling systems.
h. Use of scrap or short-cut members is not permitted.
i. Connect grid members with positive interlocking method as standard with reviewed manufacturer.
j. Secure ends of suspension system members at 2 adjacent walls as indicated and leave floating at other 2 adjacent walls.
k. Interconnect carriers over 12 inches not interconnected to walls near free end with 16 gauge tie wire or a metal strut securely attached to prevent spreading.
l. Level grid assembly in each area after installation of mechanical and electrical equipment within 1/8inch in 12 inches or conforming to slope as appropriate to area of installation.

2.4 LINEAR METAL CEILING ACCESSORY MATERIALS

A. Edge Moldings and Trim: Provide exposed members as indicated or required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of penetrations through ceiling, to conceal ends of pans and carriers, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching linear metal pans or extruded plastic, unless otherwise indicated.

B. Linear Metal Ceiling Acoustic Material – interior only: Non-woven black fabric with 1” thick glass fiber, 1-1/2 pcf density, polywrapped.
   1. NRC Rating: 0.95.

C. Linear Metal Ceiling Air Distribution Devices: Provide distribution devices that are independently suspended, relocatable, adjustable from below finished ceiling, and capable of being concealed behind (invisible to view) and fully integrated with ceiling system so as to allow no interruption of ceiling components.

D. Linear Metal Ceiling Lighting Fixtures: Provide fixtures capable of being fully integrated with ceiling system and requiring no interruption of ceiling components, that are independently suspended, and as selected to conform to lighting criteria specified in Division 26.

E. Linear Metal Ceiling Access Panels: For access at locations indicated, provide door hinge assembly, retainer clip, and retainer bar, assembled with ceiling panels and carrier sections into access doors of required size, permitting upward or downward opening.

2.5 LINEAR METAL CEILING FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 LINEAR METAL CEILING ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Color-Coated Finish: Manufacturer's standard powder-coat baked paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.
1. Finish: Decorated Wood-Look Powder Coat, color to be selected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear metal ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of linear metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans.

B. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

C. Survey substrate for wall attachment to assure squareness and proper elevation for wall panel installation.

3.3 INSTALLATION, GENERAL

A. General: Install linear metal ceilings to comply with CBC seismic requirements, following manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
1. Standard for Ceiling Suspension System Installations - ASTM C636
2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E580
3. Additionally, at Buildings 1, 2, 3, & 6 follow requirements in current edition of DSA IR 25.2

B. Suspend ceiling hangers from building's structural members and as follows:
1. Install attachments plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Install hangers plumb and free from contact with insulation or other objects within plenum that are not part of supporting structure or of ceiling suspension system.
3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
5. Secure flat, angle, and channel to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Secure wire hangers to ceiling suspension members and to supports above with a minimum of four tight turns. Connect hangers directly to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) oc along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

D. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

E. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers but without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

F. Install suspension system carriers so they are aligned and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

G. Provide expansion joints in the ceiling at intersections of corridors and at junctions of corridors with lobbies or other areas.

H. Install edge moldings and trim of type indicated at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal pans.
   1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) oc and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

I. Cut linear metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

J. Install linear metal pans in coordination with suspension system and exposed moldings and trim.
   1. Align joints in adjacent courses to form uniform, straight joints parallel to long axis of the room, unless otherwise indicated.
   2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
   3. Install pans with butt joints using internal pan splices and in the following joint configuration:
      a. Aligned.
   4. Where metal pan ends are visible, install end caps unless trim is indicated.
   5. Install sound-absorbent pads at right angle to perforated metal pans so pads do not hang unsupported.

K. Provide lateral-force bracing assemblies consisting of a compression strut and four 12-gauge splayed bracing wires oriented 90-degrees from each other at the following spaces:
   1. Place sets of bracing wires spaced not more than 12-feet by 12-feet on center.
   2. Provide bracing wires at locations not more than 1/2 the specified spacing from each perimeter wall and at the edge of vertical ceiling offsets.
   3. The slope of these wires shall not exceed 45-degrees from the plane of the ceiling and shall be taut without causing the ceiling to lift. Splices in bracing wires are not permitted.
   4. Compression struts shall not be more than 1 (horizontal) in 6 (vertical) out of plumb.

L. Provide seismic separation joints for ceiling areas greater than 2,500-square feet.

M. Testing of Concrete Anchors:
   1. When drilled-in concrete anchors or shot-in anchors are used in reinforced concrete for hanger wires, 1 out of 10 shall be field tested for 200-pounds of tension.
   2. When drilled-in concrete anchors are used for bracing wires, 1 out of 2 shall be field tested for 440-pounds in tension. Shot-in anchors in concrete are not permitted for bracing wires.

N. Support of Light Fixtures and Air Terminals: Comply with ASTM C635/C635M.
   1. Ceiling suspension systems that support light fixtures, air-ventilation grilles or partitions shall have a classification of heavy-duty.
   2. Recessed or drop-in light fixtures and grilles shall be supported directly from the fixture housing to the structure above with a minimum of two 12-gauge wires located at diagonally opposite corners. Fixture support wires may be slightly loose to allow the fixture to seat in the grid system.
   3. Fixture shall not be supported from main runners or cross runners if the weight of the fixtures causes the total dead load to exceed the deflection capability of the ceiling suspension system.

O. Perimeter Trim:
   1. Provide in longest lengths available and combinations of lengths to minimize number of joints required.
   2. Do not use pieces shorter than 48-inches.
   3. Miter joints at corners.
   4. Install to neatly close with adjoining vertical surfaces.

3.4 ADJUSTING

A. Adjust hangers as required. Addition of kinks or bends in hanger are not acceptable; take up in ties only.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections at Buildings 1, 2, 3, & 6.

B. Acoustical Ceiling Connection Devices: Test devices for capability to support the following loads:
   1. Hanger Wires: 100 pounds in accordance with requirements of CBC and DSA IR 25.2.
   2. Lateral Force Bracing Wires: 200 pounds or actual design load whichever is greater, with safety factor of 2, in accordance with CBC and DSA IR 25.2.

3.6 CLEANING

A. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 09 5423

SECTION 09 6123 – CONCRETE VAPOR EMISSION TREATMENT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Vapor emission treatment systems for on-grade and above-grade horizontal concrete surfaces receiving resilient flooring.

1.3 RELATED SECTIONS

A. Section 09 6500 - Resilient Flooring: Provision of resilient flooring.

B. Section 09 9729 – Concrete Floor Sealer: Sealer/hardener applied to concrete floor surfaces indicated to remain exposed.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data completely describing products.

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For installation coatings, including printed statement of VOC content and chemical composition of each product used.
3. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
4. CDPH Standard Method v1.1 testing report.
5. SCAQMD Rule 1113 compliant VOC testing compliance statement.

1.6 INFORMATIONAL SUBMITTALS

A. Quality Control Submittals.

B. Certificates: Submit applicator's certificate from manufacturer verifying acceptance of applicator.

1.7 CLOSEOUT SUBMITTALS

A. Warranty: Sample of special warranty.

1.8 QUALITY ASSURANCE

A. Applicator: Certified by the manufacturer of special coating system and shall provide proof of certification and shall have valid California C-15, C-61 or C-33 contractor's license.

B. Manufacturer: Minimum of five (5) years producing specified make, model number, product name and no formulation change.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Products shall meet current local, State and Federal environmental laws.

B. Provide adequate ventilation during application within an enclosed space.

C. Disposal of containers and materials and associated labor costs shall be the responsibility of the applicator.

D. Vapor emission treatments shall be installed in building climates that are representative of the finished building atmosphere. Minimum temperature for vapor emission testing, compliance product application and flooring material installation shall not fall below 65 degrees Fahrenheit.

1.10 SEQUENCING AND SCHEDULING

A. Time considerations for preparation work for vapor emission treatments are contingent upon conditions encountered. A minimum of 3 weeks should be considered for extensive work on surfaces with a high vapor emission condition.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to cover all costs of treatment system products, process controls, replacement of finished flooring and adhesive and associated labor to reinstall finished flooring materials. Warranty does not include normal weathering.
   1. Warranty Period: 15 years from date of Substantial Completion.

B. Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 018113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Coatings: Meet the following:
      a. EPA Method 24 testing of less than 65 g/liter, by independent laboratory testing.
      b. Contains no formaldehyde, formaldehyde precursors and zero-carcinogens

c. Contains zero hazardous air pollutants (HAP's)

B. Provide concrete floor sealer having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. SCAQMD Rule 1113 compliant.
3. Declare Label.

2.2 MANUFACTURERS

A. Basis-of-Design Product: The design for the vapor emission treatment system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: Floor Seal Technology, Inc., "FST Fiberseal Systems", or equal.

2.3 MATERIALS

A. General: Vapor emission treatment system shall consist of liquid penetrant of potassium silicate compound chemically formulated of vapor emission reduction and mineral immobilization. Other liquid penetrants may be modified, silicate epoxy-based chemically formulated specifically for vapor emission reduction.

B. Surface coating materials for low emission suppression action may be modified epoxy silicate chemically formulated specifically for vapor emission suppression.

C. Membrane materials shall be composed of treated fibermat and acrylic copolymer resins chemically formulated specifically for vapor emission dispersion and control.

D. System 1:
1. Application: Above-grade slabs with vapor emission up to 6.0 pounds and pH up to 12.5.
2. Provide low emission penetrating coating applied to above grade slab surfaces with moderate vapor emission caused by residual water-of-convenience and interstitial condensation of moisture from building atmosphere.
3. Product: Floor Seal Technology, Inc.'s "MES-82", or equal.

E. System 2:
1. Application: On-grade slabs with vapor emission up to 7.0 pounds and pH up to 12.5.
2. Provide low emission penetrating coating applied to on-grade slab surfaces with moderate vapor emission caused by normal slab permeability which does not display efflorescence effects from mineral migration to the surface.
3. Product: Floor Seal Technology, Inc.'s "MES-100", or equal.

F. System 3:
1. Application: On-grade and above-grade slabs with vapor emission up to 9.0 pounds and pH up to 12.5.
2. Provide membrane dispersion system of physical fiber membrane coating achieving a mechanical bond to all slab elevations. Designed to wick high vapor emission laterally while regulating the degree of vapor permissible to the bonded layer. Condensed vapor is recycled as liquid back in to the slab eliminating pooling.
3. Product: Floor Seal Technology, Inc.'s "Fiberseal", or equal.

G. System 4:
1. Application: On-grade slabs with vapor emission up to 14.0 pounds and pH up to 12.5.

2. Provide low emission penetrating coating specified in System 2 followed by membrane dispersion system specified in System 3 designed to suppress, then scatter vapor within system matrix.
3. Product: Floor Seal Technology, Inc.'s "MES-100 + Fiberseal", or equal.

H. System 5:
1. Application: On-grade slabs with vapor emission up to 14.0 pounds and pH up to 14.0.
2. Provide liquid penetrant designed for stabilizing high alkalinity moisture that causes efflorescence. Liquid penetrant shall react with calcium hydroxide creating a crystallization that will immobilize mineral migration to the surface. Liquid penetrant shall also reduce vapor emission from critically saturated states to a vapor phase that is then controlled by subsequent application of membrane dispersion specified above.
3. Product: Floor Seal Technology, Inc.'s "ASP-7", or equal.

I. System 6:
1. Application: On-grade slabs with vapor emission up to 19.0 pounds and pH up to 14.0.
2. Provide liquid penetrant specified in system 5 followed by System 4 treatment application.
3. Product: Floor Seal Technology, Inc.'s "ASP-7 + MES-100 + Fiberseal", or equal.

J. Urethane Based Caulking Compound: As recommended by vapor emission treatment system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The General Contractor shall be responsible for acceptability of moisture emission of concrete.

3.2 SUBSTRATE TESTING

A. Before installing resilient flooring, the concrete slab to receive resilient flooring shall be tested for moisture emission. The level of moisture vapor emission shall be determined by use of an anhydrous calcium chloride crystal test, administered by a qualified and competent laboratory of licensed contractor with verifiable experience.

B. Results of tests shall be expressed in pounds of emission within 1,000 square feet during 24 hours.

C. Calcium chloride test kits shall be prepackaged and of commercial consistency. Factory pre-weighed measurements are not acceptable.

D. The test shall be conducted around the perimeter of each room, at columns and where moisture may be evident. A diagram of the areas showing the locations and results of each calcium chloride test shall be submitted to the Architect.

E. At each area where the moisture emission exceeds 3.5 pounds per 1,000 square feet per 24 hours, a vapor emission treatment system shall be applied based on the application specified above.

F. If a treatment is not required, the General Contractor shall credit to the Owner the amount listed on the Bid Form according to the area not receiving a floor treatment.

3.3 TESTING PROCEDURES

A. A prepackaged calcium chloride crystal test is equipped with a sealed dish of anhydrous calcium desiccant, a 70 square inch plastic metering dome with gasket and instruction specification materials.

B. About 1 square foot of clean concrete surface area is required for each test placed.

C. Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label as well as on instruction document.

D. Unseal dish and expose test according to preprinted test kit instructions.

E. Allow 60 to 72 hours exposure only. Retrieve test according to preprinted instructions and perform calculation accordingly.

F. Environmental requirements of the building are to match that of the finished flooring environment. Doors, windows, roofing, etc. must be installed and the temperature of the building controlled to a finished building atmosphere. Do not execute tests when building interior is below 65 degrees for 72 hours prior to, and throughout the duration of the test.

G. Number of tests required is a minimum of 3 tests per 1,000 square feet or less; 6 tests for a minimum of 2,000 square feet of floor surface area or less. Areas above 2,000 square feet require 1 additional test per each additional 1,000 square feet. Time of exposure is 60 to 72 hours regardless of the number of tests.

3.4 STABILIZING PROCESS

A. The necessity to stabilize is determined by vapor emission test results. Where any tests in the series show a vapor emission exceeding 8.0 pounds per 1,0000 square feet in 24 hours, stabilization procedures will be necessary. Stabilization procedures occur only in System 5 applications specified above.

B. Time considerations for stabilization procedures require 1 to 2 days of application without interference from other trade groups, followed by 10 days of drying.

C. Protection for post-stabilization procedures require covering either by heavy paper or Masonite, depending upon the type of traffic that will be exerted upon the curing floor surface. Protection must prevent contamination of the slab under treatment from drywall dust, drywall mud, paint and other types of debris. If contamination occurs, the General Contractor may be responsible for costs associated to shot blasting the surface and subsequent cleanup of concrete pore structure and replacement of products and labor.

D. Application of stabilizing procedure may occur from airless sprayer, squeegee system or rollers.

3.5 PREPARATION

A. Shot blast concrete surface to open pores. Remove bond breakers; remove curing compounds, and ensure a clean surface profile.

B. All structural cracks, control joins and cold joints shall be routed out to a 1/4-inch depth minimum. Vacuum out debris. Any features with large, thorough passage into soil substrate shall be thoroughly dugout, vacuumed, filled with appropriate crack filling material.

C. All cleaned structural cracks and control joints shall be caulked with a urethane based caulking compound and allowed to cure according to manufacturer's specifications.

D. Fill all structural cracks, control joints and cold joints, and clean and fill all divots, voids, chips or other surface feature irregularities with an approved 100 percent Portland based type compound. Gypsum based filling materials will fail under moisture conditions and are not allowed under any circumstances.

E. The acceptable concrete surface profile will feature a texture that is similar to a 200 grit sandpaper smoothness. Slick surfaces from curing compounds and/or release agents must be shot blasted completely off. Conversely, concrete surface areas that are extremely rough must be surfaced-skimmed with an approved 100 percent Portland based cement compound and sanded with an open grit paper after proper drying.

3.6 APPLICATION

A. System 1: After preparation, apply coating system according to manufacturer's specification. Allow 2 hours tack-free setup and 24 hours before subsequent covering with floor surface materials.

B. System 2: After preparation, apply coating system according to manufacturer's specification. Allow 8 hours tack-free setup and 24 hours before subsequent covering with floor surface materials.

C. System 3:
1. After preparation, install fiberglass membrane across floor surface area with butted joints and edge termination to 1/4-inch to walls and fixed obstacles.
2. Laminate membrane with acrylic copolymer resin through surface according to instructions of manufacturer. Allow 4 hours for tack-free setup and 24 hours before continuing installation.
3. Sand membrane with open face sand paper lightly to remove irregularities in membrane.
4. Apply finish coat with acrylic copolymer resin over membrane surface in accordance with manufacturer's instructions. Allow 4 hours for tack-free setup and 8 hours before continuing installation.
5. Skim finished membrane with approved 100 percent Portland based cementitious compound to provide a smooth profile for resilient surfaces.

D. Liquid Penetrant Used in Combination with System 5 and System 6:
1. Apply penetrant with airless sprayer according to manufacturer's instructions. Apply a minimum of 2 coats allowing penetration to complete itself before continuing.
2. Follow product application with clean water to dilute surface drying of material and to ensure penetration.
3. After completion, protect treated surface as specified below.

3.7 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.8 PROTECTION

A. The General Contractor shall be responsible for the protection of the vapor emission treatment system and system process immediately after completion and acceptance. Be responsible for such protection until finished flooring system is installed.

B. General Contractor shall notify the vapor emission treatment system applicator or manufacturer of the scheduled installation of flooring product. The applicator must accept the adhesive and installation method of resilient flooring materials prior to their installation or Warranty of the vapor emission treatment system may be voided.

END OF SECTION 09 6123

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SECTION 09 6500 – RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Linoleum tile flooring.

B. Athletic rubber tile flooring.

C. Rubber wall base, reducer strips, and other accessories.

1.3 RELATED SECTIONS

A. Section 03 3000 - Cast-in-Place Concrete: Moisture content of concrete for flooring installation.

B. Section 09 3000 – Tiling: Transitions strips.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 SEQUENCING AND SCHEDULING

A. Install flooring and accessories after other finishing operations, including painting, have been completed.

B. Install flooring adequately in advance of scheduled occupancy of each Phase of the project to assure proper curing of adhesives prior to allowing foot traffic on flooring.

C. Do not install resilient floor coverings over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by floor covering manufacturer's recommended bond and moisture test.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product specified.
   1. Provide manufacturers' product data for adhesives, including printed statement of VOC content.

B. Shop Drawings: Show locations of all seams, whether deviating from seam locations indicated on Drawings or not.

C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each different color and pattern of floor covering required.
   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9-inches (230 mm) long, of each color required.

D. Heat-Welded Seam Samples: For each flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm) Sample applied to a rigid backing and prepared by Installer for this Project.

E. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
3. For low emitting flooring materials, including printed statement of VOC content and chemical components.
4. CDPH Standard Method v1.1 testing report
5. Floorscore Certified Certificate.
6. SCAQMD Rule 1113 compliant VOC testing compliance statement

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
1. Sheet Flooring: Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof, in roll form of each different composition, wearing surface, color, and pattern of sheet flooring material.
2. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
3. Resilient Base Material: 50 lineal feet of each color and size.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are approved and certified by flooring manufacturer, as well as competent in techniques required by manufacturer for floor covering installation and seaming method indicated.

B. Single-Source Responsibility for Flooring: Obtain each type, color, and pattern of resilient flooring from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

C. Fire Performance Characteristics: Provide resilient flooring 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 E648.
2. Smoke Density: Less than 450 per ASTM E662.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver resilient flooring and installation accessories 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 flooring materials 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 flooring and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.10 SITE CONDITIONS

A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive flooring 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 flooring until it is at the same temperature as the space where it is to be installed.

C. Close spaces to traffic during installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Adhesives applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 81 13 - Sustainable Design Requirements.
1. Use materials that meet or are lower than the current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1113.
2. Leveling compound adhesives and sealers must meet or be lower than the current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

B. Low Emitting Materials: Provide resilient flooring installed on the interior of the building that meets the testing and product requirements for certification by SCS FloorScore.

C. Provide resilient flooring, wall base, and adhesive materials having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. GreenGuard Gold Certified
3. SCAQMD Rule 1113 compliant VOC testing compliance.
4. FloorScore Certified.

2.2 LINOLEUM TILE FLOORING

A. Basis-of-Design Product: The design for the linoleum flooring is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: Forbo Industries, Inc.; Marmoleum – Modular.
2. Armstrong World Industries, Inc.
3. Azrock Commercial Flooring, DOMCO.

B. Tile: ASTM F2195; homogeneous linoleum floor tile of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto natural jute backing, with pattern and color extending throughout total thickness of material.
1. Dimensions: To be determined.
2. Thickness: 1/10-inch.
3. Type: Type I: Linoleum floor tile with fibrous backing;

4. Slip Resistance: In accordance with ADA recommendation of .6 for flat surfaces.
5. Static Load Limit: ASTM F970, 450 lb/sq in.
6. Fire Resistance
   a. Smoke Density: ASTM E622, 450 or less.
   b. Critical Radiant Flux: ASTM E648, Class 1.
7. Style and Color: t5226 grey granite.

2.3 RUBBER ATHLETIC FLOOR TILES

A. Basis-of-Design Product: The design for the rubber athletic flooring is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Basis-of-Design: Johnsonite Sports Rubber Flooring. Triumph Sports Flooring
   2. Infinity Flooring.
   3. Pawling Corporation.
   4. MONDO USA.
   5. Surface America.

B. Tile Standard: ASTM F1344, Class I-B, homogeneous rubber tile, through mottled.
   1. Thickness: 3/8-inch
   2. Size: 24- by 24-inches (609.6 by 609.6 mm).
   3. Seaming Method: Standard.
   4. Wearing Surface: Smooth.
   5. Hardness: Not less than 85 as required by ASTM F1344, measured using Shore, Type A durometer per ASTM D2240.
   6. Color: SMH-XX LB8 Vortex.

2.4 RUBBER BASE

A. Wall Base: ASTM F1861, Type TS (rubber, vulcanized thermoset).
   1. Manufacturer: Armstrong World Industries, Inc.
   2. Group (Manufacturing Method): I (solid, homogeneous).
   3. Style:
      a. At Hard Floor Surfaces: Cove (with top-set toe).
      b. At Soft Floor Surfaces: Straight.
   4. Minimum Thickness: 0.125-inch (3.2 mm).
   5. Height: 4-inches (102 mm).
   6. Lengths: Coils in manufacturer's standard length, but not less than 100 feet.
   7. Outside Corners: Premolded.
   8. Inside Corners: Premolded.
   9. Surface: Smooth.
   10. Color: Burke Accord 701 Black.

2.5 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.
   1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24 and South Coast Air Quality Management District Rule #1168).
      a. VCT and Asphalt Tile Adhesives: 50 g/L.
      b. Cove Base Adhesives: 50 g/L.
      c. Rubber Floor Adhesives: 60 g/L.

C. Integral-Flash-Cove-Base Accessories:
1. Cove Strip: 1-inch (25-mm) radius provided or approved by floor covering manufacturer.
2. Cap Strip: Square metal, vinyl, or rubber cap provided or approved by floor covering manufacturer.
3. Corners: Metal inside and outside corners and end stops provided or approved by floor covering manufacturer.

D. Metal Edge Strips: Schluter Systems:
1. Tile-to-Resilient Flooring: Reno-V.

E. Edge Strips: Burke/Mercer Flooring Products or Roppe; rubber, carpet-to-resilient flooring strips; color to be selected.

F. Floor Polish: Provide protective metal, cross-linked acrylic floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for resilient flooring installation and comply with manufacturer's requirements and those specified in this Section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
2. Finishes of subfloors comply with tolerances and other requirements specified in Section 033000 for slabs receiving resilient flooring.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

C. Verify adhesives are compatible with concrete curing compounds on slabs. Where adhesive is found not to be compatible, remove curing compound prior to installation of material.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring.

B. Concrete Substrates: Prepare according to ASTM F710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture and Alkalinity Testing:
a. Perform at a rate of three tests for the first 1,000 square feet and one additional test for each 1,000 square feet thereafter.
b. Anhydrous Calcium Chloride Test: ASTM F1869; proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

c. Internal Relative Humidity Test: ASTM F2170; proceed with installation only after substrates have a maximum relative humidity level of 75%RH or less.
d. Digital Alkalinity-pH Test: ASTM F710; proceed with installation only after substrates have a result of 9.0pH or less.
e. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates.

D. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

E. Broom or vacuum clean substrates to be covered by resilient flooring immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

F. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 SHEET VINYL INSTALLATION

A. General: Comply with sheet vinyl floor covering manufacturer's installation instructions and other requirements indicated that are applicable to each type of floor covering installation included in Project.

B. Maintain uniformity of sheet vinyl floor covering direction.

C. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 6-inches away from parallel joints in flooring substrates.

D. Match edges of resilient floor coverings for color shading and patterns at seams.

E. Avoid cross seams.

F. Scribe, cut, and fit sheet vinyl floor coverings to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture, including cabinets, pipes, outlets, edgings, thresholds, and nosings.

G. Extended sheet vinyl floor coverings into spaces, door reveals, closets, and similar openings.

H. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

I. Adhere sheet vinyl floor coverings to flooring substrates by method approved by floor covering manufacturer.

J. Integral-Flash Cove Base: Cove floor coverings 6-inches (152 mm) up vertical surfaces. Support floor coverings at horizontal and vertical junction by cove strip. Butt at top against cap strip.
1. Install metal corners at inside and outside corners.

K. Produce completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.

L. Comply with floor covering manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.

M. Hand roll sheet vinyl floor coverings in both directions from center out to embed floor coverings in adhesive and eliminated trapped air. At walls, door casings, and other locations where access by roller is impractical, press floor coverings firmly in place with flat-bladed instrument.

3.4 FLOOR TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles square with room axis in pattern indicated.

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern)

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. Conform to RFC1-TM-6 for joint tightness and for corner intersection unless layout pattern shows random corner intersection. More than 5 percent of the joints not touching or any joint more than 0.0051-inch wide will not be accepted.

3.5 RUBBER TILE INSTALLATION

A. Install rubber tile flooring in accordance with manufacturer's printed installation instructions.

B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles square with room axis.
2. Lay resilient flooring with arrows in the same direction.

C. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections. Remove excess adhesive immediately.

H. Do not install defective or damaged resilient tile flooring.

I. Conform to RFC1-TM-6 for joint tightness and for corner intersection unless layout pattern shows random corner intersection. More than 5 percent of the joints not touching or any joint more than 0.0051-inch wide will not be accepted.

3.6 RUBBER WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. Fit joints tight and vertical. Maintain minimum measurement of 24-inches between joints.

F. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends use premolded units.

G. Install base on solid backing. Bond tight to wall and floor surfaces.

H. Scribe and fit to door frames and other interruptions.

I. Where base wraps around columns, ensure that seams are terminated with a mitered joint at the corners of the column. Offset, asymmetrical seams on the face of the column are not permissible.

3.7 ACCESSORY INSTALLATION

A. Apply contact bond adhesive to the back of the moulding and the wall/floor surface area.

B. When adjoining carpet, trim the carpet so that it fills the undercut area of the moulding completely.

C. Do not perform any maintenance on the product for 24 hours after installation is completed.

3.8 CLEANING

A. Perform the following operations immediately after completing flooring installation:
1. Remove visible adhesive and other surface blemishes using cleaner recommended by flooring manufacturers.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by resilient flooring manufacturer.
4. Damp-mop floor to remove black marks and soil.

B. Resilient Accessory Cleaning:
1. Thoroughly sweep or vacuum the entire surface area to remove all loose dirt and grit
2. Scrub the resilient accessory surfaces with a neutral cleaning solution mixture recommended by manufacturer, using a clean cloth or sponge.
3. Rinse with clean cold water and allow the product to thoroughly dry.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.9 PROTECTION

A. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
1. Use floor polish product acceptable to flooring manufacturer.
2. Sealer: Apply manufacturer's recommended sealer, 1-2 coats.
3. Polish: Apply 2-3 coat(s).
4. Reapply floor polish after cleaning.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by flooring manufacturer.

C. Do not move heavy and sharp objects directly over flooring. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over protective panels without moving panels.

D. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.

END OF SECTION 09 6500

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SECTION 09 6723 – POLYASPARTIC FLOORING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Polyaspartic flooring system.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each polyaspartic flooring component required.

B. Samples for Initial Selection: For each polyaspartic flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For installation coatings, including printed statement of VOC content and chemical composition of each product used.
3. Declare Label: Manufacture’s publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
4. CDPH Standard Method v1.1 testing report.
5. SCAQMD Rule 1113 compliant VOC testing compliance statement.

1.5 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Material Certificates: For each polyaspartic flooring component, signed by manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For polyaspartic flooring to include in maintenance manuals.

B. Warranty: Sample of special warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying polyaspartic flooring systems similar in material, design, and extent to those

indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to polyaspartic flooring manufacturer.

1. Engage an installer who is certified in writing by polyaspartic flooring manufacturer as qualified to apply polyaspartic flooring systems indicated.

B. Manufacturer: Provide polyaspartic flooring produced by a single manufacturer with not less than 5-years prior production and installation of specified materials.

C. Regulatory Requirements: Polyaspartic flooring shall be UL rated Class A, in conformance with ASTM E108, and approved by the California State Fire Marshal's Office.

D. Source Limitations: Obtain primary polyaspartic flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

E. Pre-Installation Conference: Meet at Project site prior to commencement of work and review requirements for work and conditions which could interfere with successful performance. Where required for warranty, require manufacturer's technical representative to participate in conference.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

C. Store material(s) in accordance with manufacturer's instructions, with seals and labels intact and legible. Maintain temperatures within the required range. Do not use materials which exceed the manufacturer's maximum recommended shelf life.

D. Provide equipment and personnel to handle the materials by methods which prevent damage.

E. Promptly inspect direct jobsite material deliveries to assure that quantities are correct, comply with requirements and are not damaged.

1.9 SITE CONDITIONS

A. Environmental Limitations: Comply with polyaspartic flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting polyaspartic flooring application.

B. The minimum slab temperature must be conditioned to 60 degrees F before commencing installation, during installation, and for at least 72 hours after installation is complete. The substrate temperature must be at least 5 degrees F above the dew point during installation.

C. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during polyaspartic flooring application.

D. Close spaces to traffic during polyaspartic flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

1.10 WARRANTY

A. Furnish manufacturer's warranty signed by the applicator and authorized representative of manufacturer, warranting polyaspartic flooring materials against failures resulting from normal exposure, excluding failures due to unusual weather, failure of substrate, or abuse. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
   1. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 018113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Coatings: Meet the following:
      a. EPA Method 24 testing of less than 65 g/liter, by independent laboratory testing.
      b. Contains no formaldehyde, formaldehyde precursors and zero-carcinogens
      c. Contains zero hazardous air pollutants (HAP's)

B. Provide concrete floor sealer having the following certifications and labels:
   1. CDPH Standard Method V1.1 compliant
   2. SCAQMD Rule 1113 compliant.
   3. Declare Label.

2.2 PERFORMANCE CRITERIA

A. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
   1. Adhesion: 400+ concrete fracture per ASTM D 4541.
   2. Tensile Strength: 4,500-5,000 per ASTM D 638.
   3. Impact Direct/Reverse: 160/160 per ASTM D 2794 Inch Pounds.
   4. Abrasion Resistance: 22-28 maximum weight loss per ASTM D 4060.
   5. Flammability: Self-extinguishing per ASTM D 635.
   6. Hardness: 84, Shore D per ASTM D 2240.

B. System Chemical Resistance: According to manufacturer's chemical resistance chart.

2.3 MATERIAL

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance, resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.
   1. Basis-of-Design Product: HP Spartacote, Sparta-Guard PURE™ VOC-Free Solid Color Industrial Flooring

B. System Characteristics:
   1. Color . Match City of Hayward Public Works Department's sidewalk color standards.
   2. Wearing Surface: Textured for slip resistance.
   3. Overall System Thickness: 9 mils.

C. Primer / Body Coats:
   1. Name: SpartaFlex™ PURE Pigmented
   2. Resin: Polyaspartic Aliphatic Polyurea
   3. Formulation Description: Ultra-High solids.
   4. Application Method: Roller, Squeegee or Broom.
      a. Thickness of Coats: 8 Mils. DFT
      b. Number of Coats: One.

D. Mid-Coat: TBD
   1. Name: Sparta-Flex® PURE Pigmented
   2. Resin: Polyaspartic Aliphatic Polyurea
   3. Formulation Description: Ultra-High Solids
   4. Application Method: Roller, Squeegee, Broom
      a. Thickness of Coats: 8 mils
      b. Number of Coats: One

E. Top-Coat:
   1. Name: Sparta-Flex® PURE Clear
   2. Resin: Polyaspartic Aliphatic Polyurea
   3. Formulation Description: Ultra-High Solids
   4. Application Method: Roller, Squeegee, Broom
      a. Thickness of Coats: 8 mils
      b. Number of Coats: One
   5. Aggregates: Incorporate Sparta-Grip™ traction additive as needed for increased traction COF
   6. Color: Match City of Hayward sidewalk color standards (1lb lamp black per cubic yard of concrete).

2.4 ACCESSORIES

A. Waterproofing Membrane: HP Spartacote Hydro-Shield SL™ for concrete slabs exhibiting elevated moisture vapor emission rates (> 3 lbs over 1000 sq ft in 24 hours).
   1. Formulation Description: 100% Solids Chemically Enhanced Epoxy

B. Joint Filler Material: HP Spartacote Joint-Flex® flexible polyuria joint filler or similar product.

C. Traction Additive: Sparta-Grip™ traction additive from HP Spartacote or similar material available in 40,60 and 100 mesh sizes

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to polyaspartic flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral pH substrate for polyaspartic flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with polyaspartic flooring.
   1. Roughen concrete substrates as follows:
      a. Comply with ASTM C811 requirements, unless manufacturer's written instructions are more stringent.
   2. Repair damaged and deteriorated concrete according to polyaspartic flooring manufacturer's written recommendations.
   3. Verify that concrete substrates are dry.
      a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab in 24 hours.
      b. Perform plastic sheet test, ASTM D4263. Proceed with application only after testing indicates absence of moisture in substrates.
      c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.
   4. Verify that concrete substrates have neutral Ph and that polyaspartic flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

D. Cracks:
   1. Cracks over 1/16-inch in width and moving cracks under 1/16-inch in width shall be saw cut to 1/4-inch minimum width and depth. Saw cut 1/4-inch.
   2. Moving cracks over 1/16-inch wide and expansion joints less than 1-inch wide shall be cleaned, primed, fitted with a backing rod and sealed with polyurethane sealant.
   3. Allow sealant to cure prior to applying traffic coating.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through polyaspartic flooring according to manufacturer's written recommendations.

F. Install a 1-inch face, 45-degree cant of sealant at angle changes, including projections through the deck, walls, and curbs.

G. Prime areas to receive detail coats in accordance with manufacturer’s instructions. Extend primer 2-inches beyond area to receive detail coat to allow primer tie-in during coating application.

H. Apply 6-inch wide stripe-coat of detail coat material 30-mils thick centered over sealed cracks, hairline cracks, sealant cants, control and cold joints, and expansion joints less than 1/2-inch wide.

3.2 PRIMING

A. Mix primer in accordance with manufacturer’s instructions.

B. Apply primer at a rate of 250- to 300-sq. ft. per gallon. Avoid puddles or ponding and do not apply over stripe coats.

C. Allow primer to dry for 1- to 8-hours or until sufficiently dry. If coating is not applied with the maximum time, reprime.

3.3 APPLICATION

A. Polyaspartic Materials: Mix components and prepare materials according to polyaspartic flooring manufacturer's written instructions.

B. General: Apply components of polyaspartic flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of polyaspartic flooring system to substrate, and optimum intercoat adhesion.
2. Cure polyaspartic flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in polyaspartic flooring to comply with polyaspartic flooring manufacturer's written recommendations.
a. Apply joint sealant to comply with manufacturer's written recommendations.

C. Base Membrane: Apply in one uniform coat at the rate of 1-gallon minimum per 50-sq. ft. or as required to obtain a minimum thickness of 32 wet mills. Allow to cure 16- to 48-hours.

D. Top Coat: Apply in one uniform coat at the rate of 1-gallon per 100-sq. ft. or as required to obtain a minimum thickness of 16 wet mils. Immediately broadcast sand aggregate into the wet material at a rate of 8- to 10-lbs. Per 100-sq. ft and backroll. Allow the membrane to cure 16- to 48-hours.

E. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

3.4 FIELD QUALITY CONTROL

A. Core Sampling: At the direction of Owner's Representative and at locations designated by Owner's Representative, take 1 core sample per 1000 sq. ft. (92.9 sq. m) of polyaspartic flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.

B. Material Sampling: Owner may at any time and any number of times during polyaspartic flooring application require material samples for testing for compliance with requirements.
1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.5 ADJUSTING

A. Remove spilled and splattered materials immediately as work progresses.

3.6 CLEANING

A. Clean the polyaspartic flooring system just prior to final inspection, using materials and procedures recommended by the system manufacturer.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.
   1. Close and seal tightly all partly used containers and store protected in well-ventilated fire-safe area at moderate temperatures.
   2. Place empty containers of solvent based paints in areas designated for hazardous materials.

3.7 PROTECTION

A. Do not permit traffic during the first 24-hours after application. Do not allow cart or heavy foot traffic during the first 48-hours after application. Increase time periods as required during cool weather for the traffic coating to properly cure. Do not allow any traffic on completed coating system until approved by the Architect.

B. Protect polyaspartic flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by polyaspartic flooring manufacturer.
   1. Remove temporary covering just prior to final inspection.

END OF SECTION 09 6723

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SECTION 09 6813 – TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Modular, fusion-bonded carpet tile.

1.3 RELATED SECTIONS

A. Section 09 6500 – Resilient Flooring: Resilient wall base and accessories installed with carpet tile.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet Tile: Full-size Sample.
   2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- (300-mm-) long Samples.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
   3. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
   4. For low emitting flooring materials, including printed statement of VOC content and chemical components.
   5. Environmental Product Declaration (EPD): Manufacturer’s Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e. from cradle-to-cradle) that is verified by an ISO/IEC 17065 accredited certification body.
   6. Declare Label: Manufacture’s publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
   7. CDPH Standard Method v1.1 testing report.
   8. CRI Green Label Plus Certified Certification.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

B. Warranty: Sample of special warranty.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is approved by carpet tile manufacturer and certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements with a minimum of 5 years continuous experience in the installation of the types of carpet tile specified.

B. Carpet Surface Burning Characteristics: Provide carpet identical to that tested for the following fire performance characteristics, per test method indicated below. Identify carpet with appropriate markings of applicable testing and inspecting organization.
1. Test Method: ASTM E84.
2. Flame Spread: 75 or less.
3. Fire Hazard Classification: Class I floor finish.
4. Minimum critical flux limit of 0.45-watts/square centimeter when tested in accordance with NFPA 253.

C. Static electricity generation of installed carpet shall not exceed 3.5 KV at 70-deg. F and 20-percent R.H. for life of carpet tile.

D. Carpet Tile Low-VOC Emissions: Provide carpet and cushion materials that have been tested and certified to indicate carpet, carpet backings, cushions, and adhesives emit no or low VOCs (volatile organic compounds). Provide products carrying the following certifications:
1. CRI Green Label.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

B. Deliver and store packaged materials in original containers labels intact until time for use, with seals unbroken and store rolls in a flat position. Protect from damage, dirt, stains and moisture.

C. Do not store carpet tile near products that can off gas harmful substances.

1.11 SITE CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations:
1. Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
2. Use adhesives in strict compliance with manufacturer's recommendations, and ventilate area with maximum outside air for a minimum of 48-hours after installation.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
1. Test substrates to ensure that no dusting will occur through installed carpet tile. Apply sealer on porous concrete surfaces where required to prevent dusting.

1.12 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials, fabrication, or installation within specified warranty period.
1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide carpet tile products with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 45 percent.

B. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.

1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and SCAQMD Rule 1113 compliant.
2. Use materials that are free of added urea formaldehyde resin binders.

D. Provide insulation materials having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. GreenGuard Gold Certified
3. Type III Environmental Product Declaration.
4. Declare Label.
5. CRI Green Label Plus Certified Certification

E. Limit all carpet tile pile heights to 1/2-inch maximum.

2.2 CARPET TILE

A. Available Products (Carpet #1): Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Manufacturer: Shaw Contract.
2. Style: Visible Tile 5T002
3. Collection: Light Series
4. Product Number: 5T002
5. Color: 01557 Beam.
6. Installation Pattern: Ashlar.
7. Dye Method: 100% solution dyed
8. Backing System: Ecoworks.
9. Applied Soil-Resistance Treatment: Manufacturer's standard material.
10. Antimicrobial Treatment: Manufacturer's standard material.

B. Available Products (Carpet #2): Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Manufacturer: Interface Carpet Tile.
2. Style: 609002504
3. Collection: Super Flor 41Z
4. Color: 609008 Grey.
5. Applied Soil-Resistance Treatment: Manufacturer's standard material.
6. Antimicrobial Treatment: Manufacturer's standard material.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D5116:
a. Total VOCs: 10.00 mg/sq. m x h.
b. Formaldehyde: 0.05 mg/sq. m x h.
c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
   2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
   4. Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   5. Moisture and Alkalinity Testing:
      a. Perform at a rate of three tests for the first 1,000 square feet and one additional test for each 1,000 square feet thereafter.
      b. Anhydrous Calcium Chloride Test: ASTM F1869; proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      c. Internal Relative Humidity Test: ASTM F2170; proceed with installation only after substrates have a maximum relative humidity level of 75%RH or less.
      d. Digital Alkalinity-pH Test: ASTM F710; proceed with installation only after substrates have a result of 9.0pH or less.
      e. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 ADJUSTING

A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

3.5 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.6 PROTECTION

A. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."

B. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 6813

SECTION 09 7217 – LARGE-SCALE WALL GRAPHICS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Large scale vinyl wall graphics, location(s) indicated on Drawings.

B. Metal artwork with standoff posts for graphics provided by Owner.

1.3 SUSTAINABILITY REQUIREMENTS

A. Refer to Section 01 8113 for sustainability requirements related to this Section.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: Show graphics, materials, fabrication, and installation details for large scale wall graphics.

C. Samples: Show the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work.
1. Vinyl: 12-inch- (300-mm-) square section of fabric from dye lot to be used for the Work, with specified treatments applied. Mark face of fabric.
2. Graphics: Not less than 12-inch- (300-mm-) square section showing graphic application method.
3. Seam and Edge Condition: Not less than 12-inch- (300-mm-) long section showing seam and edge treatment.

D. Proofs: Provide proofs of supplied graphics for review and approval of the following:
1. Overall appearance.
2. Process color image.
3. Clarity.
4. Precision of scan.
5. Trim size.
6. Rule thickness, length, type placement, images.
7. Copy.
8. Dust spots and crop marks.
9. Photos, illustrations, and strip-ins.
10. Solids, screens, bleeds and reverses.
11. Color breaks and trapping.

E. Schedule: Use same designations indicated on Drawings in preparing schedule for large scale wall graphics.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For large scale wall graphics to include in maintenance manuals specified in Division 1.

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide large scale wall graphics constructed of fabrics that are identical to products that pass Test Method 1 of NFPA 701 performed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Mockups: Before installing large scale wall graphics, install mockups for each large scale wall graphic type required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Fabricate mockups to comply with the following requirements, using materials indicated for the completed Work:
   1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when mockups will be installed.
   3. Demonstrate the proposed range of aesthetic effects, fabrication, installation, seams and overlaps, and wall texture/appearance with vinyl sample applied to surface.
   4. Obtain Architect's approval of mockups before starting fabrication.
   5. Maintain mockups in an undisturbed condition as a standard for judging the completed Work.
   6. Remove mockups when directed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store large scale wall graphics rolled over rigid tubes; do not fold large scale wall graphics.

1.8 SITE CONDITIONS

A. Field Measurements: Where large scale wall graphic installation is indicated to fit to other work, verify dimensions of other work by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with other work progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Fabricate and install large scale wall graphics to withstand loads from gravity and structural movement, including thermally induced movement; and to resist, without failure, other conditions of in-service use.

2.2 LARGE SCALE WALL GRAPHICS

A. Basis-of-Design Product: 3M Envision Print Film 48C-20R graphic film with 3M Envision Matte Overlaminate 8050M or accepted equivalent.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall graphic material and substrate application; as recommended in writing by wall graphic material manufacturer and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Wall Substrate Primer/Sealer: Mildew resistant, complying with requirements in Section 09 9100 and recommended in writing by wall graphic material manufacturer for intended substrate.

2.4 METAL ARTWORKWITH STANDOFF POSTS

A. Basis-of-Design: Nations Photo Lab.
1. Metal: Stainless steel.
2. Finish: Brushed stainless steel.
3. Barrel Diameter: 5/8-inch.
4. Barrel Height: 1-inch.
5. Cap: Standard flat cap.

2.5 ARTWORK SCHEDULE

A. Type 1: Printed onto metal.
1. Location(s): Building 1 Lobby, Building 1 Dormitory, Building 2 Lobby.

B. Type 2: Vinyl wall art
1. Location(s): Building 1 Kitchen.
2. Dimensions: 10’ W x 8’ H
3. Image: City of Hayward map in custom red color, graphics to be provided by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for suitable conditions where large scale wall graphics are to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify wall surfaces designated to receive wall graphics have been finished to a level 5 finish.

3.2 INSTALLATION AND ADJUSTING

A. Install large scale wall graphics in position indicated, securely connected to wall.

B. Install large-scale wall graphics with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

C. Install seams vertical and plumb. No horizontal seams are permitted unless approved by Architect during submittal review process.

D. Fully bond large-scale wall graphics to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

E. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

F. Adjust components and accessories in presence of Architect.

3.3 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.

END OF SECTION 09 7217

SECTION 09 8413 – FIXED SOUND-ABSORPTIVE PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Acoustical wall panels.

1.3 RELATED SECTIONS

A. Section 09 5123 - Acoustical Tile Ceilings: Acoustical ceiling panels supported by exposed suspension system and tested for noise reduction.

B. Section 09 7200 - Wall Coverings: Adhesively applied felt wall coverings.

C. Section 09 8436 – Sound-Absorbing Ceiling Units: Tectum ceiling panels.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of panel edge, core material, and mounting indicated.

B. Shop Drawings: For acoustical panels. Include mounting devices and details; details at panel head, base, joints, and corners; and details at floor base, and wall intersections. Indicate panel edge and core materials.
1. Include elevations showing panel sizes and matching.
2. Show cutouts for other work.

C. Coordination Drawings: Show intersections with wall base, electrical outlets and switches, thermostats, lighting fixtures, air outlets and inlets, speakers, sprinklers, access panels, and other adjacent work.

D. Samples for Verification: For the following products. Prepare Samples from same material to be used for the Work.
1. Panels: Original production in finish specified for final use.
2. Panel Edge: 12-inch- (300-mm-) long Sample showing edge profile, corner, and finish.
3. Core Material: 12-inch- (300-mm-) square Sample showing corner.
4. Mounting Device: Full-size Sample.
5. Sample Panels: No larger than 36 by 36 inches (914 by 914 mm). Show joints and mounting methods.

E. LEED Submittals: See Section 018113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.

2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. Show values which demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004.
4. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
5. Indicate methods to be used for ensuring a reduction of indoor air quality problems in order to help sustain the comfort and well-being of construction workers and building occupants.
6. For sealants, including printed statement of VOC content.
7. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e., from cradle to cradle) that is verified by an ISO/IEC 17065 accredited certification body.
8. CDPH Standard Method v1.1 testing report

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator and testing agency.

B. Certification: Submit to the owner a certificate of compliance to specified acoustical and fire performance criteria signed by an officer of the panel manufacturer and attach independent laboratory test results for each product used, showing that the products supplied as components meet or exceed the specified requirements.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For acoustical panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

B. Warranty: Sample of special warranty.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualification: The installer shall be a firm with a minimum of 2 years of successful experience in installation of products with similar requirements.

C. Source Limitations: Obtain acoustical panels through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide acoustical panels with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.
   1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Install mockup of typical wall area as shown on Drawings.
      a. Include intersection at wall and ceiling corner door opening.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and acoustical panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

C. Protect panel edges from crushing and impact.

1.10 SITE CONDITIONS

A. Environmental Limitations: Do not install acoustical panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install acoustical panels until a permanent level of lighting is provided on surfaces to receive acoustical panels.

C. Air-Quality Limitations: Protect acoustical panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of acoustical panels by field measurements before fabrication and indicate measurements on Shop Drawings.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of acoustical panels that fail in materials, fabrication, or installation within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Adhesives applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
   1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 ACOUSTICAL PANEL

A. Acoustical Wall Panels
1. Acceptable Product: Armstrong World Industries, Inc.; Soundsoak 85 Custom Acoustical Wall Panels.
2. Surface Texture: Smooth
3. Composition: Fiberglass
4. Finish Fabric: Designtex 5mm felt, ASTM E84 Class A fabric.
a. Color: Cardinal AM003-301.
5. Size: 48 inches x 96 inches x 1 inch
6. Edge Profile: Square cut edge
7. Noise Reduction Coefficient (NRC): 0.80
8. Mounting: A mounting.
9. Composite Flame Spread: Class A.

2.3 FABRICATION

A. Acoustical Panels: Panel construction consisting of facing material adhered or attached to edges and back border of dimensionally stable core; with rigid edges to reinforce panel perimeter against warpage and damage.

B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch (1.6 mm) for the following:
1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

2.4 ACCESSORIES

A. Mounting Devices: Concealed on back of panel, recommended to support weight of panel, with base-support bracket system where recommended by manufacturer for additional support of panels.

B. Back-Mounting Accessories: Manufacturer's standard or recommended accessories for securely mounting panels, of type and size indicated, to substrates provided.
1. Mounting Devices: Z-clip hanger designed to engage steel mounting plates that are screwed to wall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, blocking, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of acoustical panels.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall Panels: Install acoustical panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with acoustical panel manufacturer's written instructions for installation of panels using type of concealed mounting accessories indicated or, if not indicated, as recommended by manufacturer. Anchor panels securely to supporting substrate.

C. Installation Tolerances: As follows:
1. Variation from Plumb and Level: Plus or minus 1/16 inch (1.6 mm).
2. Variation of Panel Joints from Hairline: Not more than 1/16 inch (1.6 mm) 1/32 inch (0.79 mm) wide.

3.3 CLEANING

A. Clean panels with on completion of installation, to remove dust, grease, oils, and fingerprints and other foreign materials according to manufacturer's written instructions. Wipe surfaces with furniture polish to enhance surface finish.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that acoustical panels are without damage or deterioration at time of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 09 8413

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SECTION 09 8436 – SOUND-ABSORBING CEILING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Lay-in sound-absorbing ceiling units and exposed suspension systems for acoustical control.

1.3 RELATED SECTIONS

A. Section 09 5123 – Acoustical Tile Ceilings: Ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.

B. Section 09 5423 - Linear Metal Ceilings.

C. Division 21: Sprinkler heads in acoustical ceilings.

D. Division 23: Grilles, registers, and diffusers in acoustical ceilings.

E. Division 26: Lighting fixtures in acoustical ceilings.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. LR: Light Reflectance coefficient.

B. NRC: Noise Reduction Coefficient.

1.6 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 ACTION SUBMITTALS

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

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members.
   2. Method of attaching hangers to building structure.

a. Furnish layouts for ceiling attachment devices whose installation is specified in other Sections.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
1. Acoustical Panel: Set of 6-inch- (150-mm-) square samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- (300-mm-) long Samples of each type, finish, and color.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
a. Include statement indicating costs for each product having recycled content.
3. Show values which demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004.
4. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
5. Indicate methods to be used for ensuring a reduction of indoor air quality problems in order to help sustain the comfort and well-being of construction workers and building occupants.
6. For sealants, including printed statement of VOC content.
7. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e., from cradle to cradle) that is verified by an ISO/IEC 17065 accredited certification body.
8. CDPH Standard Method v1.1 testing report

1.8 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

B. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

1.11 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide ceiling units that comply with the following requirements:
   1. Fire-Resistance Characteristics: Where indicated, provide sound baffles identical to those of assemblies tested for fire resistance per ASTM E119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
      a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
      b. Identify materials with appropriate markings of applicable testing and inspecting agency.
   2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E1264 for Class A materials as determined by testing identical products per ASTM E84:
      a. Flame Spread: 25 or less.
      b. Smoke Developed: 450 or less.

C. Seismic Standard: Provide sound baffles designed and installed to withstand the effects of earthquake motions according to the following:
   1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580/E580M.
   2. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.13 SITE CONDITIONS

A. Environmental Limitations: Do not install sound baffles until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.14 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of panels that do not comply with requirements or that fail in materials, fabrication, or installation within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Acoustical Panels: Sagging and warping
   b. Grid System: Rusting and manufacturer's defects
2. Warranty Period: 30 years from date of Substantial Completion.

B. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

C. System Description: Discontinuous/Open Plenum

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING (AC2)

A. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
   1. Manufacturer: Tectum Inc.
   2. Contact: 105 South Sixth Street, Newark, OH 43055; Telephone: (888) 977-9691, (740) 345-9691; Fax: (800) 832-8869;E-mail: aird@tectum.com; website: www.tectum.com.
   3. No known equal.

B. Performance Characteristics:
   1. Modular Size: As indicated on Drawings.
   2. Thickness; Acoustic Panels: 1-inch (25 mm)
   3. Edge Profile: Square Tegular 15/16 in
   4. Noise Reduction Coefficient (NRC): ASTM C 423 (E400); 0.40
   5. Ceiling Attenuation Class (CAC): ASTM C 1414;
   6. Color: As selected by Architect.
   7. Total Acoustics: NRC 0.95 / CAC 0.35 (requires the use of infill panel item 1713)
   8. Flame Spread: ASTM E 1264; Class A
   9. Light Reflectance (LR) White Panel: ASTM E1477; 0.75 – vary for colored panels
   10. Dimensional Stability: HumiGuard Plus
   11. Sustainable: EPD (Environmental Product Declaration) and HPD (Health Product Declaration).
   12. Contact Catarina Silva- Architectural & Contract Sales Manager – 408.857.3955

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C635/C635M.
   1. Basis-of-Design Product: Armstrong Ceilings;. Prelude XL 15/16"
   2. Grid: 15/16" Prelude XL Suspension System.
   3. Provide complete suspension system including perimeter trim units.

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

D. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
      a. Type: Postinstalled expansion anchors.
      b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
      c. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
      d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.
   2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to [10] <Insert safety factor> times that imposed by ceiling construction, as determined by testing per ASTM E1190, conducted by a qualified testing and inspecting agency.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
   2. Stainless-Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
   3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
   4. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

I. Edge Moldings and Trim: 7800 - 12' Wall Molding.

J. Edge Clips: Armstrong World Industries, Inc., BERC2; where indicated, provide manufacturer's standard hold-down clips spaced 24-inches (610 mm) oc on all cross tees.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which sound baffles attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of sound baffles.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install sound baffles to comply with CBC Standard 25-2 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
   1. ESR-1308, Seismic Design Category D,E and F Installation

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of four tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   7. Space hangers not more than 48 inches (1200 mm) oc along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
   8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) oc and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install hold-down clips to retain panels tight to grid system.
   1. The BERC-2 clip is used to secure the main runners and cross runners on two adjacent walls to the structure and the two opposite walls to the perimeter trim, as detailed in the report. A nominal 7/8-inch (22 mm) wall molding is used in lieu of the 2- inch (51 mm) perimeter supporting closure angle required in ASCE-7 for Seismic Design Categories D, E and F. Except for the use of the BERC-2 clip and the 7/8-inch (22 mm) wall molding and elimination of spreader bars, installation of the ceiling system must be as prescribed by the applicable code. Refer to manufacturers installation instructions.
   2. Alternate #2: If acceptable to architect, fixed attachment may be accomplished by pop riveting the runner to the wall molding.
   3. Clips installed on the walls where the runners are not fixed to the runner allow the terminal runner end to move 3/4 inch (19.1 mm) in both directions. BERC-2 clips installed in this manner are an acceptable means of preventing runners from spreading in lieu of spacer bars required in ASTM E580, which is referenced in ASCE 7 as pointed to in by the International Building Code.
   4. The SJCG Seismic Separation Joint Clip is to be installed per the manufacturer's instructions

3.4 CLEANING

A. Clean exposed surfaces of sound baffles, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 09 8436

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SECTION 09 9100 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

B. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.

C. Painting exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

D. Painting includes field-painting 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.

E. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

F. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 RELATED SECTIONS

A. Section 05 5213 - Pipe and Tube Railings: Shop-priming ferrous metal.

B. Section 08 1113 – Hollow Metal Doors and Frames: Shop-priming steel doors and frames.

C. Section 32 1723 – Pavement Markings.

1.4 LEED REQUIREMENTS

A. Refer to Section 018113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. VOC Ranges: Ranges listed are as prescribed by Master Painters Institute (MPI), Architectural Painting Specification Manual as follows:
1. VOC Range E3: Lowest; <51 g/l.
2. VOC Range E2: Next lowest; 51-200 g/l.
3. VOC Range E1: Highest allowable; 201-350 g/l.
4. VOC Range E0: Outside range.

B. General: Standard coating terms defined in ASTM D16 apply to this section.
   1. Low Gloss (G1): Refers to a 'velvet-like' finish with a gloss maximum of 10 when measured with a 60-degree meter per ASTM D523.
   2. Low Sheen (G2): Refers to an eggshell finish with a gloss range between 5 and 20 when measured with a 60-degree meter per ASTM D523.
   3. Satin(G3-G4): Refers to a low-sheen finish with a gloss range between 15 and 35 when measured with a 60-degree meter per ASTM D523.
   4. Semi-gloss (G5): Refers to a satin-like finish with a gloss range between 20 and 35 when measured with a 60-degree meter per ASTM D523.
   5. Gloss (G6): Refers to a high-sheen finish with a gloss range higher than 65 when measured with a 60-degree meter per ASTM D523.

1.6 ACTION SUBMITTALS

A. Product Data: For each paint system specified.
   1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and coating material proposed for use.
   2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing and applying each coating material proposed for use.
   3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
   1. Submit Sample Brush Outs on rigid backing, 8-1/2" x 11" minimum.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Samples for Verification Purposes: Submit samples for review of color and texture; provide list of material and application for each coat of each finish sample.
   1. Brush-Outs: Submit samples of each color and material with texture to simulate actual conditions, on hardboard.
      a. Submit 8" by 10" samples of wood finishes on actual wood surfaces; label and identify each as to location and application.
   2. Field Samples: Duplicate painted finishes of approved samples on actual wall surfaces and components for approval prior to commencing work.
      a. Size: Minimum 100 sf located where approved.
      b. Components: One full component as directed.
      c. Simulate finished lighting conditions for review.
   3. Opaque Colors and Finishes· Submit samples, on hardboard, using materials accepted for Project, of each color and paint finish selected with texture to simulate actual conditions. Prepare three samples, 8-112 Inches by 11 Inches, with required number of pa1nl coats clearly visible.
   4. Transparent and Stained Finishes: Prepare samples on species and quality of wood to be used in the Work. Re-submit as requested until acceptable sheen, color, and texture are achieved. Label and identify each sample as to location and application.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.

2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
3. For paints, including printed statement of VOC content and chemical components.
4. Product Data Sheets for each product to be used as required by the U.S.G.B.C. as proof that each product meets the requirements of either Green Seal's GS-11 or GC-03 documents.
5. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
6. CDPH Standard Method v1.1 testing report.
7. SCAQMD Rule 1113 compliant VOC testing compliance statement.

1.7 CLOSEOUT SUBMITTALS

A. Provide paint cards fully labeled with manufacturer of each paint system applied on the project. Provide the following with each system:
1. Manufacturer name.
2. Manufacturer's paint product.
3. Primer name and number.
4. Color name and number.
5. Gloss level.
6. Locations where used.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.9 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Field Samples: Apply field sample of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution prior to commencing work.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   b. Other Items: Architect will designate items or areas required.
2. Components: One full component as directed.
3. Simulate finished lighting conditions for review.
4. Install field sample using means and methods identical to those that are going to be employed during full production.
5. Allow coating to cure in accordance with manufacturer's written instructions.
6. Perform adhesion test on existing paint to remain using X-cut method per ASTM D3359. Ratings 4A and 5A acceptable.
7. Final approval of color selections will be based on field sample.
   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

8. Approval of field sample does not constitute approval of deviations from the Contract Documents contained in field sample unless Architect specifically approves such deviations in writing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the 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.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

C. 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.

1.11 SITE CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

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 (3 deg C) above the dew point; or to damp or wet surfaces.

D. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. VOC Content: Paints and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Paint Materials: Provide only paint materials that meet the requirements of Green Seal documents.

D. Provide interior paint materials having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. SCAQMD Rule 1113 compliant.
3. Declare Label.

2.2 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering interior 0-low VOC paint products that may be incorporated into the Work include, but are not limited to, the following:
1. Benjamin Moore; EcoSpec WB.
2. Glidden Professional; Lifemaster No VOC.
3. Kelly-Moore; Enviro-Cote.
4. Sherwin-Williams; Harmony Coating System.
5. PPG Architectural Finishes; Pure Performance.

B. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering exterior paint products that may be incorporated into the Work include, but are not limited to, the following:
1. Benjamin Moore.
2. Glidden Professional.
3. Kelly-Moore.
4. Sherwin-Williams.
5. PPG Architectural Finishes.

C. High Temperature Paint: Contego fire barrier intumescent latex paint, or accepted equivalent.
1. Location(s): Burn Building and on Props.
2. 10 mil DFT (dry film thickness).
3. Color: White
4. Specific Gravity: 1.35 +/- 0.05
5. pH Range: 8.0-8.5
6. Weight/Gal: 11.5 +/- 0.2 lbs (5.2 Kgs)*
7. Hazardous Ingredients: N/A
8. Volume Solids: 67.0 – 69.0%
9. Weight Solids: 68.0 – 72.0%
10. Viscosity: 20 – 25,000 cPs
11. Flammability: Not Flammable
12. VOC. (LESS WATER): .01 gm/L (Nil)

2.3 PAINT MATERIALS

A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

C. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the

exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.

D. Colors: Match colors indicated by reference to the manufacturer's standard color designations.

E. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.

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.

C. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

D. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Wood: 15 percent.
3. Gypsum Board: 12 percent.
4. Plaster: 12 percent.

E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes acceptance of substrates and conditions.

3.2 PREPARATION, GENERAL

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces.

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 prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.

D. Follow proper procedures, methods, guidelines, and regulations for paint preparation related to lead paint sanding. Wear goggles, NIOSH-approved respirators, rubber gloves, and appropriate clothing.

E. Clean building exterior using pressurized hot water.
1. Clean heavily soiled areas with fiber brush and water.
2. Equip pressure washer with fan tip nozzle of 250 degree minimum.
3. Do not permit water temperature to exceed 180 degrees F.
4. Do not permit water pressure to exceed 1,200 psi.

F. 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 printed directions.

G. Exposed Equipment: Verify installations are complete before initiating preparation of surfaces of exposed mechanical and electrical piping, conduit, ductwork, and equipment for field-painting.

H. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

I. Factory-Primed and Enamel Substrates: Wipe clean and dry.

J. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

3.3 SURFACE PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

B. Steel Substrates: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC) specification SSPC-SP 10 and written instructions of paint manufacturer.
1. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
2. Touch up bare areas and shop-applied prime coats that have been damages. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

C. Galvanized-Metal Substrates: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
   1. Treat exterior galvanized surfaces according to SSPC SP-7 and interior galvanized surfaces to SSPS SP-1.

D. Apply primers to metal surfaces in the field under any of the following circumstances:
   1. Where it can be established that shop primer was applied more than 30 days (7 days for some primers, verify with metal shop) before delivery to the site.
   2. If shop-applied primer is contaminated during transport or storage.
   3. If salts are deposited from marine fog, road salts, construction dusts, etc. during storage.

E. Cementitious Materials: Prepare concrete 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.
   1. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
   2. Treat concrete surfaces which are highly glazed or where traces of form release agents are present with a preparation of one-part concentrated muriatic acid, 4-parts water and one-part detergent or as recommended by parting compound manufacturer. Remove acid with water. Allow to dry.
   3. Remove stains on concrete resulting from weathering or corroded metals, with a solution of 2-oz. sodium methasilicate in one-gallon water. Wet stained areas with water before application of solution. Allow to dry.
   4. 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.

3.4 MATERIALS PREPARATION

A. Carefully mix and prepare paint materials according to manufacturer's directions.

B. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

C. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

D. Use only thinners approved by the paint manufacturer and only within recommended limits.

3.5 APPLICATION

A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

C. Paint colors, surface treatments, and finishes are indicated in the schedules.

D. Provide finish coats that are compatible with primers used.

E. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
   1. Slightly vary the color of succeeding coats.
      a. Do not apply additional coats until the completed coat has been inspected and approved.
      b. Only the inspected and approved coats of paint will be considered in determining the number of coats applied.
   2. Sand and dust between coats to remove defects visible to the unaided eye from a distance of 5 feet.
   3. On removable panels and hinged panels, paint the back sides to match the exposed sides.

F. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

G. 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.

H. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

I. Paint visible surfaces of ducts where visible through registers or grilles with a flat, non-specular black paint.

J. Do not paint fire-treated plywood backboards to be used for telephone or electrical equipment unless permitted by authorities having jurisdiction.

K. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.

L. Omit primer on metal surfaces that have been shop-primed and touch-up painted.

3.6 SCHEDULING PAINTING

A. 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.

B. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

3.7 APPLICATION PROCEDURES

A. Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.

B. Brushes: Use brushes best suited for the material applied.

C. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

D. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

F. Block Fillers: Apply block fillers to concrete at a rate to ensure complete coverage with pores filled.

G. 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.

H. Painted surface shall be considered unacceptable if any of the following are evident under final lighting source (including daylight) for interior surfaces:
   1. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 39-inches (1000 mm).
   2. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39-inches (1000 mm).
   3. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
   4. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.
   5. Coating exhibits lack of full adhesion to surfaces, including but not limited to bubbling, peeling, chipping, and other adhesion defects.

I. Miscellaneous Surfaces and Procedures
   1. Exposed mechanical items
      a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.
      b. Paint visible duct surfaces behind vents, registers, and grilles flat black.
      c. Wash metal with solvent, prime, and apply 2 coats of alkyd enamel.
   2. Exposed pipe and duct insulation
      a. Apply 1 coat of latex paint on insulation which has been sized or primed under other Sections; apply 2 coats on such surfaces when unprepared.
      b. Match color of adjacent surfaces.
      c. Remove band before painting, and replace after painting.
   3. Hardware
      a. Paint prime coated hardware to match adjacent surfaces.
      b. Paint metal portions of head seals, jamb seals, and astragal seals to match the color of the door frame unless otherwise directed by the Architect.
   4. Wet areas
      a. For oil base paints, use 1 percent phencimercuric or 4 percent tetrachlorophenol.
      b. For water emulsion and glue size surfaces, use 4 percent sodium tetrachlorophenate.
   5. Exposed Vents: Apply 2 coats of heat resistant paint approved by the Architect

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.8 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
   1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.9 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. 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.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.10 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.11 PAINT SYSTEMS SCHEDULES

A. Schedule: Only major areas are scheduled. Treat miscellaneous and similar items and areas within room or space with similar system.

B. Number of Coats: Where number of coats are specified, it is only as a minimum requirement. Apply additional coats, at no additional cost to Owner, if necessary to completely hide base material, produce uniform color, and provide satisfactory finish result.

C. Systems Specifications: These specifications are a guide and are meant to establish procedure and quality. Confer with Architect to determine exact finish desired.

D. Acceptance of Final Colors: Do not apply final coats of paint for either exterior and interior systems until colors have been accepted by Architect.

E. Painted surfaces shall be considered unacceptable, as judged solely by the Architect, if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces:
   1. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 39-inches (1000 mm).
   2. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39-inches (1000 mm).
   3. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
   4. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.
   5. Coating exhibits lack of full adhesion to surfaces, including but not limited to bubbling, peeling, chipping, and other adhesion defects.

3.12 EXTERIOR FINISH SCHEDULE

A. References used in this schedule are based on systems described in the Painting and Decorating Contractors of America, Master Painters Institute, Architectural Painting Specification Manual (MPI).

B. Concrete Unit Masonry:
   1. Latex Paint System MPI EXT 4.2A.
      a. Prime Coat: Block filler.
      b. Intermediate Coat: Exterior latex matching topcoat.
      c. Topcoat: Exterior latex (flat).

C. Concrete Unit Masonry and Exposed Exterior Concrete, Clear Sealer:
   1. Products:
      a. L&M Construction Chemicals; Hydropel WB.
      b. Pecora Corporation; 920W.
      c. PROSOCO; Sure Klean Weather Seal GP.

D. Steel – Galvanized (Not Chromate Passivated):
   1. Latex: MPI EXT 5.3A
      a. Prime Coat: Cementitious primer.
      b. Intermediate Coat: Exterior latex matching topcoat.
      c. Topcoat: Exterior latex (semi-gloss).

E. Galvanized Steel Flashings and Sheet Metal (Not Chromate Passivated):
   1. Latex (over Waterborne Primer): MPI EXT 5.3H
      a. Prime Coat: Waterborne primer.
      b. Intermediate Coat: Exterior latex matching topcoat.
      c. Topcoat: Exterior latex (semi-gloss).

F. Steel Pipe Railings:
   1. Polyurethane, Pigmented (over epoxy primer): MPI EXT 5.3L
      a. Prime Coat: Epoxy primer.
      b. Intermediate Coat: Polyurethane matching topcoat.
      c. Topcoat: Polyurethane (gloss).

G. Aluminum:
   1. Latex: MPI EXT 5.4H
      a. Prime Coat: Q.D. primer.
      b. Intermediate Coat: Latex.
      c. Topcoat: Latex (semi-gloss).

3.13 INTERIOR FINISH SCHEDULE

A. References used in this schedule are based on systems described in the Painting and Decorating Contractors of America, Master Painters Institute, Architectural Painting Specification Manual (MPI).

B. Concrete Unit Masonry:
1. Latex Paint System MPI INT 4.2A.
a. Prime Coat: Block filler.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (flat).

C. Steel Stairs and Railings – Primed: High-performance paint; See Sectoin 09 9600.
a. Topcoat: (semi-gloss).

D. Exposed Galvanized Ductwork and Galvanized Plumbing Piping and Conduit (Uninsulated):
1. Institutional Low Odor/VOC: MPI INT 5.3N.
a. Prime Coat: W.B. galvanized primer.
b. Intermediate Coat: Institutional low odor/VOC matching topcoat.
c. Topcoat: Institutional low odor/VOC (flat).

E. Gypsum Board Walls:
1. Latex System: MPI INT 9.2A.
a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (low sheen).

F. Gypsum Board Ceilings:
1. Latex (over latex sealer): MPI INT 9.2A.
a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (flat).

G. Gypsum Board at Toilet Rooms:
1. Latex System: MPI INT 9.2A.
a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (semi-gloss).

END OF SECTION 09 9100

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SECTION 09 9600 – HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Surface preparation and shop-application of high-performance coating systems where indicated on Drawings.

1.3 RELATED SECTIONS

A. Section 05 5000 – Metal Fabrications: Powder coating requirements for metal wall base.

B. Section 05 5213 – Pipe and Tube Railings: Powder coating requirements for pipe and tube railings.

C. Section 08 9100 – Wall Louvers: Powder coated louvers.

D. Section 08 3613 – Sectional Doors: Powder coated sectional doors.

E. Section 09 5423 – Linear Metal Ceilings: Powder coating requirements for metal ceilings.

F. Section 09 9100 – Painting: Priming ferrous metal items.

G. Section 10 4400 – Fire Protection Specialties: Powder coated cabinets.

H. Section 11 9600 – Apparatus Bay Equipment: Powder coated apparatus bay equipment.

I. Section 32 3131 – Security Fences and Gates: Powder coating requirements for fences and gates.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Samples: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

3. For paints, including printed statement of VOC content and chemical components.
4. Product Data Sheets for each product to be used as required by the U.S.G.B.C. as proof that each product meets the requirements of either Green Seal's GS-11 or GC-03 documents.
5. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
6. CDPH Standard Method v1.1 testing report.
7. SCAQMD Rule 1113 compliant VOC testing compliance statement.

1.6 QUALITY ASSURANCE

A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each color and type of coating required. Comply with procedures specified in PDCA P5.
1. Miscellaneous Areas and Items: In area or on item selected.
2. Final approval of finishes will be made from benchmark samples.
3. Approved benchmark samples may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 SITE CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 and 95 deg F (7 and 35 deg C).

B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
1. Allow wet surfaces to dry thoroughly before proceeding with or continuing coating operation.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. VOC Content: Paints and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Paint Materials: Provide only paint materials that meet the requirements of Green Seal documents.

D. Provide interior paint materials having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. SCAQMD Rule 1113 compliant.
3. Declare Label.

2.2 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.

B. Products of the following manufacturers are listed in other Part 2 articles and use the abbreviated names shown in parentheses:
   1. Carboline Company (Carboline).
   2. DuPont Company; High Performance Coatings (DuPont).
   3. Tnemec Company, Inc. (Tnemec).

2.3 EXTERIOR HIGH-PERFORMANCE TOPCOATS

A. Semigloss Polyurethane: Semigloss, aliphatic polyurethane enamel.
   1. Products:
      a. Carboline; 133-HB 2-Component Aliphatic Polyurethane.
      b. DuPont; Imron 326 (13P) Semi-Gloss Polyurethane Enamel.
      c. Tnemec; Series 75 Endurashield Aliphatic Acrylic Polyurethane.

B. Colors: As indicated on Drawings.

2.4 MATERIALS

A. Material Compatibility: For each finish indicated, provide separate component coat materials of one manufacturer 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.

B. Material Quality: Provide manufacturer's best-quality material for each coating material specified.

C. Primer: See Section 05 5000.

D. Intermediate Coat: Epoxy intermediate coat of topcoat manufacturer recommended in writing for use with primer, and topcoat, and substrate indicated under environmental conditions indicated.

PART 3 - EXECUTION

3.1 SHOP APPLICATION

A. General: Application of coatings indicates Applicator's acceptance of surfaces.

B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
   1. If a potential incompatibility of primers applied by others exists, obtain the following from primer Applicator before proceeding:
      a. Confirmation of primer's suitability for expected service conditions.
      b. Confirmation of primer's ability to be topcoated with materials specified.
   2. Notify Architect about anticipated problems before using coatings specified over substrates primed by others.

C. Ferrous-Metal Substrate Surface Preparation: As specified in Section 05 5000.

D. Preparation of Galvanized Steel to receive High-Performance Coating:
   1. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
      a. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
   2. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
   3. AESS Primed Surfaces: Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
   4. Provide barrier coats over incompatible primers or remove primers and reprime substrate.

E. Coating Material Preparation:
   1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
   2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.

F. Coating Application:
   1. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
   2. Apply coatings to exposed surfaces, including areas visible when permanent screen components are in place, and maintain system integrity and provide desired protection.

G. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
   1. Omit primer on metal surfaces that have been shop primed and touchup painted.
   2. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
   3. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
   4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
   5. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.

H. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
   1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
      a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
      b. Brush out and work brush coats into surfaces in an even film.

c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.

2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.

3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
   a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
   b. Apply each coat to provide the equivalent hiding of brush-applied coats.
   c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.

I. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.

J. Prime Coats: Before applying topcoats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
   1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a topcoat with no burn-through or other defects caused by insufficient sealing.

K. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

L. Cleanup: After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods.

3.2 FIELD TOUCH-UP

A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
   1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
   2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

3.3 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 09 9600

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SECTION 09 9729 – CONCRETE FLOOR SEALING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Concrete floor sealer/hardener.

1.3 RELATED SECTIONS

A. Section 03 3000 – Cast-In-Place Concrete: Procedures for curing concrete.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Submit literature and manufacturer's installation instructions.

B. Samples: Submit all materials to be used to the engineer for approval prior to start of work.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For installation coatings, including printed statement of VOC content and chemical composition of each product used.
3. Declare Label: Manufacture’s publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
4. CDPH Standard Method v1.1 testing report.
5. SCAQMD Rule 1113 compliant VOC testing compliance statement.

1.6 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certification that the sealer/hardener compound complies with these specifications.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Experience in the production and use of the product specified. Supply a list of projects where specified products have been used on similar projects with similar jobsite and exposure conditions.

B. Contractor Qualifications: Minimum five years prior experience with the use and application of the specified materials or similar products.

C. Pre-Installation Conference: Conference shall be attended by Contractor, Owner, Architect, sealer subcontractor and his foreman. Review procedures, materials, techniques, and coordinate related work and shutdowns.

D. Mock-up: Before applying curing and sealing compound to entire surface, test a small area to verify that product is providing the desired moisture retention, penetration ability and finish appearance (sheen).
   1. Test a minimum 4 ft. by 4 ft. area on selected area of concrete. Use the manufacturer's application instructions. Let test area protective treatment cure before inspection. Keep test area available for comparison throughout the protective treatment project.

E. Substitutions: Provide request for substitution in writing to Architect for review including the following:
   1. A certificate of compliance from an independent testing laboratory that the proposed substitute product meets or exceeds the specified performance criteria, when tested in accordance with the specified test standards.
   2. Documented proof showing that the proposed substitute has a five year proven record of performance on similar structures under similar exposures.
   3. At least five successful installations which allow the Architect to investigate the condition of the system.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealer in original; unopened containers with the manufacturers name, labels, product identification and batch numbers. They shall be ordered in sufficient quantities and shall be delivered in ample time to facilitate the work.

B. Store and condition the specified product as recommended by the manufacturer. The material shall be stored on the premises where directed.

1.9 SITE CONDITIONS

A. Refer to the applicable manufacturer's written literature for the recommended temperature of surfaces to be sealed and ambient conditions during application and drying.

B. Do not apply material if the substrate is frozen or if freezing conditions are imminent.

C. When using as a curing compound, apply when surface water has completely disappeared and the concrete will not be marred by workmen.

D. Do not apply if rain is expected within 12 hours.

E. Provide suitable coverings to protect adjacent surfaces and objects. Mask finished surfaces for protection. Provide drop cloths, where necessary to adequately protect all surfaces not to be sealed. Mask off adjoining surfaces and close off drains.

F. Do not allow surfaces to become contaminated between coats.

G. Protect sealed surfaces during drying from traffic, damage and contamination.

1.10 SAFETY PRECAUTIONS

A. Verify that manufacturer's Material Safety Data Sheets (MSDS) are accessible on site before applying sealer.

B. Provide adequate forced air ventilation during application of sealer.

C. Avoid contact with eyes and skin; do not ingest or inhale. Prolonged or repeated exposure may cause skin irritation or allergic reactions.

D. Wear goggles, NIOSH and MSHA approved respirators, rubber gloves, and appropriate clothing.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 018113 - Sustainable Design Requirements.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Coatings: Meet the following:
   a. EPA Method 24 testing of less than 40 g/liter
   b. Contains no formaldehyde, formaldehyde precursors and zero-carcinogens
   c. Contains zero hazardous air pollutants (HAP's)

B. Provide concrete floor sealer having the following certifications and labels:
1. CDPH Standard Method V1.1 compliant
2. SCAQMD Rule 1113 compliant.
3. Declare Label.

2.2 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering acrylic sealers that may be incorporated into the Work include, but are not limited to, the following:
1. BASF; MasterKure CC 1315WB.
2. NoxCrete; Cure & Seal 100-300 E.

B. Product: High solids, solvent based, non-yellowing, acrylic copolymer concrete curing, sealing and dustproofing compound.
1. Meeting the applicable requirements of ASTM C1315 Type 1, Class B; ASTM C309; AASHTO M-148.
2. VOC Content: < 350 g/l.
3. Gloss: Semi-gloss.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Comply with manufacturer's printed instructions.

B. Remove all dirt, oil, grease, paint or foreign cure residue with manufacturer's recommended stripping and cleaning agent and clean with a 10% caustic solution, exercising normal precautions for handling such materials.

C. Rinse thoroughly with clean water and allow to dry.

D. Verify that voids and cracks are filled with grout and that ridges and fins are removed leaving a smooth broom trowel finish.

E. Sweep and air blow surfaces to receive floor sealer to remove dust and foreign matter.

F. Check that pipes, vents, drains, and other penetrations of the floor sealer are completed.

G. Ensure surface is clean and dry prior to coating.

H. Do not allow traffic on cleaned surfaces prepared for finish.

3.2 CONCRETE CURING

A. Curing Freshly Placed Concrete: Cure surfaces in accordance with ACI 308. Surface must be finished and show no surface sheen from moisture. Verify surface is able to withstand walking workmen.

B. Sealing Existing Concrete: All surfaces must be structurally sound, clean, and free of dust, dirt, laitance, efflorescence, curing compounds, paint, oil, grease and other contaminants. Prior to application, properly treat and repair surface defects, voids, cracks and joints. Concrete may be damp, but must be free of standing water.

3.3 APPLICATION

A. Apply curing and sealing compound in a uniform, continuous film by sprayer, short nap roller, brush, or push broom.

B. Apply sealer to entire interior floor area indicated unless noted otherwise.

C. Freshly Placed Concrete: Apply a full, even coat of curing and sealing compound at the rates described on the manufacturer's printed literature ensuring complete and uniform coverage of the surface. Use an applicator or roller to pick up puddles or excess material from the surface. If a higher sheen is desired, a second coat may be applied. If the delay between the first and second coat results in contamination of the surface, the surface must be thoroughly cleaned before application of the second coat.

D. Airless Sprayer or Airless Air Assist: Apply at rate recommended by manufacturer. Let dry for at least 30 minutes. Treated products may be "force-dried" using heat when permitted by manufacturer in writing.

E. Sponge or Synthetic Lint-Free Mop: Wet applicator with clean water, then apply a thin coat of sealer. Apply a second coat once the first application is tack-free (about an hour). Do not permit traffic on treated surfaces for minimum 12 hours after application. Protect from water for 24 hours.

3.4 DRYING

A. Allow coated concrete to dry for a minimum of 8-12 hours. Do not open surfaces to foot traffic before dryness is obtained. Maximum surface hardness should develop within 7-10 days.

3.5 CLEANING

A. Clean curing and sealing compound from tools with soap and water following manufacturer's written instructions.

B. Leave finished work and work area in a neat, broom-clean condition without evidence of spillovers onto adjacent areas.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.6 PROTECTION

A. Protect sealed area from traffic for length of time required by manufacturer.

END OF SECTION 09 9729

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SECTION 10 1100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Markerboards with backing and trim.

B. Back-painted marker glass with standoffs.

1.3 RELATED SECTIONS

A. Section 09 2216 – Non-Load Bearing Steel Framing: Backing plate supports for marker boards.

B. Section 09 2900 - Gypsum Board: Gypsum board surface finishes.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's product data for visual display units.

B. Shop Drawings: Provide shop drawings for Visual Display Units. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout and installation details.

C. Samples for Initial Selection: Provide the following samples of each product for initial selection of colors, patterns and textures, as required, and for verification of compliance with requirements indicated.
   1. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.

D. Samples for Verification: For each type of visual display surface indicated and as follows:
   1. Visual Display Surface: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch- (152-mm-) long sections of each trim profile.
   3. Rail Support System: 6-inch- (152-mm-) long sections.
   4. Accessories: Full-size Sample of each type of accessory.

E. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.

2. For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
3. Product Data Sheets for each product to be used as proof that each product meets the requirements of the GREENGUARD Environmental Institute's GREENGUARD certification.
   a. Include printed statement of VOC content and chemical components.
4. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
5. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
6. CDPH Standard Method v1.1 testing report.
7. SCAQMD Rule 1113 compliant VOC testing compliance statement.

1.6 CLOSEOUT SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver factory-built Visual Display Units completely assembled in 1 piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect.

B. 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.

C. Store visual display units vertically with packing materials between each unit.

1.9 SITE CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating visual display surfaces without field measurements. Coordinate wall construction to ensure that actual dimensions correspond to established dimensions.
   2. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.10 WARRANTY

A. Porcelain Enamel Markerboard Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.
   1. Warranty Period: 50 years.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. VOC Content: Adhesives, sealants, paints, welding, and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Provide anchorage of visual display units capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

2.3 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Claridge Products and Equipment, Inc.
2. Platinum Visual Systems; a division of ABC School Equipment, Inc.
3. Accepted equivalent.

2.4 MARKER BOARDS

A. Porcelain Enamel Marker Boards: Provide balanced, high pressure laminated, high gloss porcelain enamel markerboards of 2-ply construction consisting of face sheet, and backing.
1. Basis-of-Design: Chemetal, White Gloss Magnetic Dry Erase 150 Series.
2. Accepted equivalent.
3. Board Color: White, 160.
4. Frame Color: Matte aluminum.

B. Surface: Provide face sheet of magnetic, 24 gauge LCS face over backing. Coat the exposed face and exposed edges with a 3 coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2 coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at the manufacturer’s standard firing temperatures, but not less than 1,200 degrees Fahrenheit.
1. Color: White.

C. Backing: 1/4-inch thick interior type standard underlayment bearing trademark of APA or high quality hardboard as standard with manufacturer.
1. Hardboard: AHA A135.4, tempered.

D. Extruded Aluminum: ASTM B221, Alloy 6063.

E. Adhesive: As recommended by manufacturer.

2.5 TACK BOARDS

A. Natural-Cork Tack Assembly: 1/4-inch-thick, natural cork sheet with vinyl backing, factory laminated to 1/4-inch- (6-mm-) thick hardboard backing.

B. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; of size and shape indicated.
1. Factory-Applied Trim: Manufacturer's standard.

2.6 BACK-PAINTED MARKER GLASS

A. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3, with exposed edges seamed before tempering, and 6 mm thick, unless otherwise indicated.
1. Comply with ANSI Z97.1, and CPSC 16 CFR 1201, Category II.
2. Process in horizontal position so that inherent roller distortion will run parallel to building floor lines after installation.
3. Glass Identification:
a. Apply manufacturer's label indicating type and thickness to each light of glass. Show position of exterior face when installed, where applicable.
b. Etch manufacturer's label on each light of tempered glass.

B. Basis-of-Design Product: The design for the projectable glass marker boards is based on the manufacturer identified below.
1. Basis-of-Design: Skyline Design Glass. Vitracolor 2016-24 with stand-off posts.

C. Characteristics:
1. Single sided marker board.
2. Thickness: 5/16-inch.
3. Laminated safety glass.
a. Safety film is not acceptable as alternative to tempered or laminated glass.
4. Dimensions: As indicated on Drawings.

D. Standoffs:
1. Basis-of-Design: Monarch Metal Fabrication
2. Metal: Stainless steel.
3. Barrel Height: 1-inch.
4. Barrel Diameter: 1-inch.
5. Cap: Standard cap.

2.7 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Assembly: Provide factory-assembled markerboard units, except where field-assembled units are required.

C. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.

D. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.

E. Where the size of boards or other conditions exist that require support in addition to the normal trim, provide structural supports or modify the trim as indicated or as selected by the Architect from the manufacturer's standard structural support accessories to suit the condition indicated.

F. Provide the manufacturer's standard vertical joint system between abutting sections of marker boards.

2.8 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

D. 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.

2.9 MARKER BOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; of size and shape indicated.
1. Factory-Applied Trim: Manufacturer's standard.

B. Chalktray: Manufacturer's standard, continuous.
1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

C. Marking Implements: Provide two new boxes of approved markers and one new eraser for each markerboard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.

B. Examine walls and partitions for proper backing for visual display surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) oc. Secure both top and bottom of boards to walls.
   1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches (600 mm) oc.
      a. Attach chalktrays to boards with fasteners at not more than 12 inches (300 mm) oc.

3.3 ADJUSTING

A. Touch up factory-applied finishes to restore damaged or soiled areas.

3.4 CLEANING

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 10 1100

SECTION 10 2113 – SOLID SURFACE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Solid surface toilet partitions and sight screens, floor-mounted, overhead braced.

B. Additional cross-bracing as . recommended by manufacturer for added strength.

C. Attachments screws and bolts.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 COORDINATION

A. Coordinate work with support framing and anchors.

B. Coordinate work with placement of plumbing fixtures and floor drains.

C. Coordinate work with placement of electrical fixtures and equipment.

D. Coordinate work with toilet accessories.

1.5 ACTION SUBMITTALS

A. Product Data: Submit for components, hardware, and accessories and include the following:
1. Product data sheets.
2. Installation instructions.
3. Cleaning and maintenance instructions.
4. Replacement parts information.

B. Shop Drawings: Indicate partition layout and dimensions, panel and door sizes, door swings, elevations, anchorage and mounting details, and finishes.
1. Show fabrication and erection of compartment assemblies, to extent not fully described by manufacturer’s data sheets.
2. Show anchorage, accessory items and finishes.
3. Provide location drawings for bolt hole locations in supporting members for attachment of compartments.

C. Samples: Submit the following:
1. Scale model of compartments, including stile, shoe, door, door hardware, divider panel, and mounting brackets.

2. Sections showing stile anchoring and leveling devices, concealed threaded inserts, panel, stile, and edge construction.
3. Show locations of reinforcements for compartment-mounted grab bars.
4. Show locations of centerlines of toilet fixtures.
5. Two samples 2 by 3 inches in size illustrating panel colors

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
3. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

1.6 CLOSEOUT SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.7 REGULATORY REQUIREMENTS

A. Conform to CCR, Title 24, Part 2, and ADAAG for accessibility requirements.

B. Conform to flame spread and smoke developed ratings of 20/95 for panel materials when tested in accordance with ASTM E84.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of solid color reinforced composite toilet compartments that do not comply with requirements or that fail in materials, fabrication, or installation within specified warranty period.
1. Warranty Period, Panel System: Furnish ten-year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory fabrication and installation.
2. Warranty Period, Hardware: Furnish one-year guarantee against defects in material, fabrication, and installation for stainless steel door hardware and mounting brackets.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Use materials and products that contain the maximum amount of recycled content allowed that retains material integrity.

B. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

C. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 PERFORMANCE REQUIREMENTS

A. Graffiti Resistance: Provide partition material having the following graffiti removal characteristics when tested in accordance with ASTM D6578/D6578M in accordance with Section 9, “Graffiti Removal Procedure Using Manual Solvent Rubs”:
   1. Cleanability: Five required staining agents shall be cleaned off material.

B. Scratch Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2197, using Gardner Stock #PA-2197/ST pointed stylus attachment on scrape tester:
   1. Scratch Resistance: Maximum Load Value: Exceed 10 kilograms.

C. Impact Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2794, using .625” hemispherical indenter with 2-lb impact weight:
   1. Impact Resistance: Maximum Impact Force Value: Exceed 30 inch-lbs.

D. Fire Resistance: Comply with the following requirements, when tested in accordance with ASTM E84:
   1. Smoke Developed Index: Not to exceed 450.
   2. Flame Spread Index: Not to exceed 75.
   3. Material Fire Ratings:
      a. National Fire Protection Association (NFPA): Class B.
      b. International Code Council (ICC): Class B.
      c. International Code Council (ICC): Class B.

2.3 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Bobrick Washroom Equipment Inc. (Basis-of-Design); www.bobrick.com, 1092.67 Sierra Series with the following adjustments:
      a. 3/4-inch Panels
      b. Floor-mounted, overhead braced.
   2. Toilet partitions constructed of High Density Polyethylene (HDPE) or High Density Polypropylene will not be acceptable.
   3. Color: Graphite Grafix (006F).

B. Toilet-Enclosure Style: Floor-mounted, overhead braced

C. Entrance-Screen Style: . Floor-mounted, overhead braced

D. Urinal-Screen Style: Wall hung.

2.4 SHOWER CUBICLES

A. HDCP Shower: Florestone, wheelchair accessible model 40-62H barrier-free fiberglass shower, Class A flame retarding, with the following:
   1. Outside Dimensions: 39” deep x 62” wide x 78” high.
   2. Stainless steel curtain rod.
   3. Pressure balance mixing valve.
   4. Heavy-duty hand held shower nozzle with chrome plated hose and slide bar.
   5. Stainless steel corner grab bar meeting ASTM F446.
   6. White, folding naugahyde wheelchair transfer seat located as indicated on Drawings.

7. Stainless steel recessed soap dish.
8. Color: White.

2.5 MATERIALS

A. Solid Color Reinforced Composite: Composed of dyes, organic wood fibrous material, and polycarbonate/phenolic resins, with a non-ghosting, graffiti-resistant surface integrally bonded to core.
   1. Edges of Material: Same color as the surface.

B. Stainless Steel: ASTM A666, Type 304.

2.6 HARDWARE

A. Latch and Keeper:
   1. Sliding Door Latch: 14 gauge (2 mm) designed to slide on nylon track and require less than 5-lb force to operate. Twisting latch operation will not be acceptable
   2. Latch Track: Attached to door by machine screws into factory-installed threaded brass inserts.
   3. Threaded Brass Inserts: Factory installed for door hinge and latch connections capable of withstanding a direct pull exceeding 1,500 lbs. per insert.
   4. Use through bolted, stainless steel, pin-in-head Torx sex bolt fasteners at latch keeper-to-stile connections capable of withstanding direct pull force exceeding 1,500 lbs. per fastener.
   5. At compartments designated as accessible, provide pull handle on each side of door centered below latch.

B. Hinges: All hardware to be 18-8, type-304 stainless steel with satin finish, continuous gravity type hinges, adjustable for door close positioning, nylon bearings.
   1. Cam: Field-adjustable to permit door to be fully closed or partially open when compartment is unoccupied.
   2. Hinges: Attached to door and stile by theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts.
      a. Fasteners secured directly into the core are not acceptable.
   3. Furnish door with two 11-gauge (3-mm) stainless steel door stop plates with attached rubber bumpers to resist door from being kicked in/out beyond stile.
   4. Secure door stops and hinges with stainless steel, pin-in-head Torx machine screws into threaded brass inserts.
   5. Provide threaded brass inserts capable of withstanding a direct pull force exceeding 1,500 lbs per insert.
   6. Provide hinges that can be adjusted to fully close door at accessible stalls.

C. Coat Hook:
   1. Coat Hook: Constructed of stainless steel and shall project no more than 1-1/8" (29 mm) from face of door.
   2. Secure coat hook to door by through-bolted, theft-resistant, pin-in-head Torx stainless steel screws. Provide through-bolted fasteners capable of withstanding a direct pull force exceeding 1,500 lbs. per fastener.

D. Finish: Stainless steel; ‘Zamac’, aluminum, or extruded plastic are not acceptable hardware materials.

2.7 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, in-swinging doors with a minimum 34-inch- (863-mm-) wide, clear opening for compartments designated as accessible.

C. Urinal Screens:
1. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.0269 inch (0.7 mm).

D. Finish Thickness:
1. Partition Panels: 1/2-inch (13 mm).
2. Pilasters: 3/4-inch (19 mm).
3. Stiles and Doors: 3/4-inch (19 mm).

2.8 FINISHES

A. Solid Color Reinforced Composite Panel Finish:
1. Facing Finish: One color and pattern in each room.
2. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard solid color reinforced composite core.

B. Stainless Steel Surfaces: No. 4 satin finish.

C. Exposed Steel Surfaces: Polished chrome plated.

D. Aluminum: Clear anodized.

E. Non-ferrous Surfaces: Polished chrome plated.

2.9 ACCESSORIES

A. Plinth: ASTM A666, Type 304 22-gauge (0.8-mm) stainless steel with satin finish, one-piece, 4-inch high, with adjustable screw jack; secured in place with concealed screws and capable of being fastened (by clip) to stiles starting at wall line.
1. Top shall have 90° return to stile.

B. Mounting Brackets and Fasteners: Stainless steel.
1. Mounting Brackets: Continuous type; mounted inside compartment.
2. Use through bolted, pin-in-head Torx sex bolt fasteners at locations connecting panels-to-stiles. Provide bolted fasteners capable of withstanding direct pull force exceeding 1,500 lbs. per fastener.
3. Wall Mounted Urinal Screen Brackets: 11 gauge (3 mm) double thickness.

C. Leveling Device: 7-gauge, 3/16" (5-mm) hot rolled steel bar; chromate-treated and zinc-plated; through-bolted to base of solid color reinforced composite stile.

D. Attachments, Screws, and Bolts: Stainless steel, theft proof type, heavy duty extruded aluminum brackets.

E. Through Bolts and Nuts: Stainless steel with tamperproof heads.

F. Steel Plate Reinforcement: Carbon steel, prepared for fasteners, 1/8 inch thick.

G. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that openings are ready to receive work.

B. Verify field measurements are as shown on shop drawings.

C. Verify correct location of built-in framing, anchorage, bracing, electrical and plumbing fixtures.

D. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch (13 mm).
      b. Panels and Walls: 1 inch (25 mm).
   2. Brackets: Secure panels to walls and to pilasters with continuous brackets using appropriate anchor devices attached at midpoint and near top and bottom of panel.
      a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
   1. Attach panels and pilasters to brackets with through bolts and nuts. Locate headrail joints at pilaster center line.
   2. Provide for adjustment of floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with plinths.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

D. Partition Hardware:
   1. Equip each toilet stall door with top, middle, and bottom hinges, and door latch.
   2. Install door strike keeper on each pilaster in alignment with door latch.
   3. Equip each toilet stall door with one coat hook and bumper.

E. Tolerances:
   1. Maximum Variation from Plumb or Level: 1/8 inch.
   2. Maximum Misplacement from Intended Position: 1/8 inch.

3.3 INSTALLATION, SHOWER COMPARTMENTS

A. Install in accordance with manufacturer's instructions, level and plumb.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Provide chrome plated rigid or flexible supplies to showers with stops appropriate to the installation, reducers, and escutcheons.

D. Install and secure showers in place in accordance with manufacturer’s written instructions.

E. Seal showers to wall and floor surfaces with sealant as specified in Section 07920, color to match fixture.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Plumb or Level: 1/8-inch.

B. Maximum Misplacement from Intended Position: 1/8-inch.

3.5 ADJUSTING

A. Adjust and align door hardware to uniform clearance at vertical edges of doors. Clearance space not to exceed 3/16 inch.

B. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation.
1. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched.
2. Set hinges on doors for accessible stalls to return doors to fully closed position.

3.6 CLEANING

A. Remove protective coverings. Clean surfaces and hardware.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.7 PROTECTION

A. Protection of Finished Work: Field touch-up of finished surfaces will not be permitted. Replace damaged components.

END OF SECTION 10 2113

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SECTION 10 2123 – CUBICLE CURTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Cubicle curtain and supporting track.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Include durability, fade resistance, and fire-test-response characteristics for each type of curtain fabric indicated.
   1. Include data on each type of applied curtain treatment.

B. Shop Drawings: Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
   1. Include details on blocking above ceiling.

C. Samples for Verification: Full-size units of each type of the following products:
   1. Curtain Fabric: 12-inch- (305-mm-) square swatch or larger Sample as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
   2. Mesh Top: Not less than 4 inches (100 mm) square.
   3. Curtain Track: Not less than 4 inches (100 mm) long.
   4. Curtain Carrier: Full-size unit.

D. Cubicle Schedule: Use same room designations as indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: Signed by manufacturers of tracks and curtains certifying that products furnished comply with requirements.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tracks and curtains to include in maintenance manuals specified in Division 1.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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. Curtains: Full-size units equal to 10 percent of amount installed for each size indicated, but not less than 2 units.

1.8 SITE CONDITIONS

A. Environmental Limitations: Do not install cubicles until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where cubicles are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Creative Healthcare Products, Inc.
2. Imperial Fastener Company.
3. Salsbury Industries.

2.2 MATERIALS

A. Ceiling Track: 6063-T5 aluminum, 1-3/8" x 3/4" x .058" wall thickness, furnished with end stops and removable snap-outs.

B. Extruded-Aluminum Track: Not less than 1-1/4 inches wide by 3/4 inch high (31.8 mm wide by 19 mm high); with minimum wall thickness of 0.058 inch (1.473 mm), surface mounted.
1. Curved Track: Factory fabricated 18-inch- (457-mm-) radius bends.
2. Finish: Satin anodized.

C. Curtain Carriers: Two nylon rollers and nylon axle with steel bead chain, and aluminum hook.

2.3 CURTAINS

A. Curtain Fabric: Cubicle manufacturer's standard, as follows:
1. Color: As selected by Architect from manufacturer's full range.
2. Fiber Content: 100 percent polyester, inherently and permanently flame resistant.

B. Mesh Top: No. 50 nylon mesh.

C. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches (152 mm) oc; machined into top hem.

2.4 TRACK FABRICATION

A. Fabricate track to shape and size indicated on Drawings, in one continuous piece wherever possible. Radius corners to be 12 inches.

2.5 CURTAIN FABRICATION

A. Fabricate curtains to comply with the following requirements:

B. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches (305 mm) added fullness.
   1. Length: Equal to floor-to-ceiling height minus 18 inches (460 mm) from finished ceiling at top, and minus distance above finished floor at bottom as follows:
      a. Cubicle Curtains: 12 inches (305 mm).

C. Curtain Hems:
   1. Top Hem: 1-1/2 inch, triple thickness, double lock stitched.
   2. Bottom Hem: 1-1/2 inch, double thickness, double lock stitched.
   3. Side Hems: Not less than 1/2 inch (12.7 mm) and not more than 1-1/4 inches (31.8 mm) wide, with double turned edges, and single lock stitched.
   4. Vertical Seams: Not less than 1/2 inch (12.7 mm) wide, double turned and double stitched.

2.6 ACCESSORIES

A. Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.

B. Attachments, Screws, and Bolts: Stainless steel.

C. Ceiling Reinforcement: Furring channel or steel stud.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that ceiling is ready to receive Work.

B. Verify field measurements are as shown on Shop Drawings.

C. Verify correct location of built-in anchorage, bracing, and ceiling reinforcement.

D. Beginning of installation means installer accepts existing conditions.

3.2 ERECTION

A. Install track secure, plumb and level, according to manufacturer's written instructions.
   1. Curtain Track Mounting: Surface.

B. Surface Track Mounting: Fasten surface-mounted tracks at intervals of not less than 24 inches (610 mm). Fasten support at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as indicated on Drawings.

C. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

D. Provide for adjustment of ceiling variations in accordance with manufacturer's recommendations.

E. Curtain Carriers: Provide curtain carriers adequate for 6-inch (152-mm) spacing along the full length of the curtain plus an additional carrier.

F. Curtains: Hang curtains on each curtain track.

3.3 CLEANING

A. Remove protective coverings. Clean track surface.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.4 PROTECTION

A. Protection of Finished Work: Do not allow construction traffic to pass by curtain once it is hung. Replace damaged components.

END OF SECTION 10 2123

SECTION 10 2813 – 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 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Toilet room accessories of the following types:
1. Paper towel dispenser/trash receptacles.
2. Toilet seat cover dispensers.
3. Toilet paper dispensers.
4. Grab bars at accessible toilet stalls.
5. Sanitary napkin disposals.
6. Soap dispensers.
7. Framed mirror units.
8. Sanitary napkin vendors.
9. Lavatory plumbing insulation.
10. Mop and broom holders at Janitor closets.

B. Shower room accessories of the following types:
1. Shower curtain rods.
2. Shower curtains.
3. Shower curtain hooks.
4. Towel bars.
5. Robe hooks.
6. Shower soap dishes.
7. Reversible seat for accessible showers.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Provide for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

B. Drawings: Identify where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide Product Data for the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Instructions, including replaceable parts and service recommendations.

1.6 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.7 SITE CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.

B. Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

C. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

D. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

E. Galvanized Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.2 FABRICATION

A. General: Only a maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed and Semi-Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation.
   1. Provide galvanized-steel backing sheet, not less than 0.034 inch (22 gage) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror Unit Hangers: Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove that will permit rigid, tamperproof, and theftproof installation.

F. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Apply sealant to perimeter between accessories and wall surface where accessory edge is permanent.

C. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

D. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F446.

3.2 ADJUSTING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

3.3 CLEANING

A. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.4 SCHEDULE – TOILET ROOMS

A. Model numbers used in this schedule are Bobrick unless noted otherwise; other manufacturers of equal quality and function may be accepted subject to Architect's approval.

B. Recessed Paper Towel Dispenser/Trash Receptacle: Model B-43944.

C. Partition Mounted Toilet Seat Cover Dispenser and Toilet Paper Dispensers: Model B-3471; keyed access seat cover dispenser for one dispenser each side; recessed toilet paper holder for two rolls each side of dispenser; adjustable flange.

D. Toilet Paper Dispensers: Model B-686; surface-mounted toilet paper holder for two rolls.

E. Toilet Seat Cover Dispenser: Model B-221, surface-mounted seat cover dispenser.

F. Grab Bars: Toilet compartment horizontal two-wall bars, 1-1/2-inch diameter, one Model Model B-6806 x 36 and one B-6806 x 42, heavy-duty size, concealed mounting using manufacturer's standard flanges and anchorages; smooth, satin finish gripping surfaces.

G. Surface-Mounted Sanitary Napkin Disposal Units: Model B-270.

H. Soap Dispenser: Model B-4063, wall-mounted, recessed dispenser, 50 fluid ounce capacity.

I. Soap Dispenser: Model B-822, lavatory-mounted dispenser, 32 fluid ounce capacity.

J. Stainless Steel Framed Mirror Units: Model B-290; 18" by 42", with 5" shelf.

K. Under-Lavatory Guard: Under-Lavatory Guard: Plumberex; white, antimicrobial, molded closed cell PVC covering with PVC Velcro closure for supply and drain piping assemblies, with weep hole at bottom of J-bend to provide for condensation drainage and air circulation; intended for use at accessible lavatories to prevent direct contact with and burns from piping.

L. Mop and Broom Holder/Utility Shelf: Model B-239 x 34.

3.5 SCHEDULE – SHOWER ROOMS

A. Shower Curtain Rod: Model B-6107, heavy-duty stainless steel shower curtain rod and flanges for wall mounting.

B. Shower Curtain: Model B-204-2, 42” x 72” vinyl shower curtain.

C. Shower Curtain Hooks: Model B204-1, stainless steel hooks.

D. Towel Bars: Gamco Commercial Restroom Accessories; Model 7674, polished stainless steel towel bars.

E. Double Robe Hook: Model B-7672.

F. Shower Soap Dish: Surface mounted dish; Gamco Commercial Restroom Accessories; Model No. 7680.

G. Reversible Shower Seat: Model B-5181, Frame constructed of type-304, satin-finish stainless steel consisting of 16-gauge (1.6mm), 1-1/4" (30mm) square tubing and 18-gauge (1.2mm), 1" (25mm) diameter seamless tubing. One-piece, 1/2" (13mm) thick, solid phenolic seat with matte-finish, ivory-colored, melamine surfaces, and black phenolic-resin core; secured to frame with stainless steel carriage bolts and acorn nuts. Seat shall be reversible for left- or right-hand installation in the field.

END OF SECTION 10 2813

SECTION 10 4400 – FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fire extinguishers and cabinets.

B. Brackets for fire extinguishers.

C. AED units.

1.3 RELATED SECTIONS

A. Section 06 1053 - Miscellaneous Carpentry: Wood blocking and shims.

B. Section 09 2900 - Gypsum Board: Roughed-in wall openings.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.6 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
   1. Fire Extinguishers: Include rating and classification.

B. Samples for Verification: For verification purposes in of each type of cabinet finish indicated, and each color, texture, and pattern specified prepared on Samples of size indicated below.
   1. Size: 6 by 6 inches (150 by 150 mm) square.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
   3. Product data and material safety data sheets (MSDS) for clean-agent fire-extinguishing systems indicating absence of HCFC and Halon.

1.7 INFORMATIONAL SUBMITTALS

A. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Provide extinguishers which are UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. Fire Extinguishing Agent: Provide clean agent which does not contain halons or HCFCs.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Larsen's Manufacturing Company; Architectural Series.
2. J.L. Industries, Inc., a division of Activar Construction Products Group; Cosmopolitan Series.

2.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
1. Sheet: ASTM B209.
2. Extruded Shapes: ASTM B221.

C. Stainless-Steel Sheet: ASTM A666, Type 304.

D. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

2.4 EXTINGUISHERS

A. Dry Chemical Type: UL 299, cast steel tank, with pressure gage; UL Rating 2A-10B:C.

2.5 CABINETS

A. Semi-Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
   1. Configuration: Semi-recessed projection type, 4 inch rough opening depth, sized to accommodate accessories.
   2. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.

B. Door Style: Vertical duo panel with frame.
   1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
      a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER".
         1) Location: Applied to cabinet door.
         2) Application Process: Silk-screened.
         3) Lettering Color: Red.
         4) Orientation: Vertical.

C. Door Glazing: Acrylic sheet.
   1. Acrylic Sheet Color: Clear transparent acrylic sheet.

D. Door Material: Formed, enameled 18 gage, hollow metal design, reinforced for flatness and rigidity. Provide fire rated tubs where cabinets are to be installed in 1-hour rated areas.

E. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Handle: Manufacturer's standard.
   2. Hinge Type: Continuous, of same material and finish as trim, permitting door to open 180 degrees.
   3. Lock: Steel cam type designed to permit opening of the cabinet door in and emergency by pulling sharply on the handle.
      a. Factory Applied Lettering: "IN CASE OF FIRE ONLY - PULL FIRMLY ON HANDLE".

F. Cabinet Mounting Hardware: Manufacturer's standard for cabinet.

2.6 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   1. Color: Red.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
      a. Orientation: Vertical.

2.7 AED CABINETS

A. Cabinet with Steel Trim and Door:
1. Basis-of-Design Product: Physio-Control, Fire Rated AED Wall Cabinet with Alarm; SKU No. 11210-000026
2. Zoll Technologies.
3. Accepted equivalent.

B. Cabinet Style: Semi-recessed.
1. Components:
a. Tub: Cold-rolled steel
1) Finish: Factory-applied powder coat paint finish.
2) Color: White.
b. Door and Trim Construction: Cold-rolled steel; flush doors with 5/8 inch (15.88 mm) door stop attached by continuous hinge and equipped with zinc-plated with roller catch.
1) Finish: Factory-applied powder coat paint finish
2) Color: White.
c. Door Style: Full Tempered Glazing; Pull & AED Decal.
d. Trim Style and Depth: Semi-recessed cabinet
1) Square Edge: 1-1/2 inch (38.10 mm).
e. Fire-Rating: Fire-Rated for 1-hour and 2-hour combustible and noncombustible wall systems.
f. Alarms: Standard: 85 db (audible) cabinet-mounted alarm standard (battery operated) to protect against theft or tampering. Alarm deactivated when door is closed.
g. Wall Signs and Cabinet Lettering: AED wall signs; manufacturer's standard.

2.8 DEFIBRILLATORS

A. Testing: IEC60529/EN60529 IPX4 "Splash Proof", MIL STD-810E Shock testing.

B. Device Capacity: 20 full discharges or 140 minutes of "on time" with a fully charged device.
1. Output Energy Sequence: Multiple levels, configurable from 150 joules to 360 joules. Factory default settings of 200J, 300J, 360J.
2. Output Energy Accuracy: ±10% into 50 ohms, ±15% into 25 to 100 ohms.
3. Shock Charge Time: Charge times with a fully charged device: 200 joules in less than 9 seconds, 360 joules in less than 15 seconds.
4. Electrical Protection: Input protected against high voltage defibrillator pulses per IEC60601-1/EN60601-1.
5. Safety Classification: Internally powered equipment; IEC60601-1/EN60601-1.
6. The specifications apply from 25 to 200 ohms. Voltage compensation is limited to the voltage that would result in delivery of 360 joules into 50 ohms.

C. Prompting: Audible and visual with graphic.
1. Shock Advisory System: An ECG analysis system that advises whether a shock is appropriate; meets rhythm recognition criteria specified in DF39. The device charges for shock only when the Shock Advisory System advises defibrillation.

D. Controls: Lid Release/ON-OFF - Controls device power.

E. Data Storage: Device stores ECG data for wireless transmission to a personal computer. ECG and event data can be downloaded.
1. Memory Type: Internal digital memory.
2. ECG Storage: Dual patient data storage. Minimum 20 minutes of ECG stored for the current patient, summarized data stored for the previous patient.

3. Capacity: Minimum 200 time-stamped event log markers.

2.9 DEFIBRILLATOR ACCESSORIES

A. Battery Charger: Type: Li/SO2Cl2 Lithium Sulfuryl Chloride, 11.7V, 1.4 amp-hours.

B. Electrode Pads:
1. Pads: ECG is received from disposable defibrillation electrodes, standard placement (anterior-lateral).
2. Pads Packaging: User intuitive, rapid release QUIK-PAK electrodes allow the electrode pads to be preconnected to the device and protected under a top cover.

2.10 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.
a. Provide factory-drilled mounting holes.

B. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim accurately.

C. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Miter and weld perimeter door frames.

D. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

E. Hinge doors for 180 degree opening with continuous piano hinge. Provide cam latch.

F. Weld, fill, and grind components smooth.

2.11 FINISHES

A. Extinguisher: Steel, red enamel color.

B. Cabinet Exterior Trim and Door: White baked enamel finish; painted to match adjacent wall surface.

C. Cabinet Interior: White, baked enamel finish; paint to match adjacent wall color.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify rough openings for cabinet are correctly sized and located.

B. Identify locations intended for installation of cabinets.

C. Notify Fire Marshal to allow inspection and adjustment of final locations of extinguishers. Obtain approval of locations from Fire Marshal prior to installation.

D. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 27 inches from finished floor to inside bottom of cabinet.

C. Install fire-rated cabinets in rated wall as required to maintain fire separation integrity of partition.

D. Attach mounting brackets and fire extinguisher cabinets securely to studs or backing plates, square, plumb and level, in compliance with their manufacturer's instructions; do not attach to gypsum board with Molly or toggle bolts.

E. Secure rigidly in place.

F. Touch-up damaged finish, when the results are acceptable to the Architect, otherwise replace damaged components, at no cost to the Owner.

G. Place extinguishers in cabinets.

3.3 ADJUSTING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

D. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.4 CLEANING

A. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 10 4400

SECTION 10 5113 – METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Special fire station type heavy duty metal lockers with metal base, sloped tops, hardware, hooks, latches and attachment hardware, and infill panels as required for complete finished installation. Types to include:
   1. Fixed lockers with secure box and door.
   2. Fixed lockers with secure box, without door.
   3. Mobile lockers with secure box and door.
   4. Mobile lockers with secure box, without door.
   5. Location(s): Apparatus Building 2. See Drawings for layout.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's data including materials, accessories, construction finishes, assembly, and installation instructions.

B. Shop Drawings: Show layout and dimensions of lockers. Indicate relationship to adjoining surfaces. Show locker elevations and details, fillers, trim, base, sloping tops, and accessories. Include locker numbering sequence. Indicate installation and anchorage requirements.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.

B. Protect lockers from damage during delivery, handling, storage, and installation.

PART 2 - PRODUCTS

2.1 TURN-OUT LOCKERS

A. Fixed Locker System Description: Provide special fire station (Turnout) type heavy duty metal lockers with metal base, sloped tops, hardware, hooks, latches, attachment hardware, and infill panels.
   1. Basis of Design: GearGrid Wall Mount Lockers, 24” width, 24” depth, and 75” height (jumbo size with custom locker depth), and matching free-standing double sided lockers with legs, anchored to slabs.
   2. Provide name plate, three hooks, top shelf, stainless steel jacket holder, hanging rod, and two heavy duty hangers
   3. Lockers: Single tier types as indicated.
      a. Base: Recessed, "Z" type closed metal base.
      b. Fillers: Provide filler panels to close off openings between lockers and between lockers and adjacent construction.
   4. End Panels: Flush with no exposed fastener end panels at exposed locations.
   5. Doors:
      a. At Fire Station: No door.
      b. Secure Doors at Trainee Lockers: 1-¼” heavy-duty tubing with ¼” high-strength steel wire grid infill. 3″ x 3″ square grid pattern
   6. Provide anchorage of free-standing lockers to slab using methods that comply with California Building Code seismic restraint loading requirements for free-standing shelving systems.
   7. Finish: Powder coat, Black.

B. Mobile Locker System:
   1. GearGrid 8-pack unit having four openings on each side back to back
      a. 18” unit overall dimensions: 83” high x 75” wide x 39” deep
   2. Locker Size: Jumbo 24”
      a. Opening: Overall dimension – 79” high x 25.25 wide x 20” deep.
      b. Clear Opening Width: 22.75”
   3. Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.
   4. Doors:
      a. At Fire Station: No door.
      b. Secure Doors at Trainee Lockers: Framed wire grid to match locker sides and backs.
   5. Vertical Dividers:
      a. Outer Frames: 1.25” O.D. x 16 gauge wall thickness ASTM A513 steel tubing.
      b. Inner Grid: .25” diameter ASTM 510 cold drawn steel wire resistance welded to a 3” square pattern.
      c. Inner Grid wires must be full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable.
      d. Inner Grid wires must run horizontally and vertically creating a square or rectangular grid pattern only. Grid wires not creating a square or rectangular grid pattern will not be acceptable.
      e. Inner Grid wires shall intersect and cross all perpendicular wires, and shall be welded at all intersections.
   6. Back Panel:
      a. Required on each locker to protect the locker contents and wall substrate, as well as provide an additional panel for accessory attachment.

b. Grid: .25” diameter ASTM 510 cold drawn steel wire resistance welded to a 3” square pattern.
c. Back panel must engage and be secured to vertical dividers via horizontal wires which extend into mounting holes pre-drilled in vertical dividers. Back panels are sandwiched between vertical dividers, preventing them from being removed after assembly is complete.
d. Inner Grid wires must be full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable.
e. Inner Grid wires must run horizontally and vertically creating a square or rectangular grid pattern only. Grid wires not creating a square or rectangular grid pattern will not be acceptable.
f. Inner Grid wires shall intersect and cross all perpendicular wires, and shall be welded at all intersections.

7. Shelves: (1) Upper, (1) Lower. .25” diameter ASTM 510 cold drawn steel wire resistance welded and cold formed. Upper shelf includes a 20 gauge steel bracket to accept a 2” x 16” name placard.
8. Apparel Hooks: (3) per locker opening. .192” diameter ASTM 510 cold drawn steel wire resistance welded, cold formed and powder coated. Apparel hooks must securely engage and snap onto side or back grid, to prevent unintentional disengagement of hook.
9. Base Assembly: Base frame shall be manufactured from 1.25” x 11 gauge wall thickness ASTM A513 square steel tubing. Each unit to be supplied with four (4) casters per unit. Casters to have a 250 lbs. capacity per each caster. Each caster is a swivel model with brake.

C. Secure Box: Where indicated on Drawings provide the following:
1. 6” wide x 6” high x 12” deep 6061 Aluminum enclosure with hinged, lockable door at outer end. Design shall include an integrated mail slot. Powder coated finish in specified color.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A36/A36M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

B. Galvanized Steel Sheet: ASTM A653/A653M, commercial quality, G60 (Z180) coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
1. Body and Shelf: Minimum 16 gage.
2. Exposed Ends: Minimum 16 gage.
3. Frames: Minimum 16 gage.
4. Metal Base: Minimum 16 gage.
5. Metal Top: Minimum 16 gage.
6. Filler Panels: Minimum 16 gage.

C. Continuously Sloping Tops: Manufacturer's standard steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers. Provide fasteners, filler plates, supports, and hipped-end type closures.

D. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

2.3 HARDWARE

A. Number Plates: Manufacturer's standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch (9 mm) high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

B. Legs: Provide nominal 6-inch- (152-mm-) long legs by extending vertical frame members, or by attaching gusset-type legs to locker body. Fabricate legs from at least 0.0598-inch- (1.50-mm-) thick steel sheet, with provision for fastening to floor, and finished to match lockers.

C. Closed Front/End Bases: Steel sheet, manufacturer’s standard thickness, without overlap or exposed fasteners, finished to match lockers.

2.4 FABRICATION

A. Unit Principle: Fabricate each locker with an individual frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.
   1. Bodies: Form backs, tops, bottoms, sides, and intermediate partitions of flanged sheet steel.
   2. Finish edges smooth without burrs

B. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, one-piece assembly.
   1. Form locker-body panels, shelves, and accessories from one-piece steel sheet, unless otherwise indicated.

2.5 FINISHES, GENERAL

A. Clean, degrease, neutralize, and finish with manufacturer's standard process.

B. Provide pre-finished lockers, flat and free of scratches and chips.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard powder-coat finish consisting of a thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 1.4 mils (0.036 mm) on doors, frames, and legs, and 1.1 mils (0.028 mm) elsewhere.
   1. Color and Gloss: As selected by Architect from manufacturer's full range.

E. Ensure exposed and semi-exposed joints are tight and true.

F. Fabricate corners, end panels, and fillers as required by installation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect delivered lockers and return any damaged items.

B. Inspect surfaces where lockers are to be installed and verify field conditions for installation are satisfactory. Report any discrepancies or layout variations to Contractor prior to commencing installation.

C. Do not begin installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lockers and accessories in accordance with approved Shop Drawings and manufacturer's installation instructions.

B. Install metal lockers and accessories level, plumb, rigid, and flush according to manufacturer's written instructions.

C. Install metal bases, end panels, and filler panels to close off openings and as required for complete installation.

D. Connect locker groups together with standard fasteners according to manufacturer's recommendations, with no exposed fasteners.

E. Anchor lockers to floors and walls at intervals recommended by manufacturer, but not more than 36 inches (910 mm) oc. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

F. Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

G. Anchor locker case to wall studs through locker back panel and to base through locker floor.

H. Benches: Secure bench pedestals to floors and benches to pedestals in accordance with manufacturer’s recommendations and installation instructions.
1. Space pedestals maximum 72" on center.

3.3 ADJUSTING

A. Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

B. Attach number plates in sequence indicated on Shop Drawings.

3.4 CLEANING

A. Clean interior and exposed exterior surfaces and nonferrous-metal surfaces.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 PROTECTION

A. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.

END OF SECTION 10 5113

SECTION 10 7313 – AWNINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Retractable metal awnings and support framework.

1.3 RELATED SECTIONS

A. Division 26 for electrical connections.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Submit for components, hardware, and accessories.
   1. Motorized Operators: Include operating instructions.
   2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Indicate dimensions, anchorage and mounting details, and finishes.
   1. Motorized Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
   2. Wiring Diagrams: Power, system, and control wiring.

C. Samples for Final Selection: Submit manufacturer's standard range of samples illustrating colors available.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   3. For priming and sealing coatings, including printed statement of VOC content and chemical components.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Service: Provide as a separate bid amount the cost for annual maintenance contract providing service 'on demand' for repair and maintenance as may be generally anticipated for the conditions of this project.

B. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

1. Methods for maintaining awning operators.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.
4. Motorized operator.

1.7 QUALITY ASSURANCE

A. 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.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
1. Steel: Average recycled content of steel to be a minimum 60 percent.
2. Aluminum: Average recycled content of aluminum to be a minimum of 70 percent.

B. VOC Content: Adhesives and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 8113 - Sustainable Design Requirements.
1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MATERIALS

A. Basis-of-Design Product: Markilux 3300 PUR Cassette Awning with wall seal.
1. Finish: Non-standard powder-coated finish to match Kelly-Moore Spectramaster Red.
2. Product Number: 1050-555

2.3 FABRICATION

A. Fabricate awnings to shape and size indicated on Drawings, in one continuous piece.

B. Provide end closures where indicated on Drawings.

C. Pre paint framework in shop prior to delivery to site to greatest extent possible.

2.4 ACCESSORIES

A. Attachments, Screws, and Bolts: Stainless steel.

B. End Closures: Same material as awnings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that walls are ready to receive Work.

B. Verify field measurements are as shown on Shop Drawings.

C. Verify correct location of built-in anchorage, bracing, and reinforcements.

D. 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.

E. Beginning of installation means installer accepts existing conditions.

3.2 ERECTION

A. Erect in accordance with manufacturer's instructions.

B. Install framework secure, plumb and level.

C. Attach framework securely to exterior wall using appropriate anchorage devices.

D. Provide for adjustment of wall surface variations in accordance with manufacturer's recommendations.

E. Connections: Connect motorized operators to building electrical system.

F. Field touch-up paint on framework where damaged by erection procedures.

3.3 ADJUSTING

A. Replace damaged components.

3.4 CLEANING

A. Clean installed framework and awning fabric. Remove construction dust by methods recommended by manufacturer.

B. Ensure that components and fabrics are clean at time of Substantial Completion.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain awing operator. Refer to Division 1 Section “Demonstration and Training."

END OF SECTION 10 7313

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SECTION 10 7343 – TRANSPORTATION STOP SHELTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Manufactured bus shelter structure, including primary aluminum framing, secondary aluminum framing, wind and seismic lateral force resisting systems, and associated structural steel and connections.
2. Bracing and stiffening elements not shown on the Contract Drawings but required by the Building Manufacturer in their design.
3. Furnishing anchor bolts and setting templates for installation under Section 03 3000.
4. Engineering design, including preparation of submittals required for Agency review and Building Permit.
5. Glass wall and roof panels.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including but not limited to primer and paint.

B. Shop Drawings:
1. Indicated assembly dimensions, size and locations of structural members, connections, attachments, openings, penetrations, cambers, stiffeners, type and size of bolts and welds, surface preparation and finish including painting, show methods of assembly. Indicate seismically critical connections.
   a. Show connection details.
   b. Show connection to foundation details to scale, minimum 1"=1'-0".
      1) Indicate required embedment lengths for anchor bolts and other connection elements embedded in concrete, show dimensioned plan and elevation location, indicate embedded item dimensions.
2. Shop drawings, specifications and calculations are to be provided and signed and sealed by a California licensed (current) structural engineer as specified below.

C. Furnish complete structural design drawings and calculations for review by Architect and submittal to regulatory agency having jurisdiction.
1. Drawings and calculations shall bear the stamp and “wet signature” of a Professional Engineer, licensed in the State of California, who was in responsible charge for their preparation.
2. Furnish in sufficient quantities for submission to regulatory agency and review by the Architect.

3. Include plan diagram showing building reactions to foundations. For each reaction location, identify the magnitude and direction of reaction for each load case considered; do not combine load cases.
4. Calculations shall include the following:
   a. Design criteria.
   b. Acceptance criteria.
   c. Load tables.
   d. Loading diagrams clearly illustrating type, magnitude, and extent of load on structure and structural members for each load type and load case. Do not include load types and load cases that are trivial or obviously do not control.
   e. Force, reaction, and deflection diagrams clearly illustrating type, magnitude, and location of internal forces, reactions, and deflections for each load type and load case. Do not include for load types and load cases that are trivial or obviously do not control.
   f. Computer analysis summary reports.
   g. Identify controlling loads and analysis results.
   h. Included demand to capacity ratios or other means of illustrating structural demand and structural capacity at critical members and connections.
   i. Identify computer programs used in structural analysis.
   j. Summary of forces to foundations.
      1) Include total corresponding vertical and horizontal forces based on applicable load combinations in chapter 16 of the 2016 CBC.
      2) List largest magnitude corresponding vertical and horizontal reactions and associated load combination for each column.
      3) Include in list the corresponding vertical and horizontal reactions for load combination equation 16-21 of the 2016 CBC; 0.9D + E/1.4. When determining the reactions based on this load combination the vertical component of the earthquake force, Ev, shall be taken as 0 (zero), per 2016 CBC section 1605.3.2.
5. Make provisions to be available to provide clarifications to questions from judiciary agencies, including DSA.

D. Samples for Verification: For each type of exposed finish required.
   1. Polycarbonate Panels: Nominal 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
   2. Flashing and Trim: Nominal 12 inches (300 mm) long. Include fasteners and other exposed accessories.
   3. Accessories: Nominal12-inch- (300-mm-) long Samples for each type of accessory.

1.5 INFORMATIONAL SUBMITTALS

A. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.

1.6 COORDINATION

A. Provide metal templates and setting drawings for installation of anchorage items embedded in other work.

B. Furnish embedded anchorage items to avoid delays to other Work.

C. Coordinate delivery and erection with requirements for painting. Refer to Section 099100 for painting requirements.

D. Coordinate installation of bracing elements with installation of interior finishes.
   1. Anticipate minimizing initial erection of final bracing elements that conflict with interior wall finishes.
   2. Anticipate temporarily removing final bracing elements to permit installation of interior wall finishes.
   3. Anticipate installing new, and reinstalling removed, bracing elements after installation of interior wall finishes.

1.7 QUALITY ASSURANCE

A. Manufacturer: The company manufacturing the products specified in this Section shall have a minimum of 10 years' experience in the manufacture of steel building systems.

B. Structural framing shall be designed, stamped and signed by a Structural Engineer, licensed in the state of California and experienced in design of this work.

C. Erector shall have specialized experience in the erection of steel building systems for a period of at least 10 years.

D. Regulatory Requirements: Abide by the codes listed on Drawings, including NFPA 13 and 2016 CBC.

E. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to bus shelter installation including, but not limited to, the following:
      a. Condition of foundations and other preparatory work performed by other trades.
      b. Structural load limitations.
      c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
      d. Required tests, inspections, and certifications.
      e. Unfavorable weather and forecasted weather conditions.
   2. Review methods and procedures related to bus shelter assemblies including, but not limited to, the following:
      a. Structural limitations of purlins and rafters during and after roofing.
      b. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
      c. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
      d. Temporary protection requirements for bus shelter assembly during and after installation.
      e. Wall observation and repair after bus shelter erection.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for the bus shelter is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: Columbia Equipment Company.

A. Components:
1. Framing: Aluminum, 2-1/2” x 2-1/2”.
2. Finish: As selected by Architect from manufacturer’s full color palette.

B. Roof Design: Molded acrylic skylight dome, translucent white.

C. Base: 4-inch external adjustable base flange.

D. Window Frames: Extruded aluminum with alignment lip on outside surface of shelter and continuous vinyl gasket to capture glazing within frame system.

E. Glazing: 1/4-inch Plexiglas.
1. Color: Clear.

F. Benches: Independent freestanding style, seat only.
1. Material: Aluminum.

G. Light Fixtures: Incandescent RAB VX-100 watt vandal-resistant, outdoor fixture with Lexan Lens, power-reducing diodes and tamperproof screws. (With a Lexan lens maximum wattage recommended is 75 watts).

PART 3 - EXECUTION

3.1 ERECTION

A. Erect bus shelter in accordance with manufacturer’s written instructions.

B. Level bearing plate area with steel wedges or shims, and grout. Check all previously placed anchorages.
1. Use hot dipped galvanized or stainless steel wedges or shims where wedges or shims are left in place.

C. Erect building frame true and level with vertical members plumb and bracing properly installed. Maintain structural stability of frame during erection.

D. Install Plexiglas panels as indicated on Drawings.

3.2 TOLERANCES

A. All work shall be performed by experienced workmen in a workmanlike manner to published tolerances.

3.3 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 10 7343

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SECTION 10 7500 – FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Aluminum flagpole, ground mounted, with integral lighting.

1.3 RELATED SECTIONS

A. Section 03 3000 – Cast-in-Place Concrete: Concrete base and foundation construction.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
   1. Include section, and details of foundation system for ground-mounted flagpoles.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

E. Deferred-Approval Submittal: Approval of shop drawings and calculations by DSA is required.
   1. Contract shall submit engineered shop drawings for this specific project; wet-stamped and signed by a qualified professional engineer licensed in the State of California, showing layouts, elevations, attachments to structure, component attachments, and component properties.
   2. Provide 2 sets of drawings, full size, including DSA-specific signature block for drawings to be accepted by the Design Professional in general responsible charge but prepared by others.

3. Contractor shall submit engineering calculations indicating code compliance of the system depicted in the Shop Drawings, 2 sets, wet-stamped and signed.
4. No components of the system may be installed until Shop Drawings and calculations are approved by DSA. Contractor shall allow a minimum of 6 weeks in their schedule for DSA review and approval (not including review time for Architect specified in Division 1). Contractor shall allow for one re-submittal specifically to address DSA comments (not including Architect's review of comments which may have been provided previously).

F. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of aluminum entrances and storefront systems that are similar to those indicated for this Project in material, design, and extent.

C. Engineering Responsibility: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of California.

1.9 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

B. Protect flagpole and accessories from damage and moisture.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
1. Steel: Average recycled content of hot-rolled steel to be a minimum 70 percent post-consumer recycled content.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
1. Seismic Loads: According to SEI/ASCE 7. See Structural Drawings.
2. Wind Loads: According to SEI/ASCE 7. See Structural Drawings.
3. Base flagpole design on nylon flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
   a. Flagpole with Flag Flying: Resistant without permanent deformation to 95 miles/hr wind velocity; non-resonant, safety design factor of 2.5.
   b. Flagpole without Flag: Resistant without permanent deformation to 145 miles/hr wind velocity; non-resonant, safety design factor of 2.5.

2.3 MANUFACTURERS

A. Basis-of-Design Product: The design for the flagpole is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: American Flagpole – IRW40D Series.
2. Eder Flagpole Company.
3. U.S. Flag & Flagpole Supply, LP.

2.4 MATERIALS

A. Aluminum: ASTM B221, 6063 alloy, T6 temper.

B. Steel: ASTM A53/A53M, Type S, Grade B.

2.5 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

B. Exposed Height: 40 feet measured from nominal ground elevation.

C. Aluminum Flagpoles: Provide entasis-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).

D. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.
1. Provide flashing collar of same material and finish as flagpole.

E. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
1. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.

2. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.
3. Halyard: 1/8 inch diameter stainless steel aircraft cable.

F. Lighting System: American Beacon Light
1. Electrical: 110V system, LED lighting, UL Listed.
2. Finish: Spun gold aluminum

2.6 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M-36, corrugated 16 gage steel, galvanized, depth of 48 inches as recommended by manufacturer.

B. Pole Base Attachment: Tube; spun aluminum flash collar.

C. Lighting Ground Spike: Steel, welded to plate at bottom of tube sleeve.

2.7 MISCELLANEOUS MATERIALS

A. Sand: ASTM C33/C33M, fine aggregate.

B. Elastomeric Joint Sealant: Single-component nonsag urethane joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, for Use O.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ACCESSORIES

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
1. Aluminum, 0.063-inch (1.6-mm) spun aluminum, finished to match flagpole.

B. Flags:
1. U.S. design, 5 by 8 feet, nylon fabric, brass grommets, hemmed edges.
2. State of California, 5 by 8 feet, nylon fabric, brass grommets, hemmed edges.
3. City of Hayward, 5 by 8 feet, nylon fabric, brass grommets, hemmed edges.

C. Cleats: 9 inch size, aluminum with stainless steel fastenings, two per halyard.

D. Connecting Sleeve For Multiple Section Poles: Same material of pole, precision fit for field assembly of pole, concealed fasteners.

E. Primer: Zinc chromate type.

2.10 METAL FINISHES

A. Pole: Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

B. Finial Ball: Gold Anodic Finish: AAMA 611, AA-M32C22A43 Class I, 0.018 mm or thicker; gold color.

C. Metal Surfaces in Contact with Concrete: Asphaltic paint.

D. Concealed Steel Surfaces: Galvanized to ASTM A123/A123M 1.25 oz/sq ft.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings and as instructed by the manufacturer.

B. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

C. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

D. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

E. Place concrete, as specified in Division 3 Section "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.

F. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.3 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to approved shop drawings and manufacturer's written instructions.

B. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

D. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as indicated on Shop Drawings.

E. Electrically ground flagpole installation.

F. Fill foundation tube sleeve with dry sand and compact.

G. Install foundation plate and wood centering wedges for flagpoles base set in concrete base and fasten.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.5 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

3.6 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 10 7500

SECTION 10 8113 – BIRD CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Bird control devices of the following type(s):
1. Bird spikes.
2. Bird wire deterrent.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Include details of dimensions, profiles, and finishes.

B. Shop Drawings: Provide details of connections, including proposed fastening methods of control devices to eaves, parapets, storefronts, and flashings where required by Drawings.

C. Samples: Submit the following:
1. 12-inch long sample of bird control material.
2. Color charts for base strip color selection.
3. Each type of hardware and fastening devices.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

1.5 QUALITY CONTROL

A. Installer Qualifications: Engage an experienced installer who has specialized in installing bird control systems similar to those required for this Project and who is acceptable to manufacturer.

B. Single Source Responsibility: Obtain bird control systems from one source and from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Provide storage to keep shipping boxes dry, clean and undamaged. Do not stack or place other packaging on the shipping boxes.

B. Keep product in original packaging until time of installation.

1.7 SITE CONDITIONS

A. Field Measurements: Verify installation surfaces by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish surface dimensions and proceed with fabricating bird control devices without field measurements. Coordinate construction to ensure that actual surface dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. BirdMaster Bird Control Systems.
   2. Bird Barrier America, Inc.
   3. Bird B Gone.
   4. Nixalite of America, Inc.

2.2 MATERIALS

A. Wires: 316 stainless steel, 0.041-inch (1mm) diameter, full-hard spring temper, 250,000 lbs. / in. (44,645 kg/cm) tensile strength.

B. Base Strip: 316 stainless steel, 0.25-inch wide x 0.02-inch-inch thick (6.3mm x 0.5mm), fully annealed.

C. Spikes: Basis-of-Design: Nixalite, Model S, including mounting hardware.
   1. Dimensions: 4” H x 4” W.
   2. Stainless steel.
   3. Layout: As indicated on Drawings.

D. Bird Wire Deterrent: Basis-of-Design: Nixalite, FliteLine Post and Wire Bird deterrent.
   1. Stainless steel posts, springs, flite bases and cable.
   2. Cable: 1x7 stainless steel.
   3. Layout: As indicated on Drawings.

2.3 ACCESSORIES

A. Anchorage Devices: Stainless steel mounting clips, anchors, nails and hardware recommended by manufacturer for type of substrate to receive bird control units.

B. Finish: Natural stainless steel finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces are ready for installation. Do not proceed until unsatisfactory conditions have been corrected.

B. Clean installation surfaces thoroughly. Remove all bird droppings and related refuse. Surface must be clean and dry before installation.

C. Verify all surface finishing is complete before installation of bird control devices. Do not apply any surface finishes to installed control devices or mounting hardware.

D. Remove or relocate all plants or foliage that overhang installation surfaces.

3.2 INSTALLATION

A. Install bird control devices in accordance with manufacturer's written installation instructions.

B. Cover the entire installation surface indicated on Drawings, not just the outer edges. Bird control devices must follow all angles and contours closely.

C. Cut strips where necessary to fit the surface properly. Gaps in the bird control coverage are not permitted.

D. Fasten bird control devices to the surface with mounting hardware recommended by the manufacturer. Follow hardware spacing guidelines and installation procedures supplied by manufacturer.

E. Inspect finished installation and make adjustments as required to conform to manufacturer's recommendations.

3.3 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 10 8113

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SECTION 11 3100 – APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Refrigeration appliances.

B. Cooking appliances.

C. Cleaning appliances.

1.3 RELATED SECTIONS

A. Division 22: Water and gas plumbing connections; garbage disposal.

B. Division 23: Hood and vent connections.

C. Division 26: Electrical connections.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each appliance required. Provide complete operating and maintenance instructions.

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For appliances, documentation indicating that products are ENERGY STAR rated.

1.6 INFORMATIONAL SUBMITTALS

A. Schedule: Use the same room designations as shown on Drawings.

1.7 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain appliances from a single manufacturer.

B. Energy Ratings: Provide appliances that carry labels indicating energy cost analysis (estimated annual operating costs) and efficiency information as required by Federal Trade Commission.
1. Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

C. UL and NEMA Compliance: Provide electrical components that are listed and labeled by UL and comply with applicable NEMA standards.

D. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of the American Gas Association (AGA) and comply with ANSI Z21-Series standards.

E. Regulatory Requirements, Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and California Title-24.

F. AHAM Standards: Provide appliances that conform to the following standards of the Association of Home Appliance Manufacturers:

PART 2 - PRODUCTS

2.1 REFRIGERATION APPLIANCES

A. Full Size Refrigerator/Freezer: GE Appliances; Model No. GNE29GMKES.
1. Configuration: French Door.
2. Temperature Management System: TwinChill Evaporators
3. Defrost Type: Frost Guard
4. Control Type Internal electronic digital temperature display.
5. Dispenser: Non-dispenser
6. Icemaker: Factory-installed.
7. Water Filtration: Advanced filtration system (RPWFE)
8. Filter Location: Left wall.
9. Fresh Food Cabinet Drawers:
   a. 1 full width
   b. 2 adjustable humidity
10. Fresh Food Cabinet Shelves
    a. 4 spill proof
    b. 4 split adjustable, 1 fill width
    c. Total: 5, glass.
11. Fresh Food Door Bins: 4 adjustable with gallon storage, 6 total.
12. Fresh Food Features:
    a. Freezer Storage Baskets: 2 full width
    b. Freezer Features: interior lighting – 2 LEDs
    c. Exterior Style: Free standing
    d. Leveling System: 2 front leveling legs
    e. Performance Features: Easily removable door gaskets.
13. Total Capacity: 28.5 cu ft
14. Fresh Food Capacity: 19.3 cu ft
15. Freezer Capacity: 9.2 cu ft
16. Color: Slate.
17. Dimensions: 36-1/4” D x 69-7/8” H x 35-3/4” W.

B. Undercounter Refrigerator/Freezer:
1. Type: Under the counter, one-door refrigerator with inside freezer compartment.
2. Appliance Color: Stainless steel.

C. Ice-Making Machine:
1. Basis-of-Design: ICE-O-Matic;. GEMU090-Pearl Self-Contained Ice Machine.

a. Description: Undercounter unit.
2. Basis-of-Design: ICE-O-Matic; ICE1406
a. Description: Large, freestanding unit.
b. Power Requirement: 60 Hz.
c. Dimensions: 48.25" (1,226 mm) wide x 24.25" (616 mm) deep x 26" (660 mm) high.

2.2 COOKING APPLIANCES

A. Freestanding Gas Range: Wolf range, Model C72SC-6B36GN. Provide with capability for coordination with station alerting system for emergency shut-off.
1. Width: 72 Inches
2. Depth: 41 Inches
3. Height: 58 Inches
4. Oven Interior Width: 26 3/8 Inches
5. Oven Interior Depth: 24 - 27 Inches
6. Oven Interior Height: 13 7/8 - 14 Inches
7. Voltage: 115
8. Burner BTU: 30,000
9. Burner Style: Grates
10. Control Type: Manual
11. Gas Inlet Size: 1 Inches
12. Griddle BTU: 60,000
13. Griddle Location: Right
14. Griddle Size: 36 Inches
15. Installation Type: Freestanding
16. Made in America: Yes
17. Maximum Temperature: 500 Degrees F
18. NSF Listed: Yes
19. Number of Burners: 6
20. Number of Ovens: 2
21. Number of Racks: 5
22. Oven BTU: 35,000
23. Power Type: Natural Gas
24. Range Base Style: Convection Oven
25. Standard Oven
26. Total BTU: 310,000
27. With Griddle: Yes

B. Hood Ventilator: Wolf Range Hood Model PW602418, 1500 CFM remote blower with remote wall-mounted blower speed controller. One (1) required.

C. Microwave Oven: TBD

D. Range Hood: Vent-A-Hood Model PRH-18-466 (66” wide, 24” deep, 18” high), 1200 CFM double B200 Dual Blower with VP563 duct transition, remote wall-mounted blower speed controller, optional overhead canopy cover flush to ceiling and VP555 wall louver.

2.3 CLEANING APPLIANCES

A. Built-In Dishwasher: Under-counter automatic dishwasher with porcelain enamel interior, two wash levels, full-extension vinyl-coated upper and lower dish racks and removable silverware basket, sized to replace 24-inch base cabinet.
1. Product: Bosch 800 Series, Model No. SGE68U55UC
2. Noise: 44 dBA.
3. Water softener.

4. Watts: 1300W
5. Amps: 12.
6. Volts: 120V
7. Energy Star qualified.
8. ADA Compliant.
9. Required cutout size : 32 1/8 " H x 24 " W x 24 " D
10. Overall appliance dimensions: 32 1/16 " H x 23 9/16 " W x 22 9/16 " D.
11. Finish: Stainless steel.

B. Washing Machine: Pellerin Milnor Corporation; 30015-T5X Short Base; The Extractor.
1. Machine Dimensions: 34.5 W x 48.6 D x 56.43 H.
2. Capacity: 40 lbs.
3. Cylinder Volume: 6.14 cu ft.
4. Cylinder Diameter x Depth: 30" x 15"
5. Motor – HP (kW) 4 (2.98).
6. Wash Speed – RPM 38
7. Distribution Speed – RPM 65
8. Extraction Speed – RPM 573
9. Extraction G-Force 140
10. Static Weight – lbs (kg) □ 1144 (519)
11. Max. Dynamic Load RMS – lbs (kg) □ 1085 (492)
12. Frequency (Hz) 10
13. Water Pressure (Required) – psi (bar) 5-75 (0.34-5.17)
14. Water Valve Cv Rating – gal/min (L/min) 1.5 (5.7)
15. Minimum Recommended Distance
16. Between Machines – ins (mm) 6 (152.4)

2.4 FINISHES

A. Finish: Provide residential appliances in the manufacturer's standard porcelain enamel finish.

B. Colors: Provide manufacturer's standard colors as shown or scheduled. If no color is indicated, provide stainless steel.

C. Wherever appliances by more than one manufacturer are installed in same space, provide units with color matching item designated by Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions and recommendations.

B. General: Comply with manufacturer's written instructions.

C. Install appliances in a secure manner, to solid blocking, in accordance with the recommendations of the manufacturer. Provide all materials and labor required for utility connections for the appliances.

D. Install work level, and plumb, with all moving parts operating freely. Where special fastenings, adhesives, lubricants or like materials are required, supply as recommended by the manufacturer of the equipment.

E. 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.

F. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

G. Where exact locations are not indicated, or special heights for mounting are required, install as directed by the Architect in the field.

H. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

I. Utilities: See Divisions 22 and 26 for plumbing and electrical requirements.

J. Protect finish surfaces of adjacent materials with tape, paper or other materials. Make fastenings as inconspicuous as possible. Remove sharp edges or burrs. Make final adjustment of moving parts immediately prior to final inspection of the work of the Project.

3.2 ADJUSTING

A. 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.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components

C. Upon completion of installation and hook-up of equipment, put each item through a complete operating cycle and verify that all equipment is properly installed and properly operating; verify that all trim is in place; adjust all components as necessary to ensure continued operation.

3.3 CLEANING

A. Remove all labels from the equipment and remove all packing materials from the job site.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 11 3100

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SECTION 11 5213 – PROJECTION SCREENS

PART 1 - GENERAL

1.1 PROJECT DESCRIPTION

A. Project is a fire training center with classrooms and training spaces for emergency responders.

B. Project is located in Hayward, CA.

C. The following spaces require audiovisual installation under this scope of work:
   1. Classroom Presentation Systems
      a. Building 1: Classrooms 110, 115, 218
      b. Building 2: Classroom 105
   2. Apparatus Bay 106 (Building 2)

D. This section includes:
   1. Motorized projection screens

1.2 DEFINITIONS

A. “Provide”
   1. Furnished, designed, engineered, installed, certified, and tested by the Contractor

B. “Bidder”
   1. Integrator/installer bidding on included scope of work

C. “Contractor”
   1. Successful audiovisual Bidder contracted to provide included scope of work

D. “Consultant”
   1. WSP

E. “Owner”
   1. City of Hayward

F. “Architect”
   1. Ross Drulis Cussenbery

G. “AV Drawings”
   1. (“T” Series)

H. “OFE”
   1. Owner-furnished Equipment: Supplied by Owner, installed and/or integrated by the Contractor as required to meet the functionality as described in this specification section

1.3 SCOPE OF WORK

A. Refer to this specification section and AV Drawings for included work.

B. Refer to Division One, general conditions and the following specification sections and drawing series for related work:
   1. Architectural
   2. Interiors
   3. Telecommunications
   4. Security
   5. Electrical

1.4 CONTRACTOR RESPONSIBILITY

A. Provide complete and functioning projection screens. Furnish all labor, equipment, materials, supplies, cabling/wiring, and final connections. Perform all operations necessary to complete the installation.
   1. The contractor is to provide all of the required materials, with the exception of equipment identified as “owner-furnished” or “OFE.” The contractor is to install and integrate all required materials to meet the functionality as described in this specification section, including owner-furnished equipment, whether specifically addressed in this specification section or not.
   2. The components described in this document are to be provided free of any engineering, manufacturing, installation, or operational defects.
   3. Installation is to adhere to all relevant building and government codes, whether local, regional, or national. Where multiple codes apply, the more stringent of these codes is to be adhered to.

B. Site Conditions
   1. Verify site conditions, including all conduit sizes/routing, clearances, and dimensions. Coordinate the exact location of equipment with conceptual location plan drawings and field conditions.
   2. Immediately report to the Owner any design or installation conflicts or irregularities that may interfere with functionality or performance of projection screen that appropriate action may be taken.
   3. Clean up and dispose of all trash on a regular basis from all Contractor work areas. Separate rubbish, recyclable, and reusable materials as described in Division 01: General Requirements.

C. Coordination with other trades and divisions
   1. Cooperate with all appropriate parties in order to achieve well-coordinated progress with the overall construction completion schedule and acceptable final result.
   2. Provide and/or coordinate with General Contractor any penetrations of ceilings, walls, floors, furniture, or millwork as required.
   3. Watch for conflicts with the work of other divisions on the job and execute, without claim for additional payment, moderate moves or changes as necessary to accommodate the work of others and to preserve architectural symmetry and pleasing appearance.

D. Associated Work
   1. Do all cutting, patching and painting necessary for proper and finished installation of the system and repair any damage done as a result of the installation.
   2. Structural
      a. Verify any mounting or suspension details for components have been properly vetted through a licensed structural engineer. Where no stamped structural drawings have been provided, retain, at Contractor’s cost, a licensed structural engineer to design and document all mounting and suspension systems associated with components.
      b. Coordinate with project structural engineer for attachment points and methods.
   3. Millwork

a. Coordinate audiovisual system components with millwork as required. Do all cutting, patching and painting necessary for proper and finished installation of the system and repair any damage done as a result of the installation.

4. Mechanical
   a. Verify that no mechanical supply or return ducts and diffusors are immediately adjacent to projection screens. Notify Consultant if supply diffusors are within 48” of projection screen surface.

E. Documentation
1. Provide and deliver submittal documentation as outlined in Part 1 of this specification section.

F. Testing and Adjustments
1. Participate in acceptance testing with Consultant and/or Owner.
2. Provide final adjustments as required to meet specification.

G. Training and Support
1. Provide training and support as outlined in Part 3 of this specification section.

1.5 QUALITY ASSURANCE

A. Codes and Standards
1. Codes: Refer to Division 01: General Requirements.
2. Standards: Refer to Division 01: General Requirements

B. Should the Contractor, at any time, discover a discrepancy between this specification section and the project documents, with respect to significant variance between location(s), violation of code requirements, or any other discrepancies, the Contractor is to notify the Owner, in writing, for clarification prior to continuation of work in question.

C. The Contractor is to notify the Owner, in writing, of any difficulties that may prevent proper coordination or negatively impact the agreed-upon schedule.

1.6 CONSTRUCTION SUBMITTALS

A. Shop Drawings
1. Submit shop drawings to the Owner and/or Consultant as PDF files, or in the preferred format of the Owner, for Consultant review, and confirm receipt of document files with Owner. Allow at least (2) weeks for Consultant review for each submittal package.
2. Prior to ordering and/or fabrication, submit drawings for all custom equipment pertaining to the projection screens. This includes, but is not limited to the following:
3. No portion of the work is to commence until the Owner and/or Consultant has approved the pre-fabrication submittals in writing.
4. All documents submitted for approval are to identify the name of the project, the Contractor’s name and contact information, date submitted, and list of documents transmitted.
5. Locations shown on AV Drawings are approximate. Base shop drawings on actual equipment, installation, and field conditions. Where possible, make equipment and field measurements prior to the preparation of shop drawings, fabrication and installation to ensure proper fit and function of the equipment. However, this requirement is not to delay the progress of the work. Allow for trimming and fitting wherever the taking of field, or other measurements, before fabrication might delay the work. Failure to coordinate equipment details with site conditions and designated equipment locations is to be the responsibility of the Contractor.

6. The review and approval of shop drawings is to be general only and does not relieve the Contractor from responsibility for proper design, engineering and installation; for deviations from the specifications or drawings due to field conditions; conflict with the work of others that may result from such deviations; or for errors of any sort.
7. Shop drawings are to include and clearly identify any proposed modification of the specifications or drawings.
8. Shop drawings are to include and clearly identify the addition of any items not detailed herein, but necessary to provide a properly functioning and complete system.

1.7 PERMITS AND INSURANCE

A. Procure and pay for all necessary permits, licenses, inspections, and observe any requirements stipulated therein.

B. Comply with all applicable federal, state, and local labor regulations, as well as any applicable local union and trade regulations.

C. Provide evidence of insurance for the full value of equipment and materials located on site. Insurance will cover all loses prior to full Owner acceptance. Maintain additional liability insurance to protect the supplier and/or Owner against damage claims for personal injury or death that may occur during the installation of this work.

D. All equipment and materials is to be fully insured against loss or damage from vandalism, theft, fire, etc.

E. A certificate of insurance for Workman's Compensation and Liability for all personnel is to be provided to the Owner and be kept on file.

F. Keep insurance in full force up until acceptance of the system by the Owner or until the Owner relieves the Contractor in writing of this responsibility, whichever is earlier.

1.8 GUARANTEES AND SERVICE

A. The integrator is to guarantee all systems, equipment and components free of defects in materials and workmanship for a period of one (1) year from the date of acceptance. Repair and replace such items within forty-eight (48) hours following report of defects by the Owner.

B. All manufacturers' equipment warranties are to be activated in the Owner's name to commence on the date of system acceptance. In the case of Contractor modified equipment, the manufacturer's warranty may be voided. In such cases, provide a warranty equivalent to that of the original manufacturer.

C. The Contractor is to be available on call and on twenty-four (24) hour notice without cost to the Owner during the two weeks of operation following acceptance of the system by the Owner to assist him or his representative in any operational problems that may arise during this initial period of operation.

1.9 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with Owner and/or General Contractor regarding construction schedule.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PROJECTION SCREENS

A. Equipment and materials supplied are to be complete, model numbers accurate, and performance is to conform to manufacturer's specifications. All equipment is to be obtained from the original equipment manufacturer.

B. All equipment and materials are to be new and conform to applicable provisions of the standards listed below:
1. American National Standards Institute (ANSI)
2. Electronic Industries Association (EIA)
3. Institute of Electrical and Electronic Engineers (IEEE)
4. Underwriters Laboratories (UL)

C. Motorized components are to operate on a 110 to 120 volt, 60 Hz electrical supply, unless otherwise noted.

D. Repair or replace any items damaged during installation.

E. Substitutions and Modifications
1. Subsequent to bid award, changes in the form of substitutions and modifications to the system may be permitted. Submit a written proposal for the substitution or modification to the Owner, which are to include, as applicable, manufacturer's specifications, descriptive data, laboratory test data and/or the proposed design. Identify all substantive differences between the proposed change and the specifications.
2. Where proposed changes alter functional, spatial, electrical/electronic, or other aspects of the system as specified, appropriately detail such alterations in the proposal.
3. Include any and all cost changes to the contract price for materials and labor necessary to implement the change.
4. Do not implement any changes without prior approval. The Owner reserves the right to accept or reject any proposed changes to the specification. If changes are implemented without prior approval, and are rejected as "not as specified", all costs to correct or "undo" the change, so as to comply with the specifications, is the responsibility of the Contractor.

2.2 MOTORIZED, CEILING RECESSED, FRONT PROJECTION SCREENS

A. Classrooms:
1. Premier: Electric motor operated, pentagonal-shaped steel case, tab tensioned. Metal roller mounted on rubber isolation mounts. Case for sizes through 12 feet x 12 feet AV, 200 inch NTSC, 184 inch HDTV and 189 inch 16:10, is one piece 22 gauge steel with end caps forming universal wall or ceiling hanging bracket. Case for sizes above 12 feet x 12 feet AV, 200 inch NTSC, 184 inch HDTV and 189 inch 16:10, consists of a curved front and L-shaped back/top cover fabricated of extruded aluminum, with endcaps forming ceiling hanging bracket. Case and tensioning dowel finished in flat black.
a. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
b. Motor Screen Controls, UL certified.
1) Low voltage control unit with three button 24V switches and cover plate to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
c. System Options:
1) Case finished black (standard).

d. Projection Viewing Surface: Mildew resistant 100 percent vinyl with black masking borders and 12 inch black drop.
   1) Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing.
e. Tab-Tensioning System:
   1) Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.
f. Viewing Area H x W. Black masking borders standard. 12 inch black drop standard.
   1) HDTV Format (16:9).
   2) Classroom 110, 115, 105: 161 inch diagonal, 79 inches x 140 inches
   3) Classroom 218: 106 inch diagonal, 52 inches x 92 inches

2. Acceptable Material: Draper Premier
3. Acceptable Material: Da-Lite

B. Apparatus Bay

1. Electric motor operated, pentagonal-shaped steel case, tab tensioned. Metal roller mounted on rubber isolation mounts. Case for sizes through 12 feet x 12 feet AV, 200 inch NTSC, 184 inch HDTV and 189 inch 16:10, is one piece 22 gauge steel with end caps forming universal wall or ceiling hanging bracket. Case for sizes above 12 feet x 12 feet AV, 200 inch NTSC, 184 inch HDTV and 189 inch 16:10, consists of a curved front and L-shaped back/top cover fabricated of extruded aluminum, with endcaps forming ceiling hanging bracket. Case and tensioning dowel finished in flat black.
   a. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
   b. Motor Screen Controls, UL certified.
      1) Low voltage control unit with three button 24V switches and cover plate to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
   c. System Options:
      1) Case finished black (standard).
   d. Projection Viewing Surface: Mildew resistant 100 percent vinyl with black masking borders and 12inch black drop.
      1) CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors.
   e. Tab-Tensioning System:
      1) Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.
   f. Viewing Area H x W. Black masking borders standard. 12inch black drop standard.
      1) HDTV Format (16:9).
      2) 193 inch diagonal, 94-1/2 inches x 168 inches
2. Acceptable Material: Draper Premier
3. Acceptable Material: Da-Lite

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Locations indicated on drawings are generalized and approximate. Verify locations with architectural and other relevant drawings prior to installation. Check for adequacy of headroom and non-interference with other equipment such as ductwork, pipes, light fixtures, etc. Report conflicts to the Owner and/or Consultant so that appropriate action may be taken before proceeding with associated work.

B. Keep a complete set of drawings on the job. Note any changes or modifications made during installation and submit to the Consultant for review one corrected set of reproducible drawings showing the work as installed.

3.2 INSTALLATION REQUIREMENTS

A. General
1. All equipment is to be installed per manufacturer documents and recommendations.
2. Locate all equipment requiring adjustments, cleaning, service, or similar attention so that it will be accessible for such attention.
3. All equipment, enclosures, boxes, cabinets, wireways, and related wiring is to be plumb and square, and held firmly in place.
4. Equipment specified herein is designed to operate in environments of normal humidity, dust and temperature. Provide appropriate protection for equipment and related wiring where extreme environmental conditions may occur.
5. Installation of all work, including components and cabling, is to be clean, neat, and organized.

B. Mounting
1. All equipment is to be permanently attached to the structure and held firmly in place. Furnish and install brackets, braces and supports as required with a safety factor of at least three (3).
2. Fabricate and install supports so that the completed installation does not weaken or overload the building structure. Do not impose the weight of equipment of fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joist, slabs or structural steel, nor welding to structural steel is permitted without prior written approval by the Owner.
3. Verify location of structural mounting, backing, and reinforcement points prior to installation of suspended and surface-mounted equipment.
4. Provide trim/escutcheon hardware for any hardware passing through finished ceilings. Trim hardware is to be finished to match the approved ceiling finishes. Verify color of trim components with Owner and/or Architect prior to ordering or installation.
5. Classrooms: Mount so that bottom of screen is at 48” AFF.
6. Apparatus Bay: Confirm desired mounting height of bottom of screen with Owner prior to ordering and installation.

C. Backboxes/Enclosures
1. Backboxes and enclosures are to be rigidly and securely mounted to the building structure. Wiring contained in them is to be accessible. Install blanking devices or threaded plugs in all unused holes.
2. Clean all interiors thoroughly before installing plates, panels or covers.

3.3 VERIFICATION

A. Make all adjustments and modifications necessary so that the system is operational and functions as intended herein.

END OF SECTION 11 5213

SECTION 11 8126 – PORTABLE DAVITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Design and supply of portable davits for window washing and maintenance at Building 8.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Provide construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
   1. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show layout and configuration of complete window cleaning and suspended maintenance system, including all components and accessories. Clearly indicate design and fabrication details, window "drops", hardware, and installation details.
   1. Include installation and rigging instructions and all necessary Restrictive and Non-Restrictive Working Usage Notes and General Safety Notes.
   2. Provide shop drawings that have been reviewed by a professional engineer, and upon request, include complete calculations or test reports.
   3. Wiring Diagrams: Power, system, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Submit 1 copy of system Equipment Manual & Inspection Log Book, with "Initial Inspection - Certification for Use" and "Inspection Sign-Off" forms completed.
   2. Submit 2 copies of a reduced plastic laminated as-built shop drawing showing equipment locations and details. This drawing is to be posted near exits onto the roof.

1.6 QUALITY ASSURANCE

A. Manufacturer: Work of this Section to be executed by manufacturer specializing in the design, fabrication and installation of window cleaning and suspended maintenance systems having a minimum of 5 years documented experience.

B. Loading and Safety Assurance: Work of this Section to meet the requirements of governing codes and jurisdiction and to comply with properly engineered loading and safety criteria for the intended use.

C. Insurance: Manufacturer to carry specific liability insurance (products and completed operations) in the amount of $2,000,000 to protect against product or system failure.

D. Welding to be executed by certified welders in accordance with AWS requirements.

E. 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.

F. References:
1. AISC S342L-1993, with Supplement No.1 "Load and Resistance Factor Design Specification for Structural Steel Buildings".
2. AISI SG-971-1996, with 2000 Supplement "Specification for Design of Cold-Formed Steel Structural Members".
3. Aluminum Association AA ADM-1-Aluminum Design Manual, 2000 and AWS D1.2-97 Structural Welding Code - Aluminum.
4. AWS D1.1-2000 Structural Welding Code - Steel.
5. ANSI/IWCA I-14.1-2001 Window Cleaning Safety Standard (International Window Cleaning Association).

1.7 REGULATORY REQUIREMENTS

A. Comply with the following California State regulation: Code of Regulations, Title 8 - Industrial Relations, Article 5 (Window Cleaning), Article 6 (Powered Platforms for Exterior Building Maintenance), and Appendix C to Article 6 (Personal Fall Arrest System).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design Factor: Designed with an ultimate design factor greater than 2.6:1 for all components including the lifting winch and base.

B. Portability: Davit crane shall break down into transportable components.

C. Lift Capacity: Davit crane shall have a variable lift capacity based on boom length, to vary between 3000 pounds lift capacity with the boom in the shortest length, and 2400 pounds with the boom fully extended.

D. Hook Reach: Boom shall telescope up to 5 different lengths allowing a maximum hook reach of at least 112 inches measured from mast center to hook center when boom is horizontal.

E. Hook Height: Hook height shall be fixed or adjustable by moving the boom up or down between 0 and 40 degrees above horizontal, with a minimum of 87 inches between the lowest position and the highest position with the boom fully extended.

F. Boom Angle: boom angle shall be fixed or adjustable with a hand operated screw jack acting to raise or lower the boom between 0 and 40 degrees above horizontal.

G. Boom Sheave: Wire rope shall pass over a sheave at the end of the boom. Sheave shall have a bronze bearing.

H. Clearance: Minimum height of the boom shall be 62 inches between mounting surface and the underside of the boom in all base configurations.

I. Rotation: Boom and outer mast shall rotate 360 degrees on tapered roller bearings and needle bearings, with a rotational handle attached to outer mast to facilitate rotation. Outer mast shall lock in one of 30 degree incremental positions with locking pin. Rotational stop option shall limit rotation in 30 degree increments.

J. Fastening Pins: Crane components shall be fastened together using stainless steel clevis style pins.

K. Nametag: Labeled with a non-corrosive metal identification plate labeled or imprinted with the manufacturer's name, model number, serial number, capacity rating, and other essential information.

L. Design window cleaning and suspended maintenance system to suit building and in accordance with plans, specifications, standards, and applicable local codes and regulations.

M. Design all anchor components to provide adequate attachment to the building and suited to current window cleaning and suspended maintenance practices. Ensure compatibility with industry standard equipment.

N. Ensure all anchor components conform to proper engineering principles and have been designed by a Professional Engineer qualified in the design of window cleaning and suspended maintenance equipment, its application and safety requirements.

O. Design system to comply with State of California structural requirements for such equipment.

2.2 MANUFACTURERS

A. Product: Thern, Inc.; Admiral Series 5PT30.

B. Other manufactured products meeting this specification may be substituted provided that manufacturers show proof of product insurance.

C. Not Allowed: Companies not normally engaged in the design and manufacture of window cleaning and suspended maintenance equipment.

D. Crane Base: Interface: crane base shall allow for removal of the mast.

E. Material: Crane boom, mast and base shall be fabricated from steel meeting ASTM standards.
   1. Finish: crane shall have a 3 step epoxy finish consisting of a primer, an epoxy coat, and a top coat of polyurethane.

F. Lifting Winch: winch shall have worm gearing operating in an enclosed oil bath, spur gearing, and a positive load holding spring set electrically released motor brake able to stop and hold the load automatically if winch operation is halted.

G. Motor: motor shall be totally enclosed non-ventilated or fan cooled, with antifriction bearings and Class B insulation minimum. Motor shall be reversible with torque characteristics suitable for the hoist service and capable of operating at specified loads. Motor at rated frequency shall be capable of operating within 10% of rated motor voltage.
   1. Voltage: 110 V AC

H. Lifting Winch: Winch shall have machine cut gears, an adjustable handle that mounts securely to the drive shaft, bronze and radial ball bearings, and a positive load holding Weston style brake able to stop and hold the load automatically if the winch handle is released.

I. Wire Rope:
1. Wire Rope: wire rope construction shall be 7 x 19 type 316 stainless steel cable.
2. Hooks: latch type hooks shall be used and shall be either non-rotating eye type or swivel type to allow 360 degree rotation under all load conditions. Hooks shall be heat treated drop forged type 316 stainless steel.

2.3 FABRICATION

A. General: Fabricate work true to dimension, square, plumb, level and free from distortion or defects detrimental to appearance and performance.

B. Grind off surplus welding material and ensure exposed internal and external corners have smooth lines.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas upon which the work of this Section depends. Report to the Contractor in writing, defects of work prepared by other trades and other unsatisfactory site conditions which would cause defective installation of products, or cause latent defects in fabrication, installation, and function.

B. Verify site dimensions.

C. Commencement of work will imply acceptance of prepared work.

3.2 INSTALLATION

A. Install equipment in accordance with approved shop drawings and manufacturer's recommendations.

B. Coordinate installation with work of related trades.

C. Install all work true, level, tightly fitted and flush with adjacent surfaces as required.

3.3 FINAL ADJUSTING AND INSPECTION

A. Adjust and leave equipment in proper working order.

B. Complete "Initial Inspection - Certification for Use" form included in Equipment Manual & Inspection Log Book.

3.4 TESTING

A. All anchorage systems relying upon chemical adhesive fasteners to be 100% tested on site using load cell test apparatus in accordance with manufacturer's recommendations.

3.5 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 11 8126

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SECTION 11 9600 - APPARATUS BAY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Interior equipment located in Apparatus Bay or adjacent:
   1. Mobile cylinder tank storage racks.
   2. Mobile hose cart racks.

B. Exterior apparatus equipment:
   1. Wall-mounted ladder storage racks.

1.3 RELATED SECTIONS

A. Section 10 5113 – Metal Lockers.

B. Section 11 3100 – Appliances: Extractor.

C. Section 14 5300 – Fire Pole.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Provide apparatus bay equipment capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1.6 ACTION SUBMITTALS

A. Product Data: Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for apparatus bay equipment.

B. Shop Drawings: Show fabrication and installation details for apparatus bay equipment, including upright-to-shelf/arm connections, lateral bracing, and attachments to other work. Include plans, elevations, sections, details, and relationship to other work.

C. Samples for Verification: For the following components, of size indicated below.
   1. Uprights: 12 inches (305 mm) long.
   2. Shelves: Full size, but not more than 24 inches (610 mm) wide by 12 inches (305 mm) deep.
   3. Brackets: Full size.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For apparatus bay equipment to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Shelves: Six full-size units for each type of shelving indicated.
   2. Clamps: Thirty units for each type of shelving indicated.
   3. Brackets: Sixteen units for each type of shelving indicated.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain apparatus bay equipment through one source from a single manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver apparatus bay equipment palleted, wrapped, or crated to provide protection during transit and Project-site storage.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install apparatus bay equipment until spaces are enclosed and weatherproof, wet work in spaces is completed and dry, and ambient temperature is being maintained at the levels indicated for Project when occupied for its intended use.

1.12 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of apparatus bay equipment attached to wall assemblies.

B. Coordinate locations and installation of apparatus bay equipment that may interfere with ceiling systems including lighting, HVAC, and sprinklers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for the apparatus bay equipment is based on the product named.
   1. Basis-of-Design, Gear Storage: GEARGRID or Ready-Rack.; Wall Mounted Red Rack; Model RRWM-6/24 and floor mounted units.

2.2 GEAR STORAGE RACKS

A. General: Factory-formed, field-assembled, wall-mounted, gear storage racks; with fixed shelf located above gear hanging area. Fabricate shelf units so each unit is independent.

1. Frame Members: Steel tube.
2. Uprights: Steel tube.
3. Shelves: Woven steel wire mesh
4. Overall Unit Width: As indicated on Drawings.
5. Overall Unit Depth: As indicated on Drawings.
6. Overall Unit Height: As indicated on Drawings.
7. Finish: Baked enamel, color to be selected.

2.3 FIRE POLE

A. Product: See Section 14 5300.

2.4 EXTERIOR WALL-MOUNTED LADDER RACK

A. Basis-of-Design: VertiRack Vertical Ladder Racks or accepted equivalent.
   1. Description Wall-mounted vertical ladder racks of height and spacing indicated on Drawings.

2.5 MATERIALS

A. Steel Wire: ASTM A853.

B. Galvanized Steel Wire: ASTM A641/A641M.

C. Mesh: 0.192-inch diameter, intercrimped and woven steel wire, securely clinched to frame members.

D. Post-installed Expansion Anchors in Concrete: With capability to sustain, without failure, a load equal to 4 times the load imposed, as determined by testing per ASTM E488/E488M, conducted by a qualified independent testing agency.
   1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition (mild).

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching foot plates for shelving units, and with capability to sustain, without failure, a load equal to 10 times that imposed by shelving systems, as determined by testing per ASTM E1190, conducted by a qualified testing and inspecting agency.

2.6 FABRICATION

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Fabricate apparatus bay equipment square and rigid with uprights plumb and true, and components flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a 1/2-inch- (13-mm-) wide hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch (1.0 mm).

E. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.

G. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish all steel surfaces, components, and accessories except prefinished stainless-steel and chrome-plated surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine floors for suitable conditions where apparatus bay equipment will be installed.

C. Examine walls to which apparatus bay equipment will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install apparatus bay equipment level, plumb, square, rigid, and true with seismic bracing as recommended by manufacturer and authorities having jurisdiction, and as required for stability. Fasten members to supporting structure.

B. Install shelves in each cylinder tank storage unit at spacing indicated on Drawings or, if not indicated, at equal spacing.

3.3 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

B. On completion of installation, clean exposed surfaces as recommended by manufacturer.

C. Touch up marred finishes or replace apparatus bay equipment that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by apparatus bay equipment manufacturer.

D. Replace apparatus bay equipment that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 11 9600

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SECTION 12 2413 – 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 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Roller shades of the following types:
   1. Solar control.
   2. Black out.

B. Motorized shade operators.

1.3 RELATED SECTIONS

A. Division 26 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
   1. Motorized Shade Operators: Include operating instructions.
   2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
   1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
   2. Wiring Diagrams: Power, system, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members and attachment to building structure.
   2. Ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
   3. Shade mounting assembly and attachment.
   4. Size and location of access to shade operator, motors, and adjustable components.
   5. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48).

D. Samples for Verification:
   1. Complete, full-size operating unit not less than 16 inches (400 mm) wide for each type of roller shade indicated.
   2. For the following products:
      a. Shade Material: Not less than 12-inch- (300-mm-) square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.

E. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. Building product disclosure and optimization - environmental product declarations – to be determined.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
   3. Product Data Sheets and MSDS for each product to be used as proof that each product meets the requirements of the GREENGUARD Environmental Institute's GREENGUARD certification.
      a. Include printed statement of VOC content and chemical components.
   4. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
   5. GreenGuard Gold Certified Certificate.
   6. CDPH Standard Method v1.1 testing report

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of roller shade, signed by product manufacturer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Service: Provide as a separate bid amount the cost for annual maintenance contract providing service 'on demand' for repair and maintenance as may be generally anticipated for the conditions of this project.

B. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
   1. Methods for maintaining roller shades and finishes.
   2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
   3. Operating hardware.
   4. Motorized shade operator.

C. Warranty: Special warranty specified in this Section.

1.8 MAINTENANCE MATERIAL SUBMITTALS

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. Provide additional 5 percent of the total length of qualified stainless steel chain required on the project, not to exceed the quantity of one 500'-0" spool.
   2. Provide additional 5 percent of each type of shade mounting hardware or brackets, but not less than one pair of each type.
   3. Provide a quantity of replacement shade bands completely fabricated and ready to attach to roller tubes equal to 5 percent of the total number of shade bands of each fabric and each color in the largest size required for each of those fabrics.

B. Clearly label all spare components and supply to Owner upon completion in original packaging for storage on site by Owner.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame-Resistance Ratings: Passes NFPA 701.

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. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.11 SITE CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of roller shade system that do not comply with requirements or that fail in materials, fabrication, or installation within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. All operating parts except for the bead chain.
   b. Shade cloth.
2. Warranty Period: 25 years from date of Substantial Completion.

B. In the event of a warranted product failure, the Shade Contractor shall, at no additional cost to the Owner, facilitate acquisition and delivery of all necessary replacement components to the Owner

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. Shade Materials: Provide only roller window shade materials that are GREENGUARD Certified.

C. Provide roller shade materials having the following certifications and labels:
1. GreenGuard Gold Certified
2. Declare Label.
3. CDPH Standard Method v1.1 testing report

2.2 STANDARD ROLLER SHADES

A. Basis-of-Design Product: The design for the roller window shades is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: MechoShade Systems, Inc.
2. Hunter Douglas Contract – Nysan Shading Systems.

B. Shade Band Material: PVC-free polyester shades, and as follows:
1. Basis-of-Design:
a. Solar Control Shades: EcoVeil 0950 Series 1% open;
1) Color: 0969 Silver Birch.
b. Blackout Shades: Equinox 0100.
1) Color: 0114 Marble.
2. Thickness: Single, non-raveling 0.030-inch (0.762mm) vinyl fabric woven from 0.018-inch diameter extruded vinyl yarn comprised of 21 percent polyester and 79 percent reinforced vinyl.
3. Bottom Hem: Straight.
4. Provide shades meeting GREENGUARD certification requirements.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band per roller, unless otherwise indicated on Drawings.

D. Direction of Roll: Regular, from back of roller.

E. Pocket-Style Exposed Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.
1. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access.

2. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

F. Bottom Bar: Steel or extruded aluminum, with plastic or metal capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

2.3 AUDIOVISUAL ROLLER SHADES

A. Audiovisual Light-Blocking Shades: Designed for eliminating all visible light gaps when shades are fully closed; fabricated from blackout shade band material with pocket and bottom bar extended and formed for light-tight joints among shade components and between shade components and adjacent construction.
1. Combine audiovisual shades with solar control shades in the same head box.

2.4 SHADE MOTOR DRIVE SYSTEM

A. Shade Motors:
1. Tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor operating at 110v AC (60hz), single phase, temperature Class A, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor.
2. Conceal motors inside shade roller tube.
3. Maximum current draw for each shade motor of 2.3 amps.
4. Use motors rated at the same nominal speed for all shades in the same room.

B. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly.

2.5 MOTOR CONTROL SYSTEMS

A. IQ/MLC: Specifications and design of shade motors and motor control system are based on the IQ/MLC motor logic control system manufactured by MechoShade Systems, Inc. Other systems may be acceptable provide that all of the following performance capabilities are provided. Motor logic control systems not in complete compliance with these performance criteria shall not be accepted as equal systems.

2.6 MOTOR CONTROL SYSTEM:

A. Provide power to each shade motor via individual 3 conductor line voltage circuits connecting each motor to the relay based motor logic controllers (IQ/MLC).

B. Control system components shall provide appropriate (spike and brown out) over-current protection (+/- 10 percent of line voltage) for each of the four individual motor circuits and shall be rated by UL or ETL as a recognized component of this system and tested as an integrated system.

C. Motor control system shall allow each group of four shade motors in any combination to be controlled by each of four local switch ports, with up to fourteen possible "sub-group" combinations via local 3 button wall switches and all at once via a master 3 button switch. System shall allow for overlapping switch combinations from two or more local switches.

D. Multiple "sub-groups" from different IQ/MLC control components shall be capable of being combined to form "groups" operated by a single 3 button wall switch, from either the master port or in series from a local switch port.

E. Each shade motor shall be accessible (for control purposes) from up to four local switches and one master switch.

F. Control system shall allow for automatic alignment of shade hem bars in stopped position at 25 percent, 50 percent, and 75 percent of opening heights, and up to three user-defined intermediate stopping positions in addition to all up / all down, regardless of shade height, for a total of five positions. Control system shall allow shades to be stopped at any point in the opening height noting that shades may not be in alignment at these non-defined positions).

G. Control system shall have two standard operating modes: Normal mode allowing the shades to be stopped anywhere in the window's opening height and uniform mode, allowing the shades to only be stopped at the predefined intermediate stop positions. Both modes shall allow for all up / all down positioning.

H. Control system components shall allow for interface with both audiovisual system components and building fire and life safety system via a dry contact terminal block.

I. Control system components shall allow for interface with external analog input control devices such as solar activated controllers, 24 hour timers, and similar items; via a dry contact terminal block.

J. Reconfiguration of switch groups shall not require rewiring of the hardwired line voltage motor power supply wiring, or the low voltage control wiring. Reconfiguration of switch groups shall be accomplished within the motor control device (IQ/MLC).

2.7 WALL SWITCHES:

A. Three-button architectural flush mounted switches with metal cover plate and no exposed fasteners.

B. Connect local wall switches to control system components via low voltage (12V DC) 4-conductor modular cable equipped with RJ-11 type connectors supplied, installed and certified under Division 26 - Electrical.

C. Connect master wall switches to control system components via low voltage (12V DC) 6-conductor modular cable equipped with RJ-12 type connectors supplied, installed and certified under Division 26 - Electrical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow clearances for window operation hardware.

B. Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

B. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades. Refer to Division 1 Section “Demonstration and Training."

3.6 PROTECTION

A. 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.

B. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12 2413

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SECTION 12 3613 – CONCRETE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Concrete bench countertops and base in Buildings 2 & 8. See Drawings for exact locations.

1.3 RELATED SECTIONS

A. Section 06 4100 - Architectural Woodwork: Plastic laminate countertops.

B. Section 07 9200 – Joint Sealants.

C. Section 12 3640 – Countertops.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate construction activities in this Section with construction activities specified in related Sections or other construction activities required for fabrication and installation.

1.6 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data indicating compliance with specified performance requirements.
   1. Accessories: Submit manufacturer's product data and installation instructions.

B. Shop Drawings: Submit top views, elevations and sections (as needed). Indicate dimensions, material thickness, location and sizes of cutouts, anchorage provisions and attachment methods. Indicate coordination requirements with adjacent and interfacing work.
   1. Show layout for cast lettering at counter base.

C. Samples: 6- by 6-inch samples or as requested; indicate full color range and pattern variation. Approved samples will be standard for concrete countertops.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
      b. Provide total weight of products provided.
   2. Building product disclosure and optimization - environmental product declarations – to be determined.

3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
4. For priming and sealing coatings, including printed statement of VOC content and chemical components.

1.7 INFORMATIONAL SUBMITTALS

A. Quality Assurance submittals outlined below.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data. Manufacturer's data indicating cleaning and maintenance requirements.

B. Warranty: Special warranty specified in this Section.

1.9 QUALITY ASSURANCE

A. Concrete Countertop Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate concrete countertops similar to that indicated for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

1.10 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Pack countertops and other flat products in wooden crates to minimize damage in shipping.

B. Acceptance at Site: Supervise unloading of materials. Check for damaged crates. Mark bill of lading if there is any obvious damage and notify marble supplier immediately. Otherwise, proceed with offloading crates.

C. Store concrete on wood A-frames or pallets with nonstaining separators and nonstaining, waterproof covers. Ventilate under covers to prevent condensation.

D. Protection: Handle materials to prevent physical damage. Protect surfaces from staining, scratching and other damage during handling.

1.11 SITE CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

1.12 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's limited warranty against product defects when fabricated and installed by an approved, manufacturer-certified fabricator.
1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site.

B. Adhesives: Type recommended by material manufacturer for products and substrate conditions indicated.
1. Use adhesives that have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MANUFACTURERS

A. Countertops: Subject to compliance with performance requirements, manufacturers offering specified items which may be incorporated in the work include the following:
1. Concrete Countertop benches in Buildings 2 & 8.
a. Concreteworks, 510.534.7141 or equal.
b. Integral Color: TBD.
c. Sealer: Sealed and waxed to resist staining.
d. Provide all mounting supports for counter base and countertop.

2.3 CONCRETE

A. Concrete Countertops: Custom made using a lightweight cement based composite
1. Density: 85 lbs. per cubic foot.
2. Thickness: 1.5"-2" as indicated on Drawings.
3. Edge: As indicated on Drawings.
4. Apron: As indicated on Drawings.
5. Backsplashes: Not required.
6. Color: Match Earthcrete Classic C602 extra smooth finish.

B. Identification: Label material with batch number by imprinting on back with manufacturer's identifying mark.

C. Custom Lettering Inlay: Provide concrete bench counter face with quote:
1. "NEVER FORGET 3"H AND" 09/11/2001"
2. Letters" 2-inch H.
3. Font: TBD.

2.4 COUNTERTOP FABRICATION

A. Fabricate to required profiles and dimensions. To the greatest extent possible, fabricate each unit continuous, without joints and to minimize on-site cutting or other modifications.

B. Custom reinforce units to accommodate appropriate spans and cantilevers.

C. Fabricate units straight, smooth, and true to size and shape. Finish edges to profile specified.

D. Complete equipment cut-outs in the shop to greatest extent possible before delivering to site. Allow cut-outs to be made only by the fabricator or installer of the concrete countertops.

E. Fabricate all surfaces to have uniform finish. Ease edges and sand smooth.

F. Layout: Layout joints to minimize joints and to avoid L-shaped pieces of concrete.

G. Inspect Material:
1. Inspect material for defects prior to fabrication.
2. Color Match: Materials throughout Project shall be from the same batch and shall bear labels with same batch number. Visually inspect materials to be used for adjacent pieces to assure acceptable color match. Inspect in lighting conditions similar to those on Project.
3. Variation in distribution of aggregates in concrete which are within manufacturer's tolerances is not a defect.

H. Tools: Cut and polish with water-cooled power tools.

I. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

J. Cutouts:
1. Cutouts shall have 3/8-inch (10 mm) minimum inside corner radius. Inside corners shall be reinforced in an acceptable manner to prevent cracking.
2. Where edges of cutout will be exposed in finished work, polish edges.

2.5 ACCESSORIES

A. Mounting Adhesives:
1. Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.
2. Acceptable Silicone Manufactures:
   a. Dow Corning.
   b. GE Sealants and Adhesives.
3. Acceptable Epoxy Manufacturers:
   a. Akemi North America.
   b. Bonstone Material Corporation.
   c. Tenax USA.
4. Provide spacers, if required, of type recommended by adhesive manufacturer.

B. Joint Adhesive:
1. Provide epoxy or polyester adhesive of type recommend by manufacturer for application and conditions of use.
2. Acceptable Manufacturers:
   a. Akemi North America.
   b. Bonstone Material Corporation.
   c. Tenax USA.
3. Color: Tint adhesive which will be visible in finished work to match concrete.

C. Joint Sealants:
1. Clear silicone sealant of type recommended by manufacturer for application and conditions of use.
2. Acceptable Manufactures:
   a. Dow Corning.
   b. GE Sealants and Adhesives.

D. Mildew Resistant Sealant: Specified in Section 07 9200.

E. Cleaning Agents: Non-abrasive, soft-scrub type kitchen cleansers.

F. Sealers: As recommended by manufacturer of countertop material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification:
1. Verify dimensions by field measurements prior to fabrication.
2. Verify that substrates supporting concrete surfaces are plumb, level, and flat to within 1/16 inch in ten feet (1.6 mm in 3000 mm) and that necessary supports and blocking are in place.
3. Base Cabinets: Verify cabinet units are securely fixed to adjoining units and back wall.

B. Inspect finished countertop surfaces for damage. Do not install until damage materials have been repaired in an acceptable manner or replaced.

3.2 PREPARATION

A. Advise installers of other work about specific requirements for placement of inserts and similar items to be used by countertop Installer for anchoring countertops. Furnish installers of other work with Drawings or templates showing locations of these items.

B. Protect finished surfaces against scratches. Apply masking where necessary. Guard against grit, dust, and other trades.

3.3 INSTALLATION - GENERAL

A. Install components in accordance with reviewed shop drawings and plans.

B. All materials to be plumb, level and rigid. Neatly scribe to adjoining surfaces.

C. Field trim all components as needed to fit field conditions.

D. Immediately replace any material that is cracked, chipped, broken or otherwise defective.

3.4 INSTALLATION – COUNTERTOPS

A. Provide continuous, structural, wooden framework at back wall, sides and front for top. Front of framework shall be 1/2-inch less than height of concrete apron.

B. Provide openings in front of framework for required accessories. Install indicated accessories as directed by Contractor.

C. Install materials in accordance to manufacturer’s recommendations. Lift and place to avoid breakage.

D. Preliminary Installation and Adjustment: Position materials to verify that materials are correctly sized and prepared. Make necessary adjustments.
1. If jobsite cutting, grinding, or polishing is required, use water-cooled tools. Protect jobsite and surfaces against dust and water. Perform work away from installation site if possible.
2. Allow gaps for expansion of not less than 1/16 inch (1.5 mm) per five feet when installed between walls or other fixed conditions.

E. Permanent Installation:
   1. After verifying fit, remove concrete from position, clean substrates of dust and contamination, and clean concrete back side and joints with solvent.
   2. Apply sufficient quantity of mounting adhesive in accordance with adhesive manufacturer's recommendations to provide permanent, secure installation.
   3. Do not exceed manufacturer-recommended spacing of mounting adhesive.
      a. At Vertical Surfaces: Provide temporary shims until adhesive cures.
   4. Install surfacing plumb, level, and square and flat to within 1/16 inch in ten feet (1.6 mm in 3000 mm).

F. Joints:
   1. Joints Between Adjacent Pieces of Concrete:
      a. Joints shall be flush, tight fitting, level, and neat.
      b. Securely join with stone adhesive. Fill joints level with concrete.
      c. Clamp or brace concrete in position until adhesive sets.

3.5 REPAIR

A. Repair or replace damaged materials in a satisfactory manner.

3.6 CLEANING

A. Remove masking and excess adhesives and sealants. Clean exposed surfaces.

B. Clean installed units not more than 48 hours prior to Date of Substantial Completion. Repair or replace damaged or stained concrete work.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.7 PROTECTION

A. Protect all finished work until final acceptance by Owner.

B. Protect after installation. Do not allow other trades to use countertops as footstools or ladders to perform their work.

END OF SECTION 12 3613

SECTION 12 3640 – COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Simulated stone countertops of the following types:
   1. Composite quartz countertops and backsplashes.

B. Stainless steel countertops with integral sinks (as occurs) and related fabrications.

1.3 RELATED SECTIONS

A. Section 06 1053 – Miscellaneous Rough Carpentry.

B. Section 06 4100 - Architectural Woodwork: Cabinet supports for quartz countertops; plastic laminate countertops.

C. Section 07 9200 – Joint Sealants.

D. Section 12 3613 – Concrete Countertops.

E. Division 22: Faucet and plumbing connections; plumbing fixtures; manufactured sinks.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 COORDINATION

A. Coordinate construction activities in this Section with construction activities specified in related Sections or other construction activities required for fabrication and installation.

1.6 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data indicating compliance with specified performance requirements.
   1. Accessories: Submit manufacturer's product data and installation instructions.

B. Shop Drawings: Submit top views, elevations and sections (as needed). Indicate dimensions, material thickness, location and sizes of cutouts, anchorage provisions and attachment methods. Indicate coordination requirements with adjacent and interfacing work.

C. Samples for Verification: For the following:
   1. Quartz Surfacing: 6- by 6-inch samples or as requested; indicate full color range and pattern variation. Approved samples will be standard for quartz surfacing.
   2. Solid-Surfacing: 6-inches (150 mm) square.

3. Stainless Steel: 6-inches (150 mm) square.

D. LEED Submittal: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For adhesives and sealants, documentation including printed statement of VOC content.
3. Declare Label: Manufacture's publicly available Declare Label as included in the declare database https://living-future.org/declare-products.
4. CDPH Standard Method v1.1 testing report.

1.7 INFORMATIONAL SUBMITTALS

A. Quality Assurance submittals outlined below.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data. Manufacturer's data indicating cleaning and maintenance requirements.

B. Warranty: Special warranty specified in this Section.

1.9 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate quartz surfacing countertops similar to that indicated for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Quality Standard: Unless otherwise indicated, comply with AWS Architectural Woodwork Standards for grades of interior architectural solid surfacing, composite quartz material, construction, finishes, and other requirements.
1. Provide WI-certified compliance certificate indicating that countertops comply with requirements of grades specified.

1.10 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Pack countertops and other flat products in wooden crates to minimize damage in shipping.

B. Acceptance at Site: Supervise unloading of materials. Check for damaged crates. Mark bill of lading if there is any obvious damage and notify quartz surfacing supplier immediately. Otherwise, proceed with offloading crates.

C. Store quartz surfacing on wood A-frames or pallets with nonstaining separators and nonstaining, waterproof covers. Ventilate under covers to prevent condensation.

D. Protection: Handle materials to prevent physical damage. Protect surfaces from staining, scratching and other damage during handling.

1.11 SITE CONDITIONS

A. Environmental Limitations: Do not install countertops until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained to comply with referenced standards and manufacturer's written instructions.

B. Field Measurements: Verify dimensions of construction to receive quartz surfacing countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

1.12 WARRANTY

A. Quartz Surfacing: Provide manufacturer’s ten-year limited warranty against product defects when fabricated and installed by an approved, manufacturer-certified fabricator.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Local/Regional Materials: Give preference to manufacturer’s whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

B. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
1. Use adhesives that have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 QUARTZ SURFACING

A. Basis-of-Design Product: The design for the quartz surfacing countertops is based on the manufacturer identified below. Product requirements in this Section are based on products by the named manufacturer. Subject to compliance with requirements, provide the named product or an approved comparable system:
1. Basis-of-Design: CaesarStone Quartz Surfacing distributed by U.S. Quartz Products Inc (CaesarStone U.S.A., Inc.); Sun Valley, CA; phone 877-9-QUARTZ; www.caesarstoneus.com.
2. Zodiaq manufactured by DuPont.

B. Quartz Surfacing Composition: 93 percent crushed quartz aggregate combined with resins and pigments and fabricated into slabs.
1. Color and Finish:
a. Reception Desk: CaesarStone Jet Black 3100.
b. Lobby Break Room, Lobby Break Alcove, Day Room, Dayroom, Locker Built-In Bench Top: CaesarStone Pure White 1141.
c. Staff Restrooms: Nougat 6600.

C. Dimensions:
1. Thickness: As shown on Drawings.
2. Slabs Size: Not less than 56.5 x 120 inches (1.44 x 3.05 m) to minimize number of joints in installation.

D. Sinks: Undermount. See Plumbing Drawings.

E. Identification: Label material with batch number by imprinting on back with manufacturer's identifying mark.

F. Performance Requirements:
1. Flexural Strength: 7,420 psi, ASTM C880/C880M.
2. Compressive Strength: ASTM C170/C170M
   a. Dry: 10,430 psi average.
   b. Wet: 11,265 psi average.
3. Izod Impact Strength: 0.361ft. lbs/inch of notch average; ASTM D256.
4. Bond Strength: 205 psi; ASTM C482 modified.
5. Modulus of Rupture: 2,110 average, ASTM C99/C99M.
6. Mohs Hardness: 6.5-7.5; scratch test.
7. Absorption: 0.022%; ASTM C97/C97M.
8. Stain and Acid Resistance: Not affected; ASTM D2299.
9. Surface Burning Characteristics: Flame spread = 10, smoke density = 195; ASTM E84.
10. Thermal Shock Resistance: Passes 5 cycles, 75°F-295°F; ASTM C484.
11. Coefficient of Thermal Expansion: $1.36x10^{-5}$ inch per °F.; ASTM C531.
12. Weathering Resistance: Not affected after seven days in 1% sulfuric acid; ASTM C217/C217M.
13. Freeze-Thaw Resistance: No visible damage or discoloration after 25 cycles (-45°C to 23°C); S.L.P. with ASTM C62 as guide.
14. Wear Resistance: 36.12 gram average; ASTM C501, tested with 1 kg. load, 1000 cycles at 70 r.p.m.

G. Exposed Edges and Corners:
1. Countertops:
   a. Edges: Square profile, single layer thick.
   b. Outside Corners: Square.
2. Backsplash:
   a. Edges: Square.
   b. Outside Corners: Square butt joints.

H. Cutouts for Undermount Bowls: Cast integral finished cutout in top to receive undermounted bowl. Insert hardware as needed into top during casting process for bowl installation. Provide other necessary hardware to attach bowl to top.

2.3 QUARTZ-SURFACING-MATERIAL COUNTERTOP CONSTRUCTION

A. Construction:
1. Quality Standard: Comply with NAAWS Section 11.
2. NAAWS Grade: Premium.
3. Material Thickness: 3/4-inch (19 mm).
4. Single length sections.
5. Intermediate support for spans over 48-inches to prevent deflection in excess of 1/4-inch under a 50 pound per sq ft load.
6. Edge Treatment: MItered in accordance with NAAWS.
7. Back Splash: As indicated on Drawings in accordance with NAAWS.
8. Back Splash Construction: AWS Assembly 2, deck mount, manufacturer-assembled.
9. Adhesive: As approved by manufacturer, able to maintain its bond with the opposing contractions of core and laminate.
   a. VOC Requirement: Provide adhesive having a VOC content of <70g/L.
10. Joints: Well fit, flush, and watertight.

B. Maximum Unsupported and Unloaded Overhang:
1. Sheet Thickness of 3/4-inch: 12-inches.

2. Sheet Thickness of 1/2-inch: 6-inches.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
1. Match color, pattern, and finish as indicated by manufacturer's designations for these characteristics.

2.4 STAINLESS STEEL COUNTERTOPS

A. Stainless-Steel Sheet: ASTM A666, Type 304, with No. 4 finish (directional satin finish) on exposed surfaces, stretcher-leveled standard of flatness.

B. Top Construction:
1. Material: Stainless steel, Type 304, 0.0781-inch (2.0-mm) thick, reinforced and sound deadened.
a. Finish: BHMA 630 (US32D) or NAAMM Number 4, satin directional polished stainless steel
2. Back Splash: As indicated on Drawings.
3. Edges: As indicated on Drawings.
4. Welded as required.
5. Crossbracing: As required.
6. Options and Accessories: As indicated on Drawings.
7. Construct with butt-edge joints, welded and ground smooth so no evidence of welding will appear.
8. Comply with AWS D9.1 for recommended practices in shop welding. Make welds continuous on exposed surfaces.
9. Control welding temperature to avoid discoloring adjacent metal.
10. Clamp components in jigs during welding to avoid distortion.
11. Clean exposed welded joints of welding flux, and dress exposed and contact surfaces to be invisible, under normal lighting conditions, from adjacent surfaces.
12. Alligatored, discolored and warped components will be rejected.
13. Do not solder, rivet, or use other visible fasteners in the work.
14. Assemble frames as single units. Jointing in the field is not permitted.
15. Integral Sinks: As indicated on Drawings.

C. Stainless Steel Countertops and Sheeting between Backsplash and Upper Cabinets: Not less than 16 gage for countertops and integral sink, not less than 20 gage for sheeting; with No. 4 satin directional polish finish.
1. Fabricate to furniture quality construction, assembled and welded in manner consistent with recognized steel furniture standards; grind joints smooth and flush and finish to match adjacent finish on exposed surfaces.

D. Sound Deadening: Heavy-bodied resinous coating, filled with granulated cork or other resilient material, compounded for permanent, non-flaking adhesion to metal in 1/8" thick coating.
1. Apply coating of sound deadening material to underside of tops, drainboards, dishtables and sinks.

E. Shop Assembly: Preassemble stainless steel countertops in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

F. Coordinate dimensions and attachment methods of stainless steel countertops with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned, unless otherwise indicated.

G. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- (12-mm-) wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch (1 mm) and support with concealed stiffeners.
   1. Make corners and joints hairline; slightly bevel arises.
   2. Fabricate component connections to support specified design loads.

H. Select materials for straightness, free of defects and irregularities.
   1. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, "oil canning," stains, discolorations, and imperfections on finished units are not acceptable.

I. Make exposed joints flush butt type, hairline joints where mechanically fastened; provide concealed connection devices with hidden fasteners.
   1. Fabricate continuous items with joints neatly fitted and secured.
   2. Ease exposed edges to approximate 1/32" uniform radius.
   3. Fabricate joints exposed to water in manner to exclude water or provide weep holes where water could accumulate.

J. Comply with AWS for recommended practices in welding each type of material; provide welds behind finished surfaces without distortion or discoloration on exposed side; dress exposed and contact surfaces.

K. Exposed Mechanical Fastenings: Flush countersunk fasteners unobtrusively located, consistent with design of structure.

L. Fabricate corners, joints, and finish such that no gaps, spaces, cavities, crevices, or inaccessible spaces or areas are present in which dirt, dust, debris, or moisture can accumulate.

M. Provide cutouts for inserts, fixtures and fittings; verify locations from on-site dimensions.

N. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.
   1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

O. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce stainless steel countertops as needed to attach and support other construction.

P. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install stainless steel countertops.

Q. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.
   1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.

R. Separate dissimilar materials with bituminous paint where concealed, with preformed separators, or similar method to prevent corrosion.
   1. Minimum G90 hot dip galvanized coating.

2.5 ACCESSORIES

A. Mounting Adhesives:
1. Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.
2. Acceptable Silicone Manufacturers:
a. Dow Corning.
b. GE Sealants and Adhesives.
3. Acceptable Epoxy Manufacturers:
a. Akemi North America.
b. Bonstone Material Corporation.
c. Tenax USA.
4. Provide spacers, if required, of type recommended by adhesive manufacturer.

B. Joint Adhesive:
1. Provide epoxy or polyester adhesive of type recommend by manufacturer for application and conditions of use.
2. Acceptable Manufacturers:
a. Akemi North America.
b. Bonstone Material Corporation.
c. Tenax USA.
3. Color: Tint adhesive which will be visible in finished work to match quartz surfacing.

C. Joint Sealants:
1. Clear silicone sealant of type recommended by manufacturer for application and conditions of use.
2. Acceptable Manufactures:
a. Dow Corning.
b. GE Sealants and Adhesives.

D. Mildew Resistant Sealant: Specified in Section 07 9200.

E. Solvent: Product recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives and sealants.

F. Cleaning Agents: Non-abrasive, soft-scrub type kitchen cleansers.

2.6 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Unless otherwise indicated, grind and polish surfaces to produce uniform finish indicated, free of cross scratches.
1. Run grain of directionally textured finishes with long dimension of each piece.

C. Directional Satin Finish: No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification:
   1. Verify dimensions by field measurements prior to fabrication.
   2. Verify that substrates supporting quartz surfaces are plumb, level, and flat to within 1/16 inch in ten feet (1.6 mm in 3000 mm) and that necessary supports and blocking are in place.
   3. Base Cabinets: Verify cabinet units are securely fixed to adjoining units and back wall.

B. Inspect finished countertop surfaces for damage. Do not install until damage materials have been repaired in an acceptable manner or replaced.

3.2 PREPARATION

A. Advise installers of other work about specific requirements for placement of inserts and similar items to be used by countertop Installer for anchoring countertops. Furnish installers of other work with Drawings or templates showing locations of these items.

B. Protect finished surfaces against scratches. Apply masking where necessary. Guard against grit, dust, and other trades.

3.3 INSTALLATION - GENERAL

A. Install components in accordance with reviewed shop drawings and plans.

B. All materials to be plumb, level and rigid. Neatly scribe to adjoining surfaces.

C. Field trim all components as needed to fit field conditions.

D. Immediately replace any material that is cracked, chipped, broken or otherwise defective.

3.4 INSTALLATION, SIMULATED STONE COUNTERTOPS

A. Provide continuous, structural, wooden framework at back wall, sides and front for top. Front of framework shall be 1/2-inch less than height of apron.

B. Provide openings in front of framework for required accessories. Install indicated accessories as directed by Contractor.

C. Install materials in accordance to manufacturer’s recommendations. Lift and place to avoid breakage.

D. Preliminary Installation and Adjustment: Position materials to verify that materials are correctly sized and prepared. Make necessary adjustments.
   1. If jobsite cutting, grinding, or polishing is required, use water-cooled tools. Protect jobsite and surfaces against dust and water. Perform work away from installation site if possible.
   2. Allow gaps for expansion of not less than 1/16 inch (1.5 mm) per five feet when installed between walls or other fixed conditions.
   3. Drainage: Adjacent to sinks, shim countertops slightly to insure positive drainage.

E. Permanent Installation:
1. After verifying fit, remove quartz surfacing from position, clean substrates of dust and contamination, and clean quartz surfacing back side and joints with solvent.
2. Apply sufficient quantity of mounting adhesive in accordance with adhesive manufacturer's recommendations to provide permanent, secure installation.
3. Do not exceed manufacturer-recommended spacing of mounting adhesive.
   a. At Vertical Surfaces: Provide temporary shims until adhesive cures.
4. Install surfacing plumb, level, and square and flat to within 1/16 inch in ten feet (1.6 mm in 3000 mm).

F. Joints:
1. Joints Between Adjacent Pieces of Quartz Surfacing:
   a. Joints shall be flush, tight fitting, level, and neat.
   b. Securely join with stone adhesive. Fill joints level with quartz surfacing.
   c. Clamp or brace quartz surfacing in position until adhesive sets.
2. Joints between Backsplashes and Countertops: Seal joints with silicone sealant.

G. Install backsplash and end splash by adhering to countertops with stone adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Leave 1/16-inch (1.5-mm) gap between splash and wall for filling with sealant. Use temporary shims to ensure uniform spacing.

H. Mechanical Fasteners: Not allowed at exposed surfaces.

3.5 INSTALLATION, STAINLESS STEEL COUNTERTOP

A. Install in accordance with manufacturer's recommendations, installation instructions, and approved shop drawings.

B. Install plumb, true and in correct relation to adjacent work, free from distortion or defects detrimental to appearance and performance.

C. Prior to securing continuous items, adjust to ensure proper matching at butt joints and correct alignment throughout their length.

D. Tolerances: Accurately align and locate components to column lines and floor levels; adjust work to conform to following tolerances.
1. Plumb: 1/8" in 10'-0"; 1/4" in 40'-0"; non-cumulative.
2. Level: 1/8" in 20'-0"; 1/4" in 40'-0"; non-cumulative.
3. Alignment: Limit offset to 1/16" where surfaces are flush or less than 1/2" out of flush, and separated by less than 2" (by reveal or protruding work); otherwise limit offsets to 1/8".
4. Location: 3/8" maximum deviation from measured theoretical location (any member, and location).

E. Install sufficient anchorage devices to securely and rigidly fasten system to building.

F. Provide anchors to be installed in other work, and setting details, in time for proper installation by trades concerned; verify correct placement

3.6 ADJUSTING

A. Repair or replace damaged materials in a satisfactory manner.

3.7 CLEANING

A. Remove masking and excess adhesives and sealants. Clean exposed surfaces.

B. Clean installed units not more than 48 hours prior to Date of Substantial Completion. Repair or replace damaged or stained quartz surfacing work.

C. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.8 PROTECTION

A. Protect all finished work until final acceptance by Owner.

B. Protect after installation. Do not allow other trades to use countertops as footstools or ladders to perform their work.

END OF SECTION 12 3640

SECTION 12 4813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Entrance mats and grids in recessed metal frames.
   1. Surface-mounted with secured edges.
   2. Interior.

1.3 RELATED SECTIONS

A. Section 03 3000 – Cast-in-Place Concrete: Casting recesses for entrance floor grilles.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

A. Product Data: Provide for each type of floor grille and frame specified, including manufacturer's specifications and installation instructions, details of construction relative to materials, dimensions of individual components, profiles and finishes.

B. Shop Drawings: Include details showing layout and types of floor grille and frames, construction relative to materials, direction of traffic, profiles, anchors and accessories.
   1. Indicate layout including dimensions each unit, showing locations of joints between sections.
   2. Submit full scale, dimensioned, detail drawings of frame and infill profiles, anchors, and internal connections.
   3. Submit detail drawings of special accessory components not included in manufacturer's product data.

C. Samples for Verification:
   1. Submit samples of specified frame material finish.
   2. Submit samples of mat indicating manufacturer's full range of available colors, textures, finishes, and patterns for selection by Owner.
   3. Submit tread insert samples indicating manufacturer's full range of available colors, textures, finishes, and patterns for selection by Owner.

D. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   2. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Manufacturer's instructions for cleaning and care of floor grilles.

1.7 QUALITY ASSURANCE

A. Single Source Responsibility:
   1. Furnish products from one manufacturer for entire Project, unless otherwise acceptable to Owner.
   2. Provide each floor mat as complete unit, including frame and accessory items necessary for proper installation and function.

B. Regulatory Requirements: Ensure non-metal components comply with applicable portions of local, state, and federal codes, laws, and ordinances for flame spread and smoke developed indices.

C. Flammability in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m2.

D. Accessibility Requirements: Provide installed floor mats that comply with California Building Code (CBC) and "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

E. Slip resistance in accordance with ASTM D2047, Coefficient of Friction, minimum 0.60 when tested in wet conditions.

F. Standard rolling load performance is 400 lb./wheel with larger loading requirements as specified (load applied to a solid 5” x 2” wide polyurethane wheel, 1000 passes without damage).

G. Utilize superior structural aluminum alloys 6105-T5 & 6016-T6 for aluminum rail components.

1.8 PROJECT CONDITIONS

A. Field Measurements: Check actual openings for mats/grids by accurate field measurements before fabrication. Record actual measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

B. For recess application coordinate frame installation with concrete construction to ensure recess and frame anchorage are accurate and that the base is level and flat. Defer installation of floor mat frames until after building enclosure is complete and related interior finish work is complete.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 100 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 100 mile radius of the project site.

2.2 PRODUCTS AND MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by C/S Group or comparable products by one of the following:
   1. Balco, Inc.
   2. C/S Group.
   3. Pawling Corporation; Architectural Products Division.

2.3 ENTRANCE MATS AND GRIDS

A. Entrance Mat: , Pedimat Entrance Mats, manufactured by C/S Group, Muncy, PA, tel: (570) 546-5941, web: www.c-sgroup.com.
   1. Floor Mats: Extruded 6105-T5 aluminum alloy with 3/4 inch deep tread rails joined by a dual durometer PVC combination hinge and cushion to compromise the overall grid length. The hinge shall be complete with perforations between each tread rail for drainage, unless otherwise specified. Unit must withstand 1,000 lb. wheel loads (load applied to a 5 inch by 2 inch wide polyurethane wheel, 1,000 passes without damage).
   2. Tread Insert: MonoTuft HD Carpet shall meet the Carpet and Rug Institute's standard for indoor air quality. Fibers shall include a minimum of 100, 12 mil monofilament fibers per square inch and colorfast, solution dyed nylon. Each carpet fiber shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths. Anti-static carpet fiber will contain antimicrobial additive and be treated with Scotchgard to reduce soiling. Carpet weight: 33 oz/yd².
   3. Mat Size: As indicated on Drawings.
   4. Color: As selected.

2.4 FABRICATION

A. Frames:
   1. Fabricate manufacturer's standard frame profiles to fit size and style of mat for permanent installation in shallow, level bottom recess in subfloor.
   2. Fabricate frame members in single lengths or, where dimensions exceed maximum available lengths, provide minimum number of pieces possible with hairline joints equally spaced, and with pieces spliced together by means of straight connecting pins.
   3. Cope or miter and rigidly connect frame corners and intersections with stainless steel fasteners or by welding.
   4. Mill finish frames in contact with concrete to be primer coated.

2.5 FINISHES

A. Aluminum Surfaces: Clear anodized finish.

B. Aluminum Surfaces in Contact With Concrete or Grout: Shop coat with zinc chromate primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of foot grilles and frames.

B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before foot grille and frame and drain pan installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed foot grilles, frames, and drain pans to comply with manufacturer's written instructions at locations indicated and with top of foot grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer.

B. Concrete Recess: Install necessary shims, spacers, and anchors for proper placement of grid framework and secure to prevent displacement when placing concrete.

C. Coordinate top of grid surfaces with bottom of doors that swing across grids to provide clearance between door and grid.

D. Set foot mat tops at height for most effective cleaning action.

3.3 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.4 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring.

B. Maintain protection during construction and install floor grilles just prior to time of Substantial Completion.

END OF SECTION 12 4813

SECTION 12 6613 – PORTABLE BLEACHER SEATING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Portable bleacher system.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for telescoping stands.

B. Shop Drawings: Include plans, elevations, sections, and details, showing layout for each bank of bleachers, and attachments to other work.
   1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Include seat heights, row spacing and rise, aisle widths and locations, assembled dimensions and anchorage to supporting structure.
   3. Indicate material types and finishes.
   4. Provide at least 2 sets of wet-stamped drawings, signed by a professional engineer registered in the State of California for submittal to DSA.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Decking: 3-inch- (75-mm-) square samples of finished material.
   2. Metal Components: 3-inch- (75-mm-) square sample of each color and finish indicated.
   3. Seating: 3-inch- (75-mm-) square sample of each seating material, color, and finish indicated.

D. Structural Engineering Calculations: Submit for all components and assemblies; signed and stamped by a California licensed Structural Engineer for submittal to DSA.

1.5 INFORMATIONAL SUBMITTALS

A. Structural Engineering Calculations: Submit for all components and assemblies; signed and stamped by a California licensed Structural Engineer.

B. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For telescoping stands to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer's Engineering Responsibility: Preparation of data for telescoping stands, including Shop Drawings, and comprehensive engineering analysis by a qualified professional engineer.

C. Safety Standard: Provide telescoping stands that comply with requirements in NFPA 102.

D. Welding: Qualify procedures and personnel according to AWS D1.1 "Structural Welding Code - Steel" and AWS D1.3 "Structural Welding Code - Sheet Steel."

E. 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.

F. Accessibility Requirements: Provide telescoping stands that comply with requirements in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)".

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.8 SITE CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, and other construction that will interface with telescoping stands by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structurally stable system; steel; capable of resisting dead load of seating system, plus:
1. Live load of 120 pounds/lineal foot;
2. Parallel sway load of 24 pounds/lineal foot of row;
3. Perpendicular sway load of 10 pounds/lineal foot of row
4. Assure positive engagement and alignment of all supports.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hussey Seating Company.
2. Mondo Seating System.

2.3 MATERIALS

A. Steel:
1. Structural Steel Shapes, Plates, and Bars: ASTM A36/A36M.
2. Galvanized Steel Sheet: ASTM A653/A653M, G90 (Z275) coating designation.
3. Uncoated Steel Sheet: ASTM A1008/A1008M, Designation CS (cold-rolled commercial steel), or ASTM A1011/A1011M, Designation CS (hot-rolled commercial steel).
4. Tubing: ASTM A500/A500M, cold formed; ASTM A501, hot formed; or ASTM A513/A513M, mechanical.

2.4 STANDS

A. Description: Multiple-tiered seating on interconnected folding platforms.

B. Layout: Three row structure with wheels at the back for portability.
1. Row Spacing: As indicated on the Drawings.
2. Section Length: Manufacturer's standard.
3. Number of Rows: As indicated on the Drawings.
4. Rise Per Row: Manufacturer's standard.

C. Seating: Bench type; , exposed galvanized steel matching stand, 18-inch width.

D. Aisles: Level, as indicated on the Drawings.

E. Wheelchair-Accessible Seating: Locate cutouts, retractable truncated benches to provide wheelchair-accessible seating at locations indicated on Drawings.
1. Equip tiers adjacent to wheelchair-accessible seating with front rails as required by referenced safety standard.
2. Equip cutouts with full-width front closure panels that match decking construction and finish and that extend from underside of tiers adjacent to cutouts to 1-1/2 inches (38.1 mm) from finished floor.

F. Bench Seats and Skirts:
1. Material: Molded polyethylene plastic with contour seat surface.
2. Bench Height: Manufacturer's standard.
3. Bench Depth: Manufacturer's standard.

G. Railings: Removable type; manufacturer's standard baked enamel finish; black.

H. Understructure: Structural steel.
1. Finish: Manufacturer's standard rust-inhibiting finish.
2. Color: Manufacturer's standard.

I. Support Column Wheels: Nonmarring, soft, rubber-face wheel assembly under each support column.
1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but not less than four per column or less than 3-1/2 inches (88.9 mm) in diameter and 1 inch (25.4 mm) wide.

J. Aisle Closures: Manufacturer's standard that produce flush vertical face at aisles when system is stored.

K. Fasteners: Vibration proof, in manufacturer's standard size and material.

L. Operation:
1. Motorized forward fold, with safety limit switch to prevent wheels from rotating after the bleachers are both fully extended or fully closed.

M. Wheels:
1. Oiltight or ball bearing rubberized wheels.
2. Provide double the number of wheels normally supplied by the manufacturer. Typically 6 wheel per supporting leg, for each row.
3. Provide 5-1/4-inch by 1-1/8-inch wheels.

N. Ancillary Items:
1. Pendant Control for Powered Operator: Specified manufacturer's standard. Mount socket for pendant control in the vertical metal skirting of the first bleacher seat row. Mount disconnect switch on rear wall underneath the bleachers.
2. Front Skirting: Specified manufacturer's standard; color: black.

2.5 FABRICATION

A. Fabricate understructure from structural steel members in size, spacing, and form required to support design loads specified in referenced safety standard.

B. Weld understructure to comply with applicable AWS standards.

C. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.

D. Form exposed sheet metal with flat, flush surfaces, level and true in line, and without cracking and grain separation.

E. Seating Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair the usefulness of seating units.
1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.
2. Finish all steel parts with baked-on enamel. All surfaces, including underside of deck to receive a moisture repellant sealer. Provide an additional polyurethane wearing surface for all surfaces to receive pedestrian traffic.
3. End panels on all exposed ends of gym seats, with finish to match gym seats.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where telescoping stands are to be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install telescoping stands to comply with referenced safety standard and manufacturer's written instructions.

B. Lubricate and adjust for smooth operation with no binding.

C. Check operation of bleachers to ensure that, when closed, the front of the gym seats present a flush vertical surface.

3.3 ADJUSTING

A. On completion of installation, lubricate, test, and adjust each telescoping stand unit so that it operates according to manufacturer's written operating instructions.

3.4 CLEANING

A. Clean installed telescoping stands on exposed and semiexposed surfaces. Touch up shop-applied finishes or replace components as required to restore damaged or soiled areas.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain telescoping stands. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 12 6613

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SECTION 12 9316 – BICYCLE LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Bicycle lockers and accessories.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Submit for specified rack, including material descriptions, dimensions of individual components, and accessories required for installation.

B. Samples for Verification: Submit manufacturer's full range of color samples for final selection.

C. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
   1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver racks to site wrapped in protective coverings. Remove coverings only according to manufacturer's written instructions.

B. Store racks in a dry, protected area to prevent scratches or other damage to racks prior to installation.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

A. Recycled Content: Use materials and products that contain the maximum amount of recycled content allowed that retains material integrity.

2.2 LOCKERS

A. Single Bicycle Lockers: Dero Single Locker:
   1. Construction:
      a. Frame: 1.50" x 3.00" x 14g tube
      b. Floor: 18g plate
      c. Sides: 18g plate
      d. Doors: 16g plate

e. Top: 18g plate
2. Dimensions: Length: 76"; Width: 32"; Height: 49".
3. Capacity: 1 bicycle per modular unit.
4. Doors:
a. Panels: Perforated sheet steel with 3⁄8" holes.
b. Hinges: Heavy duty full length 14 gauge stainless steel piano door hinges.
c. Door Locks: Pop-out T-handles with removable lock cylinder.

B. Double Bicycle Lockers: Dero Two-Tier Bike Locker:
1. Construction:
a. Frame: 1.5” x 14g square tube
b. Sides: 18g plate
c. Doors: 16g plate
d. Top: 18g plate
2. Dimensions: Length: 77"; Width: 38.5"; Height: 102.5".
3. Capacity: 2 bicycles per modular unit.
4. Doors:
a. Panels: Perforated sheet steel with 3⁄8" holes.
b. Hinges: Heavy duty full length 14 gauge stainless steel piano door hinges.
c. Door Locks: Pop-out T-handles with removable lock cylinder.

C. Finish: Rust inhibitor under topcoat of thermosetting polyester powdercoat; UV, chip, graffiti, and flake resistant.
1. Color: To be selected from manufacturer’s full range of standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units where indicated on Drawings following manufacturer’s written instructions.

B. Place the locker base in the final locker position. Thread the leveling feet into the locker base and adjust the feet as necessary to level the base.
1. Drill through the leveling feet and into the ground at least 4-inches. Pound wedge anchors through the leveling feet and into the ground. Tighten the nuts.

C. Attach corner pieces to the base with bolts and washers at each corner bottom. Fasteners should be finger-tight. Place floor before corners.

D. Attach side pieces with bolts and washers. Fasteners should be finger-tight.

E. Attach roof with bolts and washers. Verify that all corners are aligned with the base corners and tighten the bolts at the bottom of the corners. Then tighten the bolts at the top of the corners. Finally, tighten the bolts attaching the sides and top.

F. Attach the door with flat-head bolts and toothed nuts. Ensure that these fasteners are very tight.
1. Verify the latch bar is holding the door shut without the door being held shut too tight or loose.
2. Verify the latch strike is smoothly engaging the lock.
3. Adjust as required for a smoothly operating installation.

3.2 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 12 9316

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SECTION 13 1600

Motor Fuel Storage and Dispensing System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 131601, Motor Fuel Electrical System

C. Section 131602, Environmental Monitoring System

D. Section 131603, Fuel Management System

1.2 DESCRIPTION

A. This Section describes furnishing and installing the motor fuel storage and dispensing system as shown on the contract drawings and as specified herein, including but not limited to the following:

1. Aboveground motor fuel storage tanks
2. Geotextile fabric
3. Earthworks and excavation support
4. Concrete
5. Tank Top Equipment
6. Spill and Overfill Protection
7. Sump and Riser Assemblies
8. Automatic Line Leak Detector
9. Submersible Turbine Pumps
10. Variable Frequency Drive Motor Controllers
11. Underground Fuel Piping
12. Fuel Dispensers
13. Dispenser Fuel Filter Assembly
14. Ball Valves
15. Emergency Shear Valve

16. Fire Extinguishers

17. Dispenser Equipment

18. Surface Manways

19. Signage, labeling, and designation

1.3 REFERENCES

A. ACI: American Concrete Institute

B. API: American Petroleum Institute

1. API 1626 – Storing and Handling Gasoline-Ethanol Blends at Distribution Terminals and Service Stations

2. API 2000: Venting Atmospheric and Low-Pressure Storage Tanks

C. ASME: American Society for Mechanical Engineers

1. ASME B31.3: Process Piping

D. ASTM: American Society for Testing and Materials

1. ASTM A48: Standard Specification for Gray Iron Castings

2. ASTM A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

3. ASTM C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

4. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m-m3))

E. BAAQMD: Bay Area Air Quality Management District

F. CARB: California Air Resources Board

1. Phase I EVR: Vapor Recovery Certification Phase I EVR for Underground Storage Tanks

G. CUPA: Hayward Fire Department

H. EPA: Environmental Protection Agency

I. FM: Factory Mutual Association

J. International Code Council

1. International Fire Code

K. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry

1. MSS SP-110: Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

L. National Certified Pipe Welding Bureau

M. NFPA: National Fire Protection Association

1. NFPA 30: Flammable and Combustible Liquids Code

2. NFPA 30A: Code for Motor Fuel Dispensing Facilities and Repair Garages

3. NFPA 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

4. NFPA 70: National Electric Code

N. NTEP: National Type Evaluation Program

O. OSHA: Occupational Safety and Health Act

P. PEI: Petroleum Equipment Institute

1. PEI RP200: Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling

Q. UL: Underwriter's Laboratories

1. UL 79: Standard for Power-Operated Pumps for Petroleum Dispensing Products

2. UL 87: Standard for Power-Operated Dispensing Devices for Petroleum Products

3. UL 567: Pipe Connectors for Flammable Liquids and Combustible Liquids and LP-Gas

4. UL 842: Standard for Valves for Flammable Fluids

5. UL 971: Standard for Nonmetallic Underground Piping for Flammable Liquids

6. UL 2085: Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids

1.4 DEFINITIONS

A. A. Degree of Compaction: Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, for general soil types, abbreviated as percent laboratory maximum density.

1.5 SUBMITTALS

A. Comply with Division 1 as stated previously in 1.1.A of this Section.

B. Shop drawings: Submit original copies of product data submittals for materials and equipment in Part 2 of this section including but not limited to:

1. Pipe bedding and backfill material.
2. Tank bedding and backfill material.
3. Compaction methods and equipment.
4. Aboveground Storage Tanks.
5. Anchors and Supports.
6. Leak detection and monitoring.
7. Piping.
8. Valves.
9. Containment Sumps.
10. Spill Containment Manholes.
11. Dispensers.
12. Hose Retractors.
13. Nozzles.
14. Hoses.
15. Breakaways.
16. Hose Swivels.
17. Filters.
18. Turbine Pumps.
19. Pump Controllers, including initial dip-switch and other startup settings
20. Solenoid valves.

C. Test Reports: Submit written test results for all tests as outlined in this specification.

D. Record and submit actual location of piping system, storage tank, and system components.

E. Contractor's certificates certifying that installers are licensed and qualified to install equipment as required by the Project.

F. No welder will be employed on the work who has not been fully qualified under the herein specified procedures and so certified by the local chapter of the National Certified Pipe Welding Bureau or similar testing authority.

1. Each operator's certificate shall be on file at the site and shall be made available upon request.

G. At no expense to the Owner, the Contractor shall obtain State, City, and other authorities having jurisdiction, permits and certificates required for the gasoline storage and dispensing system installation. Verification of permits shall be submitted.

H. Provide certification that a tank and piping tightness test has been performed according to State and Federal EPA standards, and system is free of leaks.

I. Manufacturer's Field Reports: Submit report of each visit of manufacturer's representative to provide technical assistance during installation.

J. State Installer Certification: Certify tank installers employed on the Work, verifying that all work meets State installer requirements.

1.6 CLOSEOUT SUBMITTALS

A. Comply with pertinent provisions of Division 1 as stated in 1.1.A of this Section.

B. Coordinate closeout submittals with Sections 131601, 131602, and 131603 to provide a single package for the fuel system project.

C. The following additional items shall be included in the closeout submittals for the motor fuel system:

1. A minimum of 400 high resolution (no less than 4 mega-pixel) digital (.jpeg format) photographs depicting the installation at each critical construction phase. Ensure to photograph underground, buried, and normally inaccessible components.

2. AST installation/warranty checklist with proof of delivery to manufacturer.

3. Underground piping manufacturers' installation checklists with proof of delivery to manufacturer.

4. Indicate layout of each piping system to scale of 3/8 inch. Indicate piping system routing showing pipe sizes, elevations, pipe lengths, fitting locations, valve locations, expansion joints, expansions loop locations, anchor locations and joint locations. Indicate on Record Drawings leak detection and locating system routing and panel location.

5. Environmental Monitoring/Leak Detection system checklist, warranty registration and checkout form/Intrinsic Safety Checklist with proof of delivery to manufacturer.

6. Laminated large format diagram showing all sensor, probe locations throughout system with corresponding labels to match Environmental Monitoring and Fuel Control System device designations.

7. Large format key plan of all gasoline and related system components and designation abbreviations.

8. Monitoring systems final setup printout.

9. Underground sump test records (dispenser, piping).

10. Dispenser Registration documentation and proof of transmittal to manufacturer.

11. Dispenser calibration documentation.

12. Copies of any State/Local approvals, authorizations, permits, and registrations.

13. Include local Permit applications, required plans by AHJ's and other applicable entities

14. Tank and Piping Test Results, Vapor Recovery Test Results, and Test Results for all secondary containment structures or annuluses and all containment sumps.

15. Records of all other inspections and tests.

16. Automatic line leak detector test results and electronic release detection equipment (sensors and probes) test results on state regulatory agency forms.

17. Tank certificate, licenses, and/or registration.

18. Warranties for all equipment and apparatus. In general, any product / manufacturer documentation that was provided with the equipment shall be provided as part of the closeout documents. Any warranty requiring forms or checklists shall be completed and fully executed.

19. Training certification for instruction seminars signed by the individuals trained on these systems.

20. All instruction bulletins, preventive maintenance schedules, operational instructions, and parts lists provided with the tanks, dispensers, monitoring system, and all other systems.

21. Waste disposal documentation (if any).

22. Other environmental information or permits (if any).

23. Copies of receipts for any keys, locks, or other equipment turned over to the Owner.

24. Provide directions for and sequences of operation Gasoline and related systems. Sequence shall list valves, switches, and other devices used to start, stop and control systems.

25. Operating manuals and instructions for each major system. Manuals shall include the following materials and information for all specified materials and equipment:
    a. Table of contents.
    b. Emergency instructions with 24-hour phone number to contact a responsible individual for each Section of Work.
    c. All Subcontractor warranties.
    d. Name and telephone number of local representative and supplier.
    e. Manufacturers' maintenance procedures: Systems which require preventive maintenance to maintain efficient operation shall be furnished with complete necessary maintenance information. Required routine maintenance actions, as specified by the manufacturer, shall be stated clearly and incorporated on a readily accessible label on the equipment. Such labels may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product.
    f. Exploded drawings and parts lists.

g. Troubleshooting checklists with potential problems and possible causes.
h. Schematic wiring diagrams.
i. As-built Record drawings.
j. Valve tag charts.
k. Equipment warranties and guaranties.
l. Sequence of Operations and Systems Descriptions.
m. Additional requirements specified in other sections

1.7 QUALITY CONTROL

A. Unless otherwise shown on the drawings or specified, regulatory requirements from following agencies shall be followed as minimum requirements for equipment required by the project:

1. Local and State building, plumbing, mechanical, electrical, fire and health department codes.

2. National Fire Protection Association (NFPA).

3. Occupational Safety and Health Act (OSHA).

4. Factory Mutual Association (FM).

5. Underwriter's Laboratories (UL).

6. American Petroleum Institute (API).

B. Specific reference is made to the following Standards of the National Fire Protection Association (NFPA) which shall govern provision of work as specified and as required by codes and authorities:

1. NFPA 30 – Flammable and Combustible Liquids Code.

2. NFPA 30A – Code for Motor Fuel Dispensing Facilities.

3. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

4. NFPA 70 – National Electric code

C. Qualifications: Use adequate numbers of skilled, licensed individuals who are thoroughly trained and experienced in the installation and testing of the specified systems and who are completely familiar with the requirements and the methods needed for proper performance of the work of this Section.

D. Tests of all Contractor secured materials and products being submitted for approval to determine conformance with all requirements of the Contract Documents, including borrow materials proposed for use, shall be performed by an independent testing laboratory retained and compensated by this Contractor.

E. As materials are incorporated into the project, on-site and off-site quality control tests shall be performed during construction to determine conformance with the Contract Documents by an independent testing laboratory retained and compensated by this Contractor.

F. All fuel system equipment shall be compatible with oxygenated fuel blends including up to 15 percent Ethanol.

G. Comply with the testing and field quality control in Part 3.

H. Qualifications:

1. Manufacturer: Utilize companies specializing in manufacturing products specified in this section with minimum five years documented experience.

2. Leak Detection Systems: The installing Contractor of the Environmental Monitoring system shall be the highest-grade technician as certified by the leak detection manufacturer.

3. Tank Installer: Company specializing in performing Work of this section with minimum ten years documented experience. The Contractor installing the Motor Fuel System shall be licensed by the State of California and be in accordance with Local and State requirements.

4. Provide a manufacturer certified installer to supervise the installation of the underground UL-971 piping systems.

1.8 EXTRA MATERIALS AND SPARE PARTS

A. Provide 1 spare of every type and model of relay used in the fuel system.

B. Provide 2 spare dispenser hose breakaway fittings (1 each size).

C. Provide 2 spare dispensing nozzles, one of each type specified in the system.

D. After the completion of a complete filter change out following commissioning, provide 2 additional filters for each product.

1.9 PERMITS AND SUBMISSIONS

A. The Contractor shall provide all permits and notifications required by state and local codes and regulations.

B. Specifically, at a minimum, the Contractor shall submit to the Hayward Fire Department (designated CUPA) for approval.

C. The Contractor shall also contact the Department of Public works, the Bay Area Air Quality Management District of Building Inspections, and the Department of City Planning to determine if these departments will require any additional permitting for AST installation. If such permits are required, the Contractor is responsible for submitting applications and obtaining all permits. The Contractor shall be responsible for securing the Phase II Vapor Recovery waiver that currently exists at the site.

D. Copies of all submissions and permits/registrations received shall be provided as part of the closeout documentation.

1.10 GENERAL CONDITIONS

A. The Contractor shall determine a benchmark and key elevations of existing tank slabs and grades in the new tank slab areas before demolition. Establish and maintain temporary benchmarks on the site for reference. All vertical dimensions shall be verified from these benchmarks.

B. All permanent benchmarks shall be protected from disturbance or destruction. Any point disturbed or destructed shall be immediately replaced by a qualified surveyor at this Contractor's expense. Documentation of any such relocation or replacement shall be given to the Engineer.

C. Disposition of Utilities

1. Adequately protect from damage all active utilities and remove or relocate only as indicated, specified, or directed.

2. Report inactive and abandoned utilities encountered in excavating and grading operations to the Engineer. Remove, plug or cap as directed by the Engineer.

3. Provide a minimum of a 48-hour notice to the Engineer and receive written notice to proceed before interrupting any utility.

D. Stockpiling of topsoil and other excavated materials will be permitted on-site within the project limits on a case by case basis provided the stockpiles are constructed and maintained in a manner that does not create a foreign object damage risk or adversely affect any other ongoing construction or operation at the site.

E. During windy or wet conditions and at the conclusion of each day's work period, cover all excavated material to prevent it from becoming saturated or being displaced by wind or rain. Anchor all sides of covering as required to hold the covering firmly in place. In all cases, provide additional measures as necessary to prevent erosion, sedimentation, and wind-borne displacement of excavated materials from their stockpiled location.

F. Before beginning any work specified in this Section, the Contractor shall make certain that all applicable soil erosion and sediment control requirements are compiled with and the proper authorities have been informed of the construction schedule.

G. The Contractor shall restore all disturbed areas to original conditions including curbing, utility lines, etc. Concrete and pavement thickness shall be in accordance with the construction drawings.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Comply with Division 1 as stated in 1.1.A of this Section.

B. Protect equipment, materials and specialties from elements and other damages caused during shipment, storage and erection until final acceptance from the Owner.

C. Contractor shall verify upon delivery that the tank size, diameter and configuration of tank top sumps and openings meet the project design requirements.

1.12 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.13 WARRANTY

A. All tanks shall carry a 30-year warranty and shall be installed to the manufacturer's requirements and shall be supervised by a manufacturer's trained installer.

PART 2 - PRODUCTS

2.1 ABOVEGROUND GASOLINE STORAGE TANKS

A. Manufacturers:

1. A custom fabricated, Containment Solutions Hoover Vault Tank is the basis of design, and forms the basis of the design of the concrete slab dimensions, bollard layout, support slab, seismic anchors, submersible pump shaft dimensions, and other critical equipment dimensions. If an alternate manufacturer is chosen, the Contractor shall provide an alternate tank with equivalent dimensions, anchoring points, weights, and working volumes, or provide the necessary design revisions to the above elements to accommodate the alternate tank. In any case, the gross dimensions of the tank area and tank placement shall remain the same so as not to change the site operations in the case of a substitution.

2. Approved manufacturers:
   a. Basis of Design: Containment Solutions, Hoover Vault Tank, customized as shown on construction drawings
   b. Modern Welding Company, customized as shown on construction drawings
   c. Highland Tank, customized as shown on construction drawings

B. The primary aboveground storage tanks shall be rectangular, double-walled, constructed of steel and shall be listed to UL 2085. Provide tanks with nominal capacity, dimensions, and fittings as shown on the contract drawings. IMPORTANT NOTE: To accommodate specific needs of the owner, the tank dimensions have been customized. The custom dimensions depicted on the design reflect the customized tank from Containment Solutions.

C. Primary tank:

1. The standard primary storage tank shall be rectangular in design. It shall be constructed of UL 2085 specified steel thickness, with continuous welds.

2. The primary storage tank shall be constructed of steel.

3. Refer to construction drawings for number and orientation of tank top fittings.

4. The primary tank shall be pressure tested to UL 2085 Standard at the factory, and shall be field tested by the contractor to a maximum 3 psi.

D. Secondary Leak Containment Tank:

1. The secondary leak containment tank shall be rectangular in design and listed to UL 2085 insulated secondary aboveground tanks for flammable and combustible liquids, protected type.

2. The secondary tank shall be tested liquid tight at the factory (minimum 3 to maximum 5 psi), and shall also be field tested by the contractor to a maximum 3 psi, or in accordance with manufacturer requirements.

3. The secondary tank shall provide reinforcement for the lightweight concrete to remain in place around the primary tank.

4. The secondary tank shall provide true 360° Radius "pressure testable" containment for the primary tank.

5. The port openings in the top of the secondary tank shall be constructed with full welds to prevent moisture from seeping between the fire proofing material and secondary and primary tanks.

6. The top of the secondary tank shall be sloped so that water will not accumulate on top of the tank.

7. The secondary tank shall have a two (2) inch monitoring port including a tube which provides a means to detect product leakage from the primary tank into fire protection material that directly surrounds the primary tank.

E. Coatings:

1. The exterior surface of the secondary tank shall be cleansed of foreign material and coated with a corrosion resistant industrial epoxy-polyamide coating with urethane topcoat (minimum 6 mils DFT epoxy and 2 mils DFT urethane).

2. The color shall be light gray. Provide color swatch for City approval with the tank submittal.

F. Tank Appurtenances:

1. The tank shall be equipped as shown on the construction drawings, which includes, but is not limited to:
   a. The tank shall have an interstitial monitor tied into the fuel system environmental monitoring system, as shown on the drawings.
   b. The tank shall be equipped with spill boxes, as shown on the construction drawings.
   c. The fill port bungs shall be sized to accommodate a 3” overfill protection device (i.e.6” bung).
   d. The tank shall be equipped with steel primary working vents and vent caps. Vents shall be sized IAW UL listing for the tank.
   e. The tank shall be equipped with primary and secondary emergency vents, one for the primary tank and one for the interstice, sized by the tank manufacturer per NFPA 30A.
   f. The tank shall be equipped with level gauges depicting gallons of product in the tank, as shown on the construction drawings.
   g. The tank shall be equipped with an electronic level probe. Coordinate with Section 131602.
   h. The tank shall be equipped with all code and industry standard safety and identification signage.
   i. The tank shall be equipped with galvanized stairs provided by the tank manufacturer.
   j. Underwriters Laboratories label shall be permanently affixed to each tank.
   k. Gauge Stick: The tank shall be provided with an appropriately sized gauge stick calibrated in inches.

G. Tank Top Equipment

1. General: All tank top equipment, including vent caps, shall meet the Phase I EVR standard as defined by the California Air Resources Board.

2. Fittings: The Contractor shall provide threaded fittings on top of the tank of size and number as specified on the construction drawings.

3. Drop Tube
   a. The Contractor shall provide a standard aluminum drop tube extension into the tank, as specified on the construction drawings. The drop tube shall include an automatic shutoff valve set to stop the filling process at 95 percent of the actual tank capacity.

4. Fill Pipe
   a. The fill pipe shall conform to specifications on construction drawings.

5. Vapor Recovery Pipe
   a. The vapor recovery pipe shall conform to specifications on construction drawings.

6. Pressure Vacuum Vent
   a. All primary gasoline tanks shall be vented with a pressure-vacuum vent that remains closed unless venting under pressure or vacuum conditions. Tanks are designed for operation at atmospheric pressure only. Pressure vacuum vents shall be Phase 1 EVR listed by CARB.

2.2 EARTHWORKS

A. Fill Materials

1. Supply AST slab subbase materials the aboveground tank installation in accordance with structural and geotechnical sections.

2. Supply fill materials for the underground motor fuel piping installation in accordance with piping manufacturer requirements.

2.3 CONCRETE

A. Concrete for tank slab, fuel dispensing apron, and concrete paving (when required) shall be air entrained, have a minimum 28-day compressive strength of 4000 psi, with a maximum slump of 4 inches. Concrete shall be broom finished and sealed. Seal shall be Spray-Lock Concrete Protection or approved equal. Refer to and coordinate with Structural sections for additional concrete requirements.

B. Reinforcing bar shall comply with ASTM A615.

2.4 TANK TOP AND DISPENSING EQUIPMENT

A. All tank top and dispensing equipment, including vent caps, shall meet the Phase I EVR standard as defined by the California Air Resources Board, and be certified as a complete system by a single CARB Executive Order.

2.5 SPILL AND OVERFILL PROTECTION

A. Mechanical Overfill Prevention Valves
   1. Manufacturers: OPW (61fSTOP) EVR, EMCO A1100EVR, or equal.
   2. The overfill prevention valve shall be Phase I EVR listed by CARB
   3. The overfill prevention valve shall be designed for pressurized tank fills.

4. The mechanical overfill prevention valve shall have a 3” diameter primary dimension (i.e. 3” valve in 6” bung).

B. Audible/Visual Overfill Alarm
1. Manufacturers: Manufactured by selected Environmental Monitoring manufacturer in Section 131602.
2. Provide 1 strobe/horn combination for each AST compartment.

C. Spill Containment Boxes
1. Provide spill containment boxes for both the gasoline and diesel fill ports.
2. Spill containment boxes shall be floor-mounted boxes and stainless steel.
3. Boxes shall be supplied with operating valves and check valves and shall have a means to return spilled product to the tank.

2.6 TRANSITION SUMP ASSEMBLIES

A. Manufacturers: S. Bravo Systems or Approved Equal.

B. Transition sump assemblies shall be FRP.

C. Sumps shall be watertight, and be brine monitored, double walled in accordance with AB 2481.

2.7 ELECTRONIC LINE LEAK DETECTOR

A. Manufacturers: Veeder Root, or pre-bid approved equal

B. The Contractor shall supply an electronic automatic line leak detector (ALLD/ELLD) for each underground piping run. The leak detector shall be capable of detecting a leak in the underground piping at a leak rate compliant with State and local regulations. Refer to Section 131602 Environmental Monitoring and Fuel Control System for requirements.

2.8 SUBMERSIBLE TURBINE PUMPS

A. Manufacturers: FE Petro, Red Jacket, or approved equal. IMPORTANT NOTE: The FE Petro pumps depicted on the construction drawings are the basis of design, Should an alternative manufacturer be used for the generator pump, the Contractor shall validate that the flowrates and output pressures are equivalent, or coordinate with mechanical sections to validate that the day tank overflow pump specified in other sections is appropriately balanced with the generator supply STP specified here.

B. General

1. The Contractor shall provide pumps with power requirements as shown on the drawings.

2. Pumps shall be capable of the following performance:
a. For 1/3 hp pump, shall be capable of 66 feet of head at 20 GPM
b. For 3/4 hp pump, shall be capable of 85 feet of head at 20 GPM

3. To meet federally mandated “Spitback” control requirements the predetermined flow rate through the unleaded gasoline nozzle shall be controlled to limit this to 10 GPM maximum. This shall be limited with the addition of a flow limiting device.

4. The entire pumping assembly shall be UL 79 listed.

5. The pump discharge head and manifold assembly shall be manufactured from ASTM A48 class 25 gray iron.

6. The pump shall use a single phase fixed speed motor designed for installation through a standard 4-inch tank opening.

7. The pump shall be equipped with a variable telescoping length feature such that the pump length is field adjustable in length without disrupting the UL label.

8. The pump motor shall have a thermal over-current overload protector with automatic reset.

9. The pump motor assembly shall be clearly marked with pertinent information including Model, Horsepower, Voltage, Phase and Manufacturer etched into the pump shell for permanent identification.

10. The pumps shall be designed for motor fuels and be UL listed for blend concentrations of:
    a. 0 percent - 15 percent ethanol or methanol and gasoline.
    b. 20 percent MTBE with 80 percent gasoline.
    c. 20 percent ETBE with 80 percent gasoline.
    d. 17 percent TAME with 83 percent gasoline.
    e. Diesel and Bio-Diesel blends up to B20

11. The pumping unit shall not incorporate any flexible diaphragms. All sealing shall be accomplished with O-rings or UL recognized fiber gaskets.

12. The pump shall be rated to operate between -40 degrees F and 104 degrees F with non-gelled product.

13. The pump shall have a three-wire field connection and an easy access ground wire terminal and shall incorporate a wire seal plug which will incorporate all four wires.

14. The pump shall incorporate a port for line pressure testing that shall be sealed with a 1/4-inch NPT pipe plug.

15. The head of the pump shall contain a manual pressure relief screw to bleed static line pressure to zero through a flow path into the tank. This feature is required to avoid product escaping into the environment when opening the piping system for service when the piping is pressurized.

16. The pump unit shall have a fully extractable head in order to permit removal of the pump motor assembly without disturbing the discharge piping, product in the pipelines downstream of the check valve, siphoning system with siphon check valve installed, or the electric wiring.

17. During the removal of the extractable portion of the pump, product contained in the discharge manifold of the pump shall drain automatically into the storage tank.

18. The product in the pipelines shall be held in place by a line check valve that shall have a minimum sealing force of 170 lbs. when the pump is not running and a minimum 30 PSI of pressure in the pipeline.

19. The line check valve shall be independent of the removable head and shall be easily accessible.

20. Input and Output wiring of the controller shall be “home-run” rigid metal conduits, no shielded power cables required.

21. The pump shall have an air/vapor elimination system that returns air or vapors to the underground storage tank through a tune discharging near the top of the pump motor assembly.

22. The unit shall contain a built-in expansion relief valve that relieves pressure at or above pumping pressure but below 50 PSI as standard. Other pressure relief settings shall be available.

23. The pump motor shall utilize the product being pumped for lubrication of the motor bearings and for cooling the stator, and this fluid shall discharge into the underground storage tank at the top of the motor.

24. The pump shall have siphon capability built into the pump.

25. The pump shall have a 2-inch NPT threaded opening for the installation of mechanical line leak detectors or pressure transducers used in certain electrical line leak detectors.

2.9 SINGLE-PHASE DRIVE MOTOR CONTROLLER

A. Manufacturer: The motor fuel submersible pump motor controllers shall be supplied by the manufacturer of the submersible pumps

B. The controller shall have the following additional functions:

1. Report Abnormal Operating Conditions: The controller shall report the following abnormal operating conditions by means of dual seven segment displays on the face of the controller, or by connection to a computer through an RS 485 communications port.

2. Abnormal Conditions:
   a. Tank Empty, Under Load
   b. Low Incoming Voltage
   c. Locked Rotor
   d. Open Circuit
   e. Capacitor Bank Failing
   f. Extended Run
   g. Short Circuit
   h. High Temperature

3. The pump shall be capable of monitoring and reporting by the Environmental Monitoring and Fuel Control Consoles.

4. Manual Reset Button: The controller shall be equipped with a manual reset button, which is pressed upon correction of any of the above faults.

5. Silence Button: The controller shall be equipped with a silence button, which is pressed upon acknowledging audible alarm on abnormal conditions. Pushing and holding the silence button will display the last faults encountered by the controller.

6. Seven Segment Displays: The front cover of the controller shall have seven segment display to indicate power on, pump running, and abnormal conditions. The controller shall have the capacity to be configured as:

7. Stand Alone: This configuration will allow the controller to operate independently as a Stand-Alone unit.

8. One controller is required for each pump.

9. The controller shall operate on 200-250-volt, 60 Hz, 1-phase.

10. The controller shall have an RS 485 communications port for connection compatibility to electronic line leak detection/point of sale units manufactured by others, or other PC monitoring means.

11. The pump and controller shall be manufactured by the same company.

2.10 UNDERGROUND MOTOR FUEL PIPING

A. Underground Flexible Stainless-Steel Fuel Piping

1. Manufacturer
   a. Brugg Pipe Systems (Flexwell-HL)
   b. Approved Equal

2. Piping shall be flexible double walled stainless steel with integral polyethylene jacket. Provide piping nominal diameters and fittings as shown on the drawings. Primary piping and secondary piping shall be 316L stainless steel. Secondary piping shall be jacketed with a non-metallic material to provide corrosion protection.

3. Fittings shall be made by the manufacturer and shall be stainless steel. Fittings shall allow for vacuum monitoring of the interstitial space between primary and secondary piping.

B. Flexible Connectors

1. Manufacturer
   a. Franklin Fueling Systems (Fireflex)
   b. Approved Equal

2. Provide UL listed, stainless steel flexible connector. Provide stainless steel end fittings as shown on the Drawings.

2.11 MOTOR FUEL DISPENSERS

A. Manufacturers: Gasboy, Wayne or pre-bid approved equal

B. Dispenser must be compatible with specified fuel management system. Fuel management system has been selected due to its compatibility with the overall system.

C. Requirements:

1. Dispenser shall have a National Type Evaluation Program (NTEP) Certificate of Conformance, be UL 87 rated, and be compatible with ethanol blended fuel up to E15.

2. Gasoline and Diesel Dispenser:
   a. Self-contained, single product, ***enhanced capacity***, electronic dispensers with lane-oriented nozzle boots, stainless steel panels and doors, solenoid valves

and 100:1 dual pulse output per nozzle. Number of hoses shall be in accordance with the drawings.

3. Label all dispensers by fueling position. Do not affix labels to removable dispenser doors.

4. Provide 1 dispenser key per dispenser to the Owner at project conclusion.

5. Provide primary and spare dispenser filters for dispenser startup described later in this section. All dispenser filters provided shall be designed for compatibility with ethanol blends.

6. Provide all required stickers and labels, including 87 Octane, ULSD, product labels, anti-static, and all required safety labels.

D. Fuel Filter Assembly

1. Manufacturers: Vaporless, or equal

2. Provide a safety port fuel filter assembly on each gasoline dispenser fuel filter housing. The assembly shall allow for line testing and the installation of pressure test equipment, Vaporless Safety Port (SP-series) or equal.

2.12 TANK VENTS

A. Tank Venting Requirements: All gasoline primary tanks shall be vented with a pressure-vacuum vent that remains closed unless venting under pressure or vacuum conditions. All diesel primary tanks shall be vented with an atmospheric vent. Tanks are designed for operation at atmospheric pressure only. Pressure vacuum vents shall be Phase 1 EVR listed by CARB and be part of the same CARB executive order as other equipment at the site.

2.13 BALL VALVES

A. Acceptable Manufacturers: Jomar, Apollo, or equal.

B. 2 inch and smaller: Full port, class 150, MSS SP-110, UL 842 listed, stainless steel body, stainless steel ball and stem, seat, body, and stem seals PTFE, steel handle, threaded ends.

C. Larger than 2 inch: Full port, class 150, MSS SP-110, UL 842 listed, stainless steel body, stainless steel ball and stem, seat, body, and stem seals reinforced PTFE, steel handle, flanged ends.

2.14 STAINLESS STEEL EMERGENCY SHEAR VALVE

A. Acceptable Manufacturers: OPW, Morrison Brothers, Franklin Fueling Systems, or equal

B. Double poppet, normally closed valve, NPT threaded connections with a union top, fusible link closes at 165 degrees F., with shear point, test port, ductile iron valve, stainless steel. UL 842 listed. Provide stabilizer bar to rigidly mount in dispenser sump.

C. Emergency shear valves shall be stainless steel.

2.15 ABOVEGROUND PIPING

A. Aboveground pressure gasoline and diesel piping, including fill piping: 304L/316L stainless steel, seamless, schedule 40S, conforming to ASTM A312 and ASME B36.19, as depicted on the construction drawings. Where carbon steel piping is specified, piping shall be ASTM A53, Schedule 40, threaded. Where depicted on the construction drawings, all carbon steel piping and components shall be prepared to an SSPC SP-2 standard, primed with one coat of compatible primer appropriate for the preparation method and marine environment, and coated with 2 coats of an alkyd high-gloss paint, color gray.

B. Stainless steel fittings shall be schedule 40S, socket/butt welded connections, conforming to ASTM A403 Carbon steel fitting shall be malleable, 150#.

C. All fittings shall be stainless steel compatible with gasoline/ethanol blends up to 85% ethanol and diesel/biodiesel blends up to 20% biodiesel.

D. Provide flange and orifice plate with 1” nominal opening at day tank transition area for regulation of generator supply flowrate to day tank. Provide extra orifice plate if necessary, to reduce generator supply flowrate after testing while commissioning system.

2.16 FIRE EXTINGUISHERS

A. Provide fire extinguishers, metal cabinets (no glass/plastic windows), and signage at each fuel dispenser and other locations shown on the construction drawings, including at each fuel dispensing area and at each aboveground storage tank.

B. Fire extinguishers shall be UL Listed with a 4-A:80-B:C UL rating.

2.17 DISPENSER EQUIPMENT

A. Hose Retractors

1. Manufacturers: Morrison Bros, Universal, or equal

B. Gasoline and Diesel Nozzle (3/4”)

1. Manufacturers: OPW, Franklin Fueling Systems, or pre-bid approved equal

2. Nozzle shall conform to CARB requirements/Executive Order for Phase I EVR system.

C. Hoses

1. Manufacturers: Continental, Goodyear, Irpco, or equal

2. Nozzle shall conform to CARB requirements/Executive Order for Phase I EVR system.

D. Breakaways

1. Manufacturers: OPW, Catlow, or equal

2. All breakaways shall be re-connectable

E. Hose Swivels (3/4”)

1. Manufacturers: OPW, Franklin Fueling Systems or equal

2. 45-degree hose swivel for ¾" nozzles as shown on the drawings

F. Aboveground Dispenser Containment Sumps/Pedestals

1. Manufacturers: Emco Wheaton, Morrison Brothers, or approved equal

2. Aboveground dispenser sumps/pedestals shall be stainless steel.

3. Sumps/Pedestals shall be specifically sized to the selected dispenser, shall be intended for surface mount and designed to support the full weight and axial loads of the dispenser, and shall have the ability to be seismically anchored to the concrete tank slab.

G. All Dispenser equipment shall be Phase I EVR, as applicable, and all listed on the same CARB Executive Order.

2.18 SIGNAGE, LABELING, AND DESIGNATION

A. Provide designation labels on all equipment in this specification outlined on the related equipment drawings. All labels shall bear the abbreviations as described on those drawings and legends and shall match exactly the designation abbreviations programmed into the Environmental Monitoring and Fuel Control System and the Fuel Management and Revenue Control System.

B. Tag all valves, mechanical devices and components identified on system Process and Instrumentation Diagrams with permanent tags, as indicated.

C. Provide wall mounted, plain English, permanent signage at all fill ports, regulating valves, evacuation stations, manual emergency actuators, operating valves and any other mechanical/or electrical device that the facility user would be expected to actuate or operate in the normal course of business or emergency situation.

D. Identify piping, concealed or exposed, with plastic pipe markers. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction. Underground pipe marker shall be detectable magnetic warning tape.

E. All wall mounted and equipment mounted designation tags shall be 2 or 3-ply phenolic, outdoor and long-life rated, non-flammable, non-conductive, 1/8-inch thick, engraved. All signage shall be 0.020 baked enamel aluminum or FRP sized appropriately for the lettering. Aluminum shall be mounted with stainless steel hardware. Stock adhesive stickers are authorized only where specifically designated on the construction drawings. Designation labels and operating signage shall be white letters on black signage. All emergency, warning or other related signs shall be red signs with white letters, unless otherwise specified on the construction drawings. Designation label material shall be specifically designed to prevent static build-up, ES-1 Phenolic by NORPLEX, or approved equal. Lettering on designation labels shall be ½-inch in height. Lettering for operational signage shall be 3/4-inch in height unless otherwise designated in the construction drawings. Lettering for emergency signage shall be 1-inch in height unless otherwise designated in the construction drawings. Wall mounted signs shall be affixed with anchors and stainless-steel screws. Equipment mounted signs shall be mounted with epoxy adhesive.

F. Valve and component tags shall be hanging type, stainless steel, round with stamped lettering. Tag size shall be minimum 1-1/2 inches diameter with finished edges. Tags shall

be affixed to valves with a clamped wire rope loop, such that it is not easily removable. Lettering shall be 1/4-inch in height unless otherwise designated in the construction drawings. Removable and adjustable ball-type chains or zip ties are not acceptable for mounting.

G. Provide a typed list of all signs and valve tags at completion of the project. This list shall include the valve tag number, type of valve, location of valve, and purpose of valve (i.e. isolation valve, bypass valve, etc.). This list shall be framed and provided to the Owner for installation. Provide copies of the valve list in the Operation and Maintenance Manuals as part of the project closeout.

PART 3 - EXECUTION

3.1 GENERAL

A. The installation of aboveground storage tanks and all fuel system equipment shall be conducted in strict accordance with the manufacturer's installation instructions. Nothing in this specification is intended to supersede or contradict those instructions.

B. Install aboveground tanks and all fuel system equipment in accordance with all local and state requirements and Fire Codes. Additionally, install per NFPA 30, NFPA 30A, and NFPA 70.

C. The Contractor shall install enabling infrastructure in the fuel dispensing area for tenant installed productivity systems.

D. Prior to installing aboveground storage tank, verify the presence of existing interferences and confirm that the installation procedures will not violate headroom restrictions.

3.2 ABOVEGROUND MOTOR FUEL STORAGE TANKS

A. The installation of aboveground storage tanks shall be conducted in strict accordance with the tank manufacturer's installation instructions. Nothing in this specification is intended to supersede or contradict those instructions.

B. Check factory installed equipment and accessories for loosening during transit.

C. Install aboveground tanks with anchoring as specified in the drawings. Refer to structural sections for additional seismic anchoring requirements.

D. Install piping connections to tanks with unions. Provide venting in accordance with API 2000.

E. Extend fill line and cover to grade and provide concrete pad as specified in the drawings.

F. Tank Accessories:

1. Install tank accessories shipped loose with tank.

2. Install tank accessories as indicated on drawings.

3.3 EARTHWORKS AND EXCAVATION SUPPORT

A. Excavation

1. Refer to soils and structural sections for general site earthwork requirements.

2. Unless otherwise directed, all excavated native soil shall be replaced with manufacturer approved backfill material. Allowance shall be made for the required base and sand or gravel cushion-leveling course. The area of the foundations and footings shall be proof rolled to detect any soft zones. All soft zones shall be removed and replaced with select material compacted to 95 percent maximum dry density (ASTM D1557), as tested by the Contractor.

3. Structures and utilities located within the excavated area shall not be disturbed without prior approval by the Owner. The Contractor shall protect all structures and utilities to remain to prevent disruption of facility operations.

4. The Contractor shall provide the necessary shoring, sheeting or bracing as required by OSHA and other applicable regulatory agencies for any trenching or similar excavation. All shoring materials used shall be in good, serviceable condition, and carried down as the excavation progresses.

B. Dewatering

Follow project dewatering specifications, and comply with all Federal, State, and Local regulations.

C. Material Disposal

1. The Contractor shall dispose of all excess and/or unsuitable excavated material.

D. Subgrade Preparation

1. The Contractor shall finely grade all improvement areas indicated on the contract documents to the finish elevation indicated less the depth of the slab, footing, paving, and/or walkways and their base. Any required fill shall conform to specifications set forth in Paragraph F.4. All subgrades shall be compacted to 95 percent Maximum Dry Density (ASTM D1557) as tested by the Contractor.

E. Fill, Backfill, and Base

1. Refer to structural and soils sections for general project earthwork requirements.

2. The Contractor shall not commence placement of fill, backfill, or base materials until the subgrade has been inspected and approved by the Owner.

3. The Contractor shall provide a minimum of 12-inch compacted gravel cushion below all new concrete slabs, (including replacement). Backfill around concrete shall be of materials not subject to expansion or contraction (non-cohesive) and shall be sloped away from the concrete work. Sand shall not be placed above any gravel used as backfill in an area undergoing installation of concrete slabs, footings, paving, and walkways.

4. Trench or excavation backfill shall be compacted to 95 percent maximum dry density, as tested by the Contractor, with a mechanical tamper in lifts not to exceed 6 inches. Surface material and finish shall be replaced to match that of adjacent grade surface, including any base material required.

5. All new fill shall be compacted to at least 95 percent Maximum Dry Density at Optimum Moisture Content according to ASTM D1557, as tested by the Contractor.

6. Crushed stone and similar base materials shall be material that will compact and adequately bond under watering and rolling. Base course materials are to be placed in one or more layers, rolled thoroughly, and compacted until the material does not creep or wave ahead of the roller. All coarse aggregates shall be removed, and the finish surface of the base shall be firm and free of loose material.

7. Crushed gravel or crushed rock shall be 1-1/2-inch minus, free from dirt, clay balls, and organic material, well graded from coarse to fine, containing sufficient finer material for proper compaction, and less than 8 percent by weight passing the No. 200 sieve.

F. Pipe Trenches

1. Excavate to the dimensions indicated in the drawings. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Wet and tamp as necessary to provide a firm and compacted pipe bed.

2. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length.

3. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe.

4. Backfill and fill material placement over pipes

5. Backfilling over tanks or underground fuel piping shall not begin until construction below finish grade has been inspected, tested and approved. This includes, but is not limited to underground utilities, fuel piping, UST vent piping and other related piping installations.

3.4 CONCRETE

A. Install concrete slabs in accordance with the drawings, and ACI standards.

B. The concrete tank top slab shall have an HS-25 loading.

C. All tank top concrete manways shall be crowned to prevent storm water from entering manways.

D. Refer to structural and civil sections for additional requirements.

3.5 TANK TOP EQUIPMENT

A. Install tank top equipment in accordance with CARB EVR Phase I requirements, manufacturer requirements and the drawings.

3.6 SPILL AND OVERFILL PROTECTION

A. Install spill and overfill protection equipment in accordance with manufacturer requirements and the construction drawings.

B. Submit mechanical overfill prevention valve calculations to the Owner for approval.

C. Demonstrate operability/measure all overfill prevention devices in the presence of a representative of the Owner.

D. Submit written test results.

3.7 SUMP AND RISER ASSEMBLY

A. Install sump equipment in accordance with manufacturer requirements and the drawings.

3.8 ELECTRONIC LINE LEAK DETECTOR (ELLD/ALLD)

A. Install the Electronic automatic line leak detector in accordance with manufacturer requirements and Section 131601.

B. The ALLD shall be installed **WITHOUT** a positive alarm such that the associated submersible pump feeding the emergency generator still runs if there is a line leak alarm. This is for the generator pumps only.

3.9 SUBMERSIBLE TURBINE PUMPS

A. Install submersible pumps in accordance with manufacturer instructions, requirements, and regulations.

B. Configure the diesel submersible pump to shut down when the tank level reaches 3,000 gallons remaining, to accommodate the minimum required emergency generator volume.

3.10 SINGLE-PHASE DRIVE MOTOR CONTROLLERS

A. Submersible turbine pump controllers in accordance with manufacturer requirements.

B. Provide a manufacturer rep for the submersible pump and controller for commissioning. Program/configure the submersible pumps to meet the performance requirements. For gasoline dispensers, adjust flow limiting devices so that flow rates are 9-10GPM at the nozzle. Submit startup settings to the Owner for approval prior to startup.

C. Adjust configuration of pumps between single operation, master/slave, alternating, or master/slave alternating as required, coordinating with mechanical trades to adjust valve alignments, to achieve performance requirements. Provide dedicated hook signal to each pump controller.

3.11 UNDERGROUND MOTOR FUEL PIPING

A. Examination

1. Verify excavations are to required grade, dry, and not over-excavated.

2. Over-excavated areas shall be provided with select fill at no more than 4-inch lifts, wetted and compacted to 95 percent density. This shall be repeated until the desired grade is achieved.

B. Installation

1. All piping shall be installed by manufacturer certified personnel in strict accordance with manufacturer installation instructions.

2. Verify connection size, location, and invert elevations are as indicated on drawings, or as required for indicated slope.

3. Establish elevations of buried piping with not less than 12 inches of cover unless otherwise specified.

4. Remove scale and dirt on inside of piping before assembly.

5. Excavate pipe trench.

6. Install pipe to elevation as indicated on drawings.

7. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth; compact to 95 percent maximum density.

8. Install pipe on prepared bedding.

9. Install pipe to allow for expansion and contraction without stressing pipe or joints.

10. Install shutoff and drain valves at locations indicated on drawings.

11. Install magnetic utility warning tape continuous over top of pipe buried 6 inches below finish grade and in accordance.

12. Pipe Testing Requirements:
    a. Test piping per manufacturer's requirements and specifications.
    b. Maintain the required pressure for a minimum of 2 hours after the backfill process has been completed. Maintain a vacuum on the interstitial space through all backfilling and concrete work. Remove vacuum from interstice only after all work is completed above the piping.

13. Pipe Cover and Backfilling
    a. Backfill trench in accordance per manufacturer's requirements.
    b. Maintain optimum moisture content of fill material to attain required compaction density.

14. After pneumatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 4 inches compacted layers to 6 inches minimum cover over top of jacket. Compact to 95 percent maximum density.

15. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.

16. Do not use wheeled or tracked vehicles for tamping.

17. Test primary and secondary piping in accordance with manufacturer's requirements and this specification prior to backfill, prior to pouring concrete for building and tank slabs, and after all trenches have been backfilled and building and tank slabs have been installed.

18. In addition, conduct a precision test, capable of detecting a leak of 0.005 gallons per hour and after all backfill and concrete work, including tank slab, is complete.

3.12 ABOVEGROUND MOTOR FUEL PIPING

A. Install aboveground motor fuel piping in accordance with NFPA 30, NFPA 37, the California Fire Code, and ASME B31.3.

B. All aboveground piping shall be hydrotested to 150% of maximum working pressure. Maximum system pressure is defined as 50 psig. Hydrostatic test pressure shall be 75 psig.

C. Install orifice plate in generator supply line near connection point to day tank. Test system in overflow condition and validate that: 1) The supply flowrate is adequate for the maximum generator fuel consumption, and 2) The overflow line flowrate exceeds the supply flowrate. If the supply flowrate exceeds the overflow flow rate, change orifice plate to reduce supply flowrate under the direction of the engineer.

3.13 MOTOR FUEL DISPENSERS

A. Dispensers shall be installed in strict accordance with manufacturer instructions.

B. The Contractor shall furnish and install filters designated by the dispenser manufacturer for each gasoline dispenser. This aims to eliminate the potential for additional and unforeseen flow restrictions. At startup, activate each dispenser and inspect filter for leaks. Allow approximately 100 gallons of product to flow through the filter, then remove and replace filter.

C. Perform an electric circuit test on the fuel dispensers to confirm complete system functionality and all safety and environmental interlocks.

D. The Contractor shall add 87 Octane, ULSD, and ethanol (10 percent) stickers to the appropriate dispensers, as applicable.

E. Calibrate all dispensers and provide documentation of calibration by a manufacturer certified dispenser technician. Arrange Weights and Measures licensing per state requirements. Ensure all dispensers are tagged and sealed by regulatory Weights and Measures authorities. Provide written report of Weights and Measures certification.

F. Commission dispensers under the supervision of a factory authorized technician, and complete warranty registration with the manufacturer.

3.14 DISPENSER FUEL FILTER ASSEMBLY

A. Install safety port filter assembly in accordance with manufacturer instructions.

3.15 BALL VALVES

A. Examination

1. Verify piping system is ready for valve installation – ensure valves are not installed during system flushing and cleaning.

B. Installation

1. Install valves with stems upright or horizontal, not inverted.

2. Install valves with clearance for installation and operation, and allowing access.

3. Provide access where valves and fittings are not accessible.

C. Valve Applications

1. Install shutoff and drain valves at locations indicated on drawings in accordance with this Section.

2. Install ball or gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
3. Install ball or globe valves for throttling, bypass, or manual flow control services.

D. Flanged Connections

1. Align flange surfaces parallel.

2. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on pipe threads. Tighten bolts gradually and uniformly with torque wrench.

E. Adjusting

1. Contractor shall adjust all valves for flows and pressure setting specified in Part 2.

3.16 EMERGENCY SHEAR VALVES

A. Install emergency shear valves in accordance with manufacturer instructions, requirements, and regulations.

B. Test all under-dispenser crash/emergency valves and provide written report. Ensure that all crash valves are free to operate prior to introducing fuel into the system.

3.17 FIRE EXTINGUISHERS

A. Installation

1. Install fire extinguishers, cabinets and signage in accordance with NFPA and State Fire Code Requirements, in locations shown on the drawings.

2. Coordinate location of extinguisher mounts so as not to conflict with other fuel island or aboveground storage tank equipment.

3.18 DISPENSER EQUIPMENT

A. Install dispenser equipment in accordance manufacturer instructions in locations as shown on the drawings.

3.19 SIGNAGE, LABELING, AND DESIGNATION

A. Affix signs as close as practicable to the intended equipment. Affix designation labels on the front face of equipment in a manner to be easily identifiable but not covering other labeling or features.

B. All signs, labels, and tags shall be affixed in a permanent manner.

C. All emergency signs shall be unobstructed and easily readable from as wide an area as possible.

D. Install detectable magnetic warning tape, colored appropriately, 12-inch above the pipe it is protecting.

3.20 FIELD QUALITY CONTROL

A. Test all tanks, piping systems, sumps, interstitial spaces in accordance with manufacturer requirements and guidelines, and PEI RP200. All test results shall be submitted to the Owner within 24 hours of completion. The primary and secondary chambers of all product carrying vessels (pipes and tanks) shall be tested prior to and after final backfill. The test pressure on the interstitial piping space shall be maintained through the final backfill process and verified after backfill is complete.

B. After completion of the gasoline system installation, and after backfilling and setting concrete, test all underground piping with a precision method capable of detecting leaks of 0.005 gph. The precision test shall be performed by a third-party independent testing company and shall provide a certified report of tightness to the Owner with 5 days of completion. Also complete a precision test of all piping prior to pouring concrete protective slab.

C. Pressure test piping in accordance with NFPA 30A, NFPA 30, and ASME B31.3.

D. Notify the Owner at least 10 working days prior to final backfill of the underground piping. The Owner may be present for a final-pre-backfill inspection of all underground components, and neither of these evolutions shall be conducted until the Owner has had the opportunity to observe.

E. In addition to the requirements outlined above, hydrostatically test all dispenser containment sumps, tank sumps, turbine enclosures, and other containment structures by filling each sump with water to within 6 inches of the top and monitoring the water level of 2 hours. This test shall be conducted by a testing agency and the results reported to the Owner within 24 hours of completion.

F. Provide documentation of all tests signed by certified personnel to the Owner prior to the operation of the facility and in the closeout documents.

G. Complete an operation test of all leak detection and level monitoring systems.

H. Test all safety devices, including but not limited to crash valves, emergency stop devices, and leak detection devices, in the presence of the Owner. Provide a written report of all tests.

I. Test all leak detection sensors, automatic line leak detectors, and level probes. Report results on State required forms that document annual test for these devices. Tests shall be in accordance with manufacturer requirements for startup tests and in accordance with State requirements for annual testing.

J. Commission and calibrate the fuel dispensers using the services of a manufacturer certified service organization. Provide a report of startup and calibration from that agency.

K. Adjust/calibrate/commission the submersible pump controllers, adjusting output pressures as required to achieve the desired flow rate performance.

L. Test the flow rate of fuel at each dispenser in the presence of the Owner. Flow rate shall be 8-10 gallons per minute, with a minimum of 100 percent of the nozzles pumping, i.e. one nozzle per dispenser operating. Adjust the submersible turbine pump variable frequency drive output pressures to deliver equal flow rates to all dispensers.

3.21 INITIAL FUEL DELIVERY AND CALIBRATION

A. The Contractor shall provide all fluids required to commission and test the fuel system.

3.22 COMMISSIONING

A. The Contractor shall commission the gasoline fuel system. Commissioning shall include all testing, start-up, calibration, programming, and documentation. At the conclusion of the commissioning, the facility shall be ready for the Owner and tenants to conduct unrestricted operations and use all systems to their full intended and designed capacity.

B. The Contractor shall submit a system commissioning plan to the Owner for approval at least 30 days prior to commissioning the system. The plan, at a minimum shall include health and safety, testing, calibration, startup, and operational testing procedures for all operation and safety equipment. The plan shall also include all testing and commissioning procedures specifically outlined in this section. The Contractor shall be responsible for supplying all fluids and commodities required to startup and calibrate systems.

C. Commissioning of the fuel system shall commence no less than 7 days prior to date of beneficial occupancy.

D. Train facility personnel on system operations, including all valves, actuators, and controls. Training shall be a minimum of 8 hours.

E. Fuel or flammable liquids shall not be introduced into the aboveground tanks until the environmental monitoring and leak detection system is fully programmed, operational, and tested. Fuel shall not be introduced into the dispensing system until all safety (including emergency stop, crash valves, etc.) and leak detection devices have been tested, and fire extinguishers installed.

F. Notify the Owner no less than 14 days prior to the completion of Commissioning. When Commissioning is completed, the Contractor shall facilitate a final inspection by the Owner. The Contractor shall have all necessary trade personnel on-site to operate equipment, open containment areas, and open electrical enclosures and equipment during the Owner's final Commissioning inspection. That final inspection shall include, but not be limited to:

1. Operational test of all systems.

2. Operational test of all safety devices (e-stop switches, crash valves, overfill alarms);

3. General review of the installation against plans, specs, and manufacturer requirements;

4. Review of all test reports and manufacturer start-up reports;

5. Test of all leak detection sensors;

6. Closeout document requirements review;

7. Tank registration form review, to include all outstanding regulatory reports;

8. Inspection of all tank level probes to verify 90 percent setting;

9. Inspect of mechanical overfill protection devices to verify/measure 95 percent setting;

10. Inspect of all sumps and containment areas;

11. Review and validation of monitoring system programming;

12. Operational test of the fuel management system and verification that the system is recording transactions and that the operator is able to generate fuel invoices.

13. Confirmation that system training has been completed; and

14. Verification that remote monitoring in accordance with Section 131602, Environmental Monitoring and Fuel Control System is set up and functioning properly.

3.23 MANUFACTURER'S FIELD SERVICES

A. Furnish factory trained representative of system supplier for 8 hours of on-site time during leak detection and location system sensor and electronics installation.

B. Furnish factory trained representative of system supplier for 8 hours of on-site time during final checkout of leak detection and location system.

3.24 TANK REGISTRATION

A. Submit all forms, notifications, and reports as required by the City of Hayward Fire Department for tank registration, and provide copies to the Owner prior to operation of the system, and in the closeout documents.

END OF SECTION 13 1600

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SECTION 13 1601

Motor Fuel Electrical System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 131600, Motor Fuel Storage and Dispensing System

C. Section 131602, Environmental Monitoring System

D. Section 131603, Fuel Management System

1.2 DESCRIPTION

A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

B. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with the contract documents.

C. In general, the work of this Section includes furnishing labor, equipment, and materials necessary to perform the excavation, trenching, de-watering, bedding, backfilling, compaction, shoring and off-site disposal of excess and unsuitable materials during installation of fuel piping, underground storage tanks, transition sump pits, fuel related electrical conduit, and all other related utilities specified or indicated in the Contract Documents.

D. Furnish and install motor fuel and specialized electrical systems as shown on the drawings and as specified herein, including but not limited to the following:

1. Hazardous locations
2. Conduits
3. Circuit Boards
4. Seal-off fittings
5. Wire and cable
6. Panelboards
7. Outlet, junction and pull boxes
8. Formed steel channel

9. Underground warning tape

10. Emergency stop

11. Dispenser emergency stop interrupt

12. Emergency stop signage

13. Identification, signage and labeling

14. Grounding and bonding

15. Surge suppression

16. Uninterruptable power supplies

1.3 REFERENCES

A. API: American Petroleum Institute:

1. API 1615 – Installation of Underground Petroleum Storage Systems

B. ASTM: American Society for Testing and Materials

1. ASTM A48: Standard Specification for Gray Iron Castings

2. ASTM A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

3. ASTM C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

4. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m-m3))

C. International Code Council

1. International Fire Code

D. NEMA: National Electrical Manufacturers Association

1. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum).

2. NEMA WD 1: General Requirements for Wiring Devices.

3. NEMA WD 6: Wiring Devices-Dimensional Requirements.

4. NEMA FG 1: Nonmetallic Cable Tray Systems.

5. NEMA VE 1: Metal Cable Tray Systems.

6. NEMA VE 2: Metal Cable Tray Installation Guidelines.

E. NFPA: National Fire Protection Association

1. NFPA 30: Flammable and Combustible Liquids Code

2. NFPA 30A: Code for Motor Fuel Dispensing Facilities and Repair Garages

3. NFPA 70: National Electrical Code (NEC)

F. PEI: Petroleum Equipment Institute:

1. PEI RP200: Recommended Practices for Installations of Aboveground Liquid Storage Systems

G. UL: Underwriters Laboratories

1. UL 913: Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous Locations.

2. UL 1238: Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices

1.4 SUBMITTALS

A. Comply with Division 1 requirements as stated in 1.1.A in this Section.

B. Shop drawings: Submit original copies of product data submittals for materials and equipment in Part 2 of this section including but not limited to:

1. Conduits

2. Circuit Boards

3. Seal-off fittings

4. Wire and cable

5. Panelboards

6. Outlet, junction and pull boxes

7. Formed steel channel

8. Underground warning tape

9. Emergency stop

10. Dispenser emergency stop interrupt

11. Emergency stop signage

12. Identification, signage and labeling

13. Grounding and bonding

14. Surge suppression

15. Uninterruptable power supplies

16. Include voltage drop calculations and wire sizing on all branch circuits.

C. Test Reports: Submit written test results for all tests as outlined in this specification.

D. Contractor's certificates certifying that installers are licensed and qualified to install equipment as required by the Owner.

1.5 QUALITY CONTROL

A. Unless otherwise shown on the drawings or specified, regulatory requirements from following agencies shall be followed as minimum requirements for equipment required by the project:

1. Local and State building, plumbing, mechanical, electrical, fire and health department codes.

2. National Fire Protection Association (NFPA).

3. Occupational Safety and Health Act (OSHA).

4. Factory Mutual Association (FM).

5. Underwriter's Laboratories (UL).

6. American Petroleum Institute (API).

B. Specific reference is made to the following Standards of the National Fire Protection Association (NFPA) which shall govern provision of work as specified and as required by codes and authorities:

1. NFPA 30 – Flammable and Combustible Liquids Code.

2. NFPA 30A – Code for Motor Fuel Dispensing Facilities.

3. NFPA 70 – National Electric code

C. Contractor Qualifications: The Contractor shall be a licensed Master Electrician in the State of California and the City of Hayward and **shall have a minimum of ten years' experience with installation of gasoline and petroleum electrical systems, including those regulated by Articles 514 and 515 of the National Electric Code**.

D. No electrician will be employed on the work who has not been fully qualified under the herein specified procedures and so certified by the State of California or similar testing authority.

1. Each operator's certificate shall be on file at the site and shall be made available upon request.

1.6 PERMITS AND SUBMISSIONS

A. The Contractor shall be responsible for all permits and notifications required by State and Local codes and regulations.

B. Copies of all submissions and permits/registrations received shall be provided as part of the closeout documentation.

C. Specifically, at a minimum, the Contractor shall submit to the Hayward Fire Department (designated CUPA) for approval.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Division 1 as stated in 1.1.A in this Section.

B. Protect equipment, materials and specialties from elements and other damages caused during shipment, storage, and erection until final acceptance from the Owner.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Comply with Division 1 as stated in 1.1.A in this Section.

B. Do not install underground conduit when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 CONDUITS

A. Rigid metal conduit: Threaded, galvanized rigid metal conduit is required for all motor fuel systems wiring and all wiring passing through the defined Class I hazard areas. Non-metallic conduit is permitted underground only when specifically allowed by NEC Article 514 and the applicable local electric code. EMT shall be allowed for conduit located completely in buildings and not in or under Hazardous locations. RIGID METAL CONDUIT IS THE BASIS OF DESIGN.

B. Flexible steel conduit with listed fittings are only permitted in Class I, Division 2 areas where specifically allowed by the NEC. Shall be single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside, forming a smooth internal wiring channel. Maximum length is 6 feet. Each section shall contain appropriately sized equipment grounding wire bonded at each end. Provide connectors with insulating bushings. Steel squeeze-type or set screw type fittings. IMPORTANT NOTE: IF NON-METALLIC CONDUIT IS USED ON THE PROJECT, THE CONTRACTOR SHALL ADD CABLE SHIELDING OR ADDITIONAL EQUIPMENT GROUNDING CONDUCTORS AS REQUIRED BY THE ENVIRONMENTAL MONITORING SYSTEM, DISPENSER, AND FUEL MANAGEMENT SYSTEM INSTALLATION MANUALS, WHEN SUCH ADDITIONAL EXTRA PROTECTIONS ARE REQUIRED FOR NON-METALLIC CONDUITS.

C. Liquid-tight flexible electrical conduit with listed fittings: only permitted in Class I, Division 2 areas where specifically allowed by the NEC. Shall be single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside, forming a smooth internal wiring channel with a water-tight plastic outer jacket. Maximum length is 6 feet. Each section shall contain appropriately sized equipment grounding wire bonded at each end. Cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushings which thread to interior of conduit. Spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat. Steel squeeze-type or set screw type fittings.

D. Aluminum conduit is not authorized.

2.2 SEAL-OFF FITTINGS

A. Seal-off fittings shall be listed for Class I, Division 1 and Division 2 areas where applicable and shall be installed in accordance with the NEC.

B. All seal fittings shall be 40 percent fill type.

2.3 WIRE AND CABLE

A. General

1. Electrical grade annealed copper, tinned if rubber insulated and fabricated in accordance with ASTM standards. Provide only copper stranded conductors for feeders and branch circuits, and stranded conductors for control circuits. Power conductors shall not be smaller than 12 AWG for branch circuits. Conductors shall be sized for overcurrent protection and voltage drop. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent. Insulation voltage rating: 600 volts, except for wire used in 50 volts or below in control of signal systems, in this case use 300 volt minimum.

2. Use the following wiring methods in fueling areas:

3. Branch circuit wiring: Insulated single conductor type THHN/THWN, flame retardant, heat resistant thermoplastic insulation, nylon jacketed rated for 90 C dry/75 C wet operation.

4. Feeder circuit wiring: Insulated single conductor type THHN/THWN or RHW or XHHW, rated for 90 C.

2.4 PANELBOARDS AND CIRCUIT BREAKERS

A. Provide panelboards as specified on the construction drawings.

B. Provide switch-neutral breakers for all motor fuel dispenser branch circuits.

2.5 OUTLET, JUNCTION, AND PULL BOXES

A. All exterior sumps, panels, and fuel component outlet boxes, including motor fuel equipment, throughout the site not in a designated electrical room, shall carry a NEMA 4 or NEMA 4X rating unless otherwise indicated the specifications or drawings. All boxes in Hazard areas shall be rated in accordance with the NEC.

2.6 FORMED STEEL CHANNELS

A. Manufacturers: Allied Tube & Conduit Corp., B-Line Systems, Midland Ross Corporation Electrical Products Division, Unistrut Corp., or equal.

B. Description: Galvanized 12-gauge thick steel. Holes 1-1/2 inches on center.

2.7 UNDERGROUND WARNING TAPE

A. Manufacturers: TEK ID., PRESCO, or equal.

B. Description: 3-inch-wide plastic detectable type tape, colored red with suitable warning legend describing buried electrical lines. Warning shall list utility covered, e.g. “CAUTION BURIED ELECTRIC LINE BELOW”

2.8 EMERGENCY STOP

A. Description

1. Furnish and install emergency stop buttons (ESBs) in locations as shown on the drawings. The buttons shall be red momentary push-buttons switches, mounted in NEMA 4X enclosures, supplied with plastic covers, with minimum 120VAC 10A rating. ESBs isolate systems as shown the drawings by shunt trip breakers.

2. The system shall interface with the motor fueling, environmental monitoring, and fuel management systems. Coordinate with Sections 131600, 131602 and 131603.

3. Furnish and install 3-Phase contactors for isolation of the fueling panels, as shown on the construction drawings.

4. Provide all wiring, conductors, raceways, mounting hardware, connectors, enclosures, and other equipment necessary for a complete installation.

2.9 DISPENSER EMERGENCY STOP INTERRUPT

A. Manufacturers: Power Integrity, Square D, Carolina Products, or equal

B. Provide UL listed low voltage dispenser emergency stop interrupt(s) at dispensing area as indicated on the drawings.

2.10 EMERGENCY STOP SIGNAGE

A. Furnish emergency stop signage at each actuator location. Furnish operating instruction for the emergency stop system in each shunt trip location reset location. Emergency stop signage shall meet signage specifications outlined in sections below.

2.11 IDENTIFICATION, SIGNAGE, AND LABELING

A. Cable Tags and Wire Identification Labels. Label and designate all electrical components and wires in accordance with NFPA 70.

B. Provide wall mounted, plain English, permanent signage at all manual emergency actuators and any other mechanical/or electrical device that the end-user would be expected to actuate or operate in the normal course of business or emergency situation.

C. Supply detectable magnetic warning tape over all underground conduits.

D. All wall mounted and equipment mounted designation tags shall be 2 or 3-ply phenolic, outdoor and long-life rated, non-flammable, non-conductive, 1/8-inch thick, engraved. All signage shall be 0.020 baked enamel aluminum or FRP sized appropriately for the lettering. Aluminum shall be mounted with stainless steel hardware. Stock adhesive stickers are authorized only where specifically designated on the construction drawings. Designation labels and operating signage shall be white letters on black signage. All emergency, warning or other related signs shall be red signs with white letters, unless otherwise specified on the construction drawings. Designation label material shall be specifically designed to prevent static build-up, ES-1 Phenolic by NORPLEX, or approved equal. Lettering on designation labels shall be 1/2-inch in height. Lettering for operational signage shall be 3/4-inch in height unless otherwise designated in the construction drawings. Lettering for emergency signage shall be 1-inch in height unless otherwise designated in the construction drawings. Wall

mounted signs shall be affixed with anchors and stainless steel screws. Equipment mounted signs shall be mounted with epoxy adhesive.

2.12 GROUNDING AND BONDING

A. Grounding Conductors

1. All grounding conductors shall be 2/0 AWG, stranded copper.

2. Grounding ring conductors shall be 2/0.

B. Grounding Rods

1. All grounding rods shall be copper clad and 8 feet minimum in length.

C. Connectors

1. Make connections in accordance with NFPA 70.

D. Rod Electrodes

1. Product Description: Copper-clad steel.

2. Diameter: 3/4 inch.

3. Length: 8 feet.

E. Mechanical Connectors

1. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for the particular installation.

2.13 SURGE SUPPRESSION

A. Manufacturers: Power Integrity, Eaton, or equal.

B. Description: Supply a parallel connected, panel-based surge suppression device for each Main Fuel Service Panel. The panel shall be connected in parallel to the service panel through a circuit breaker. The panel shall be rated for 120kA surge capacity.

2.14 UNINTERRUPTABLE POWER SUPPLY (UPS)

A. Provide UPS devices for the following equipment:

1. Environmental Monitoring System

2. Fuel Management System

3. Routers, switches, and networking equipment

B. Each device shall be capable of powering each piece of equipment for 15 minutes.

C. Provide disconnects for each UPS as shown in the drawings.

2.15 OUTDOOR FUEL SYSTEM ELECTRICAL ENCLOSURE

A. Manufacturers: Hoffman, or approved equal

B. Provide UL 508A Type 4 electrical enclosure for fuel system electrical equipment with dimensions as shown in the drawings.

C. Enclosure shall be NEMA 4X minimum, powder-coated white by the manufacturer.

D. Enclosure shall be equipped with double-doors with a three-point latch, padlocking handles, and removable center post.

E. Enclosure shall have anchor points as specified on the drawings for seismic anchoring.

2.16 ENCLOSURE COOLING UNIT

A. Manufacturers: Stratus, or approved equal

B. Provide UL listed 2,000 BTU/hr enclosure air conditioner compatible with the fuel system electrical enclosure for mounting as shown in the drawings. Unit shall be NEMA 4X enclosure.

C. Cooling unit shall be capable of conditioning between 70-95 degrees F with up to 125 degrees F ambient temperature.

D. Unit shall be equipped with a programmable temperature controller with visible alarm features.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to device installation, verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

B. Prior to making equipment connections, verify equipment is ready for electrical connection, for wiring, and to be energized.

3.2 CONDUITS

A. Install conduits in accordance with the NEC Chapter 5, Articles 500, 501, 505, 511, 514, and 515 when installing conduit for gasoline and vehicle service equipment.

B. Conduit penetrations in the floor of the fueling system/fuel island area (within the horizontal extents of the class I hazard area) are prohibited, except within the raised concrete fuel island or other raised concrete island.

3.3 SEAL-OFF FITTINGS

A. A. Install in accordance with the NEC where required in hazardous areas and for conduit passing underneath hazardous areas.

3.4 WIRE AND CABLE

A. Number of conductors and sizes shall be in accordance with the drawings.

3.5 PANELBOARDS

A. Install switched-neutral (SWN) breakers on all motor fuel dispenser branch circuits.

3.6 OUTLET, JUNCTION, AND PULLBOXES

A. Pay particular attention to NEC Chapter 5, Articles 500, 501, 511, 514, and 515 when installing seal-off fittings for the motor fuel related equipment.

3.7 FORMED STEEL CHANNEL

A. Support all vertical conduit in the fuel island area with formed steel channel.

B. Conduit penetrations in the floor of the fueling system/fuel island area (within the horizontal extents of the class I hazard area) are prohibited, except within the raised concrete fuel island or other raised concrete island.

C. Coordinate the mounting and installation of formed steel channel for conduits on raised fuel islands.

3.8 UNDERGROUND WARNING TAPE

A. Install underground, detectable, magnetic warning tape over all underground conduit. Install 12 inches over conduit. Install one string of tape for each conduit 3 inches or larger. Install one string of tape per 3 smaller conduits. When conduits are placed in a horizontal array in a large trench, the conduits on each extent of the trench (i.e. the “outside” conduits) shall have a dedicated warning tape.

3.9 EMERGENCY STOP

A. Installation locations

1. Install the emergency stop system in accordance with the drawings.

2. Install the emergency stop buttons in locations shown on the drawings.

3. Install all emergency stop shunt trip breakers and isolations solenoid switches as shown on the drawings.

4. Install all shunt trip in NEMA rated enclosures appropriate for the exposure.

B. System Operation and Logic

1. Install the system to comply with the operating logic outlined in the drawings and in this section.

2. The emergency stop system activates when an emergency stop button is activated. When an emergency stop button is actuated, electrical power is secured to all fueling areas via the shunt trip breakers in the fueling panels.

3. Manual reset to restore power to fueling panels and systems is accomplished by actuating breakers that have been tripped. The emergency stop reset restores power to all fueling panels and systems shut down during an emergency stop.

4. Inputs. Shut-down will be activated by actuation of any one of the manual emergency stop buttons' outputs: Upon shut-down, the following will occur:
   a. Power secured to all dispensers and pumps via the shunt trip breakers.

C. Tests and Inspections

1. Conduct a test with the Owner present that the system is operating properly. Every actuation method and environmental alarm sensor shall be actuated to demonstrate functionality.

2. After successful completion of the Owner test, conduct the same test in the presence of the authority having jurisdiction (AHJ).

3. In no way shall the above tests substitute for or be in lieu of any other tests, inspections, or trials required by the AHJ or other regulatory authorities. The Contractor is responsible for the conduct of all required system tests and shall all equipment, supplies, and materials, including test fluids, to complete the tests.

3.10 DISPENSER EMERGENCY STOP INTERUPT

A. Installation Locations

1. Install interrupts in as shown on the drawings.

B. System Wiring

1. Install wiring to each dispenser emergency stop interrupt.

C. Tests and Inspections

1. Conduct tests with the Owner present that dispenser emergency stop interrupts are operating properly.

2. After successful completion of the Owner test, conduct the same test in the presence of the AHJ.

3. 3. In no way shall the above tests substitute for or be in lieu of any other tests, inspections, or trials required by the AHJ or other regulatory authorities. The Contractor is responsible for the conduct of all required system tests and shall all equipment, supplies, and materials required to complete the tests.

3.11 EMERGENCY STOP SIGNAGE

A. Emergency Stop signage and Emergency Stop Reset signage and instructions shall be posted respectively at each emergency stop button and shunt trip breaker locations.

3.12 IDENTIFICATION, SIGNAGE AND LABELING

A. Affix signs as close as practicable to the intended equipment. Affix designation labels on the front face of equipment in a manner to be easily identifiable but not covering other labeling or features.

B. All signs, labels, and tags shall be affixed in a permanent manner.

C. All emergency signs shall be unobstructed and easily readable from as wide an area as possible.

D. Install detectable magnetic warning tape, colored appropriately, 12 inches above the conduit it is protecting.

E. Label all conduits at the point of emergence from ground, and the entry point of all wiring troughs with a permanent paint marking pen. Paper labels are not acceptable.

3.13 GROUNDING AND BONDING

A. Examination

1. Verify final backfill and compaction has been completed before driving rod electrodes.

2. Clear and verify the location of all underground structures and utilities prior to beginning work.

3. Verify trenching is completed before installing horizontal electrodes.

B. Installation

1. Install rod electrodes in vertical position with bottom at least 5 feet below frost line.

2. Install interconnecting wire 2 feet below finished grade level.

3. Demonstrate location of each accessible grounding connection and each chemical treatment well.

4. Connection to the piping shall be made to base metal. Restore disturbed coating with manufacturer approved materials to match pre-manufactured coating.

C. Grounding

1. Install a grounding electrode system which includes ground rods, and concrete encased electrodes. Install all electrodes per NFPA 70.

2. Install 2 ground rods spaced not less than 6 feet apart.

3. Install a concrete encased electrode in each UST tank slab. Bond UST vent piping to the concrete encased electrode.

4. Provide all other grounding in accordance with NFPA 70 and the State of California requirements.

D. Bonding

1. Bond all aboveground piping and service systems, to the piping grounding electrodes, and to the main grounding electrode system:

2. Bond grounding systems to the facility electrical service grounding and bonding system.

3. Bond the electrical system in accordance with NFPA 70.

3.14 SURGE SUPPRESSION

A. Install surge suppression system in accordance with manufacturer requirements on Main Fuel Service Panels.

3.15 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. Connect each device to the specified protected equipment in accordance with manufacturer instructions.

3.16 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

C. Clean adjacent surfaces of firestopping materials.

END OF SECTION 13 1601

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SECTION 13 1602

Environmental Monitoring System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 131600, Motor Fuel Storage and Dispensing System

C. Section 131601, Motor Fuel Electrical System

D. Section 131603, Fuel Management System

1.2 DESCRIPTION

A. Furnish and install the environmental monitoring and fuel control system as shown on the drawings and as specified herein, including but not limited to the following:

1. Environmental monitoring and fuel control system consoles.

2. Environmental monitoring system sensors and probes.

3. Environmental monitoring system communications.

4. Environmental monitoring and fuel control system signage and labeling.

1.3 REFERENCES

A. ASTM: American Society for Testing and Materials

B. NEMA: National Electrical Manufacturers Association

C. NFPA: National Fire Protection Association

1. NFPA 70: National Electrical Code (NEC)

D. NWGLDE: National Work Group on Leak Detection Evaluations

E. UL: Underwriters Laboratories

1. UL 1238: Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices

1.4 SUBMITTALS

A. Shop drawings Product data and Samples

B. Test Data: Submit test data for the following field testing and inspection reports:

1. Test of all sensors, probes, and overfill alarm.

2. Test of interconnection rules between systems.

3. Certifications that the system is free of leaks and has passed all required tests.

C. Contractor's certificates certifying that installers are licensed and qualified to install equipment as required by the Project.

D. The person installing the monitoring system shall be a manufacturer certified technician of the appropriate level. Each operator's certificate shall be on file at the site and shall be made available to the Owner upon request.

E. At no expense to the Owner, the Contractor shall obtain State, City of Hayward, and other authorities having jurisdiction, permits and certificates required for the environmental monitoring system installations. Verification of permits shall be submitted.

F. Provide certification that the system is free of leaks and has passed required tests required in Part 3 of this section.

1.5 QUALITY CONTROL

A. Regulatory requirements from following agencies shall be followed as minimum requirements for equipment required by the Project. Stricter requirements indicated in the drawings or the specifications shall have precedence over the requirements listed below:

1. Contractor Qualifications: The Contractor shall be a manufacturer certified installer and programmer of the system.

2. Manufacturer Qualifications: The manufacturer shall at least ten years' experience with manufacturing systems of this type.

1.6 EXTRA MATERIALS AND SPARE PARTS

A. None.

PART 2 - PRODUCTS

2.1 SYSTEM MANUFACTURER

A. All consoles, sensors, level probes, and high-level annunciating devices shall be supplied from the same manufacturer to form an integrated system.

B. Manufacturers: Veeder-Root TLS 450 PLUS ATG – no substitutions authorized.

2.2 ENVIRONMENTAL MONITORING SYSTEM CONSOLE

A. Provide environmental monitoring system consoles in numbers as specified in the construction drawings.

B. System shall be equipped with intrinsically safe monitoring probe and sensing devices, and integral printer. Supply expansion boxes for functionality specified. Supply system management software.

C. The console shall be supplied with an ethernet jack for direct internet connection.

D. Monitoring requirements:

1. Continuous monitoring of all sensor inputs as shown on the drawings.

2. Continuous liquid level monitoring for up to 4 tanks.

3. Continuous monitoring of submersible turbine pumps.

4. External inputs for signals from other monitoring systems.

5. Pressure transducer inputs from various places on the fuel system.

6. Continuous monitoring of all hydrostatic sensor input from all sumps.

7. Underground piping line leak detection.

E. Control Capabilities:

1. A minimum number of relay output channels as shown on the drawings.

2. Submersible turbine interfaces.

3. The ability to manage submersible turbine pump hook signals and provide hook signal isolation for dispensers through up to 4 AC input channels and the submersible turbine interface.

4. The ability to program rules to allow for submersible turbine pump activation in the case a valid hook signal is received.

5. The ability to shut down the diesel motor fuel dispensing submersible pump when the tank reaches 3,000 gallons of remaining capacity, to retain the minimum volume required for the emergency backup generator.

F. Communication requirements:

1. E-mail notification capability.

2. Direct Ethernet connection capability.

3. USB 2.0 connectivity.

4. RS-232/485 connectivity.

5. IP addressable web-based interface for remote monitoring.

6. Output relays to alert other systems

2.3 ENVIRONMENTAL MONITORING SYSTEM SENSORS AND PROBES

A. Provide containment sump (dispenser, intermediate, and transition) leak detection probes. Dispenser and sump leak detection probes shall be non-discriminating type.

B. Provide interstitial sensor for the aboveground storage tank.

C. Provide magnetorestrictive level probes for each product in the aboveground storage tank.

D. Provide automatic line leak detection sensor for the underground pipe.

E. Provide hydrostatic interstitial monitoring probes for all sumps, and dry interstitial monitor for the AST.

F. Provide functionality as shown on the construction drawings.

2.4 WIRING

A. Provide conduit, wiring, junction boxes, seal fittings, and other components for a complete system in accordance with manufacturer instructions and the NEC.

B. All conduit shall be galvanized rigid metal.

2.5 ENVIRONMENTAL MONITORING SYSTEM COMMUNICATIONS EQUIPMENT

A. Connect the environmental monitoring system into the building networking and communications system to be monitored by the internet. Refer to drawings for data connection number and locations.

B. Provide networking and communication wiring to monitor the submersible turbine pumps.

C. Provide one remote overfill alarm annunciator for each underground tank monitored. Do not assign a single overfill annunciator to multiple tanks. Each compartment in a compartmented tank is considered a single underground tank.

2.6 ENVIRONMENTAL MONITORING SYSTEM SIGNAGE AND LABELING

A. A. Provide designation labels on all equipment in this specification outlines on the related equipment designation drawings. All labels shall bear the abbreviations as described on the drawings and legends and shall match exactly the designation abbreviations programmed into the Inventory and Leak Detection System and the Fuel Management and System, in accordance with Section 131603.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL MONITORING AND FUEL CONTROL SYSTEM INSTALLATION

A. Install consoles in strict conformance with manufacturer requirements, recommendations, and instructions.

B. Install console(s) in the locations shown on the drawings.

C. Protect power the Environmental Monitoring Consoles via UPS devices. Coordinate with other sections.

D. Load and connect all wires required for a fully functioning system as described on the construction drawings. Install all necessary expansion cards, modules, and boxes to provide the functionality below:

E. Configuration and Programming

1. Program and configure the system to monitor the following:
   a. Leak monitoring of all dispenser containment and transition sumps.
   b. Leak monitoring of all tank containment sumps.
   c. Line leak monitoring of all underground fuel piping.
   d. Interstitial leak monitoring of all underground tanks and sumps.
   e. Level monitoring of all underground and aboveground tanks. Coordinate with other sections.
   f. Performance monitoring of all submersible turbine pumps.
   g. Vacuum monitoring of all underground fuel and vent piping.
   h. Each different emergency stop signal.
   i. Input from the Fuel Management System.
2. Program and configure the system to send the following outputs:
   a. Output signals to actuate the submersible pumps when hook signals are received, and the line leak detection system is not in alarm, Output signals authorizing fuel dispensers to dispense.
   b. Output signals to the appropriate overfill protection annunciators.
3. Program and configure the system for the following rules:
   a. Actuate the appropriate submersible pump when a hook signal is received and appropriate line leak detector is not in alarm.
   b. Send the appropriate signal to the appropriate overfill alarm annunciator when a tank liquid level reaches 90 percent.
   c. Upon completion and testing of programming, provide the Owner with a hard copy output of all programming and rules. Additionally, the Contractor shall download the programming configuration to a flash drive so that the system can be quickly re-programmed by electronic upload.
   d. Program the diesel motor fuel dispenser submersible pump to shut down at 3,000 gallons of remaining capacity.
   e. Program diesel delivery limit at 4,500 gallons and the low product warning at 3,250 gallons.

3.2 ENVIRONMENTAL MONITORING SYSTEM SENSORS AND PROBES

A. Install sensors and proves in strict accordance with manufacturer recommendations, requirements, and instructions.

3.3 ENVIRONMENTAL MONITORING SYSTEM COMMUNICATIONS EQUIPMENT

A. Configure the system and program rules to send e-mail on certain system alarms at the direction of the Owner and Fuel Manager. At a minimum, configure e-mail notifications for leak alarms and low fuel levels.

B. Configure the system so that each console is capable of monitoring over the internet.

C. Connect the system to the fuel management VPN. Refer to Section 131603.

3.4 ENVIRONMENTAL MONITORING SYSTEM SIGNAGE AND LABELING

A. Affix signs as close as practicable to the intended equipment. Affix designation labels on the front face of equipment in a manner to be easily identifiable but not covering other labeling or features.

B. All signs, labels, and tags shall be affixed in a permanent manner.

3.5 COMMISSIONING

A. The Contractor shall submit a system commissioning plan to the Owner for approval at least 30 days prior to commissioning the system. The plan, at a minimum shall include health and safety, testing, calibration, startup, and operational testing procedures for all operation and safety equipment. The plan shall also include all testing and commissioning procedures specifically outlined in this section. The Contractor shall be responsible for supplying all fluids and commodities required to startup and calibrate systems.

B. Engage the services of a manufacturer certified representative to program and configure the system and otherwise oversee installation. The manufacturer certified technician shall be present during all system testing, startup procedures, and fuel system testing.

C. In the presence of the Owner, test all sensors and probes. Measure all probes to demonstrate overfill alarm settings. Coordinate testing and commissioning with other sections.

D. In the presence of the Owner, test all interconnections and rules between systems. Verify that all system functionality is operating properly.

E. Train Owner’s personnel to operate system.

F. Do not introduce fuel into any aboveground or in-building system until all safety features of the Environmental Monitoring System have been fully tested.

END OF SECTION 13 1602

SECTION 13 1603

Fuel Management System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 131600, Motor Fuel Storage and Dispensing System

C. Section 131601, Motor Fuel Electrical System

D. Section 131602, Environmental Monitoring System

1.2 DESCRIPTION

A. This section describes furnishing and installing the fuel management system as shown on the drawings and as specified herein, including but not limited to the following.

1. Fuel management system
   a. Fuel Management Pedestal
   b. Fuel Management Software and User Licenses
   c. Other Fuel Management Equipment

2. Wiring and Equipment Interfaces.

3. Network equipment.

1.3 REFERENCES

A. ASTM: American Society for Testing and Materials

B. NEMA: National Electrical Manufacturers Association

C. NFPA: National Fire Protection Association

1. NFPA 30: Flammable and Combustible Liquids Code

2. NFPA 30A: Motor Fuel Dispensing Facilities and Repair Garages

3. NFPA 70: National Electrical Code (NEC)

D. UL: Underwriters Laboratories

1. UL 1238: Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices

1.4 SUBMITTALS

A. Shop drawings Product data and Samples: Submit the following product data:

1. Fuel management system pedestal with all options identified.

2. Nozzle readers.

3. Software and user licenses.

4. Data wire product information.

5. Network equipment product data.

6. Test Reports: Indicate procedures and results for specified field testing and inspection.

B. Contractor's certificates certifying that installers are licensed and qualified to install equipment as required by the Project.

C. The person installing the fuel management system shall be a manufacturer Certified Technician of the appropriate level.

1. Each operator’s certificate shall be on file at the site and be made available upon request.

D. At no expense to the Owner, the Contractor shall obtain State, City of Hayward, and other authorities having jurisdiction, permits and certificates required for the fuel management system installation. Verification of permits shall be submitted.

E. Provide certification that inspections and tests, as described in PART 3 of this Section, have been performed, system is free of leaks, and has passed specified testing requirements

1.5 QUALITY CONTROL

A. Regulatory requirements from following agencies shall be followed as minimum requirements for equipment required by the Project. Stricter requirements indicated in the drawings or the specifications shall have precedence over the requirements listed below:

1. Contractor Qualifications: The Contractor shall be a manufacturer certified installer and programmer of the system.

2. Manufacturer Qualifications: The manufacturer shall at least ten years’ experience with manufacturing systems of this type.

1.6 EXTRA MATERIALS AND SPARE PARTS

A. None

PART 2 - PRODUCTS

2.1 FUEL MANAGEMENT SYSTEM

A. Manufacturer: Gasboy, Fuel Point Plus System. No substitutions authorized. System shall be fully compatible and same manufacturer as other City-wide systems.

B. Pedestal: Gasboy Islander Prime. No substitutions authorized.

C. Supply fuel management system with the following:

1. One Gasboy Islander PRIME pedestal.
   a. The pedestal shall be ADA compliant and have the ADA compliant option.
   b. The pedestal shall be stainless steel and have the stainless steel option.
   c. The pedestal shall be supplied with an internal Wireless Gateway (To serve as a Wireless Gateway Terminal (WGT) and shall be supplied with a Wireless Gateway license.
   d. The pedestal shall be supplied with an interface to accept mechanical dispenser pulse inputs for up to 4 nozzles. (Islander Prime 4M Blade)

2. Head Office Software. The Contractor shall supply the initial Site License for the system, so that this facility can connect to the existing City of Hayward Gasboy EKOS cloud-based fuel management software.

3. Nozzle Readers: The Contractor shall supply sufficient nozzle readers so as to provide Fuel Point Plus functionality of the diesel and gasoline dispensing system.

4. One (1) Main Circuit Control Box (MCC) and Uninterruptible Power Supply (UPS) dedicated to the fuel management system.

D. Provide un-managed, non-POE 8-port ethernet switch, Cat 5e/6 cabling, and all other network equipment required for the fuel management system to be connected to the internet for remote monitoring.

E. Supply all wiring and cabling, including fiber optic cables and converters where required for long runs. Cat5e/6 cabling shall be shielded and conform to Gasboy Islander Prime installation manual.

PART 3 - EXECUTION

3.1 FUEL MANAGEMENT SYSTEM INSTALLATION

A. Install the Fuel Management System in accordance with manufacturer requirements, instructions, and recommendations, in accordance with the State of California Building Code, and in accordance with NFPA 30A and 70.

B. Connect the fuel management and environmental monitoring systems (other sections) into the site network for remote access and control.

C. Run wires, cables, conduits, and raceways as necessary to complete all system connections, including fiber optic pathways and converters where necessary.

D. Connect and configure the system to the existing City-wide fuel management network so that this new site is fully operational in the existing City-wide Gasboy EKOS system, including connectivity/visibility to the Veeder Root Environmental Monitoring System. Assign IP address(es) to the Fuel Management Pedestal, as/if necessary, to accomplish full functionality. The Contractor shall include travel to the City office where the City Fuel Manager resides to perform setup, commissioning, and system testing activities. Communicate and coordinate with City personnel to arrange/schedule such visits.

E. Make all connections to system to function as described above.

F. Connect the Fuel Management System directly to the to the Environmental Monitoring system with manufacturer approved Cat 5e/6 cable, or connect both devices to the same network switch, to provide full inter-system (Gasboy/Veeder Root) communications capability, and so that the Veeder Root system functions and indications can be viewed from the City-Wide EKOS system.

3.2 COMMISSIONING, PROGRAMMING, AND TESTING

A. Engage the services of a manufacturer field representative for a minimum of (1) one field visit (or as many field visits as necessary to startup and program the system) to program, start up, calibrate, and test the system and provide training to fuel management personnel on all system functionality. Complete sample transactions and generate sample invoices from those transactions. Demonstrate that the system is fully functioning with all features via the City-wide Gasboy EKOS system.

B. Test any dispensing authorization limits in the presence of the Owner and CUPA Inspector.

C. Provide a written report to the Owner documenting the system test and confirming that all required functionalities have been tested.

3.3 COMMUNICATIONS AND NETWORK CONNECTIONS

A. Engage the service of an information technology professional to connect and configure the fuel management system in the network and provide all functionality as described above, including to assign the necessary IP addresses to the equipment.

B. Verify and test all required functionality described above.

3.4 MANUFACTURER FIELD SERVICES

A. Provide manufacturer field services as described above. Provide sufficient field services so that facility is fully functional prior to date of operational occupancy.

END OF SECTION 13 1603

SECTION 14 2100 – ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. This Section includes electric traction passenger elevators.
   1. Operating Elevator System at Building 1: Include a car frame, car safety, overspeed governor and pit buffers for both car and counterweight; all integrated into the system.
   2. Inoperable Elevator at Building 8.

1.3 RELATED SECTIONS

A. Section 03 3000 - Cast-in-Place Concrete: For setting sleeves, inserts, and anchoring devices in concrete.

B. Section 05 1200 - Structural Steel Framing: For the following:
   1. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
   2. Divider beams.
   3. Hoist beams.
   4. Structural-steel shapes for subsills that are part of steel frame.

C. Section 05 5000 - Metal Fabrications: For the following:
   1. Attachment plates and angle brackets for supporting guide-rail brackets.
   2. Machine beam installation.
   3. Weld plates for anchoring elevator machine to machine room floor slab.
   4. Structural-steel shapes for subsills.
   5. Pit ladders.

D. Section 09 6500 – Resilient Flooring: For finish flooring in elevator cars.

E. Division 26 Sections for electrical service for elevators to and including fused disconnect switches at machine room door and standby power source, transfer switch, and connection from auxiliary contacts in transfer switch to controller.

F. Division 27 Sections for telephone service for elevators.

G. Division 28 Sections for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.

1.4 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.5 DEFINITIONS

A. Definitions in ASME A17.1 apply to work of this Section.

B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.6 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate sequence of elevator installation with other work to avoid delaying the Work.

C. Coordinate locations and dimensions of other work relating to electric traction elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; machine beams; and electrical service, electrical outlets, lights, and switches in pits and machine rooms hoistways.

1.7 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:
1. Car enclosures and hoistway entrances.
2. Operation, control, and signal systems.
3. Signal and operating fixtures, operating panels and indicators.
4. Cab design, dimensions and layout.
5. Hoistway-door and frame details.
6. Electrical characteristics and connection requirements.

B. Shop Drawings: Submit approval layout drawings. Include the following:
1. Car, guide rails, buffers and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Loads on hoisting beams.
5. Clearances and travel of car.
6. Clear inside hoistway and pit dimensions.
7. Location and sizes of access doors, hoistway entrances and frames.
8. Coordination with building structure, relationships with other construction, and locations of equipment and signals.
9. Include large-scale layout of car control station and standby power operation control panel.
10. Show plans, elevations, sections, and large-scale details indicating service at each landing.
11. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- (75-mm-) square Samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

D. Deferred-Approval Submittal: Approval of shop drawings and calculations by DSA is required.
   1. Contract shall submit engineered shop drawings for this specific project; wet-stamped and signed by a qualified professional engineer licensed in the State of California, showing layouts, elevations, attachments to structure, component attachments, and component properties.
   2. Provide 2 sets of drawings, full size, including DSA-specific signature block for drawings to be accepted by the Design Professional in general responsible charge but prepared by others.
   3. Contractor shall submit engineering calculations indicating code compliance of the system depicted in the Shop Drawings, 2 sets, wet-stamped and signed.
   4. No components of the system may be installed until Shop Drawings and calculations are approved by DSA. Contractor shall allow a minimum of 6 weeks in their schedule for DSA review and approval (not including review time for Architect specified in Division 1). Contractor shall allow for one re-submittal specifically to address DSA comments (not including Architect's review of comments which may have been provided previously).

1.8 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

B. Qualification Data: For Installer.

1.9 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Warranty: Sample of special warranty.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Continuing Maintenance Proposal: Service agreement specified in this Section.

B. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
   1. Perform maintenance, including emergency callback service, during normal working hours.

C. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard five-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain elevators through one source from a single manufacturer.
1. Provide major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

C. Regulatory Requirements: Comply with ASME A17.1 and elevator design requirements for earthquake loads in ASCE 7.
1. Effective peak velocity acceleration (Av) for Project's location is greater than or equal to 0.20 (seismic Category CD).
2. Provide earthquake equipment required by ASME A17.1.
3. Design earthquake spectral response acceleration, short period (Sds) for Project is indicated on Structural Drawings.
4. Project's seismic design category is indicated on Structural Drawings.
5. Project's seismic design category is CD.
6. Elevator importance factor is 1.0.

D. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)".

E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

F. Acoustical Requirements: Comply with following requirements:
1. Limit overall elevator noise emissions to the following maximum A-weighted sound pressure levels in any mode of operation:
a. 75 decibels measured 3 feet from any piece of equipment in the room where machinery is located.
b. 50 decibels measured 5 feet above the cab floor near the center during all sequences of operation, including door operation, exhaust blower and annunciators.
c. 45 decibels measured in the elevator lobby 10 feet from the elevator doors.
2. Provide filters on SCR power converter and regulation units to suppress acoustic noise. A-weighted sound pressure level shall not exceed 60 dB when measured 3 feet from the unit under all load conditions.
3. Provide gearless direct drive machinery to avoid gear box noise. Otherwise provide worm gear traction type machinery.
4. Vibration isolate the following items with Mason Industries, or equivalent, isolators with a 0.2 inch static deflection or as noted:
a. Power converter and regulation unit. Mason Industries model BR.
b. Motor and gearbox assembly. Mason Industries model BR. Provide appropriate safety restraints.

c. Sheave beams. Provide Mason Industries Model RBA or SWM waffle pad with neoprene grommet and washer isolated bolt attachment to eliminate structure-borne sound being transmitted to the building. Select isolators to compress a minimum of 0.1 inches under load.

5. Provide flexible power connection to motor equivalent to Seal-tite.
6. Provide adjustable volume controls for elevator cab annunciators.
7. Provide optical cab position detectors.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging.

B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.13 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.
1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for the elevator system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis of Design: KONE Inc.: KONE MonoSpace 500 Elevator.
2. Otis Elevator Co.
3. ThyssenKrupp Elevator

2.2 SYSTEMS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered elevator systems and as required for complete system.

B. Elevator Machines: At manufacturer's option, provide either variable-voltage or variable-frequency, ac-type hoisting machines. Provide solid-state power converters.
1. Provide non-regenerative system.
2. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

C. Machine Brake: Electrically released and spring applied. The drive sheave shall be accurately turned and grooved for the quantity and size of hoist ropes applicable to this service.

D. Traction Steel Hoist Ropes: Of size and number appropriate to insure proper wearing qualities. As a minimum, the number and size of ropes shall comply with the factor of safety requirements of the ASME A17.1 Safety Code for Elevators.

E. Furnish hoist rope deflecting sheave as follows:
   1. Sheave: Locate in machine room and support on machine bedplate.
   2. Sheave Guard: As provided by the elevator contractor and fitted in place at the deflecting sheave.

F. Counterweight: Each elevator shall be suitably counterbalanced with adequate weights contained in a structural steel frame. This Counterweight shall be equal to the weight of the complete elevator car plus a percentage of the capacity load.

G. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section.

H. Car Frame and Platform: Welded steel units.

I. Spring Buffer: Helical coil spring type; polyurethane buffer.

J. Guides: Provide the following:
   1. Guide Rails: Elevator car and counterweight roller guide rails, erected plumb, and securely fastened to the hoistway framing. Design and provision of hoistway framing shall be of adequate strength and properly positioned to withstand loads applied in conjunction with data provided by the elevator contractor.

K. Wiring: Wiring for hoistway electrical devices included in scope of the elevator system, hall panels, pit emergency stop switch, and the traveling cable for the elevator car.

2.3 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system for each group of elevators as required to provide type of operation system indicated.

B. Selective Collective Control: Pressure upon one or more car buttons shall send the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed, provided the hoistway door interlock and car door switch circuits are completed. During this operation, the car shall also answer calls from the landings, which are in the prevailing direction of travel. Each landing call shall be canceled when answered.
   1. Pressure upon a hall button at a floor above the car location shall cause the car to start up and answer any up calls as they are reached by the car irrespective of the sequence the buttons have been pressed. The car shall not stop at floors where down buttons only had been pressed. If no further car or up hall calls are registered, the car shall reverse its direction preference to response to car calls or down hall calls.
   2. The car shall start down to answer calls below the car and shall not stop where only up calls are registered. When traveling up, the car shall reverse at the highest call and proceed to answer calls below it. When traveling down, the car shall reverse at the lowest call and answer calls above it.
   3. Should both an up and a down call be registered at an intermediate landing, only the call responding to the direction in which the car is traveling shall be canceled upon the stopping of the car at the landing. Terminal limit switches shall be provided in the hoistway designed to automatically stop the car at or near the closest terminal landing.

C. Group Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators and elevator groups where indicated:

1. Up-Fall Protection: Provide a system, which monitors for unintended upward movement of the elevator system. In the event unintended upward movement occurs the system shall engage a braking system to stop a car with up to 125% of rated capacity. The main car brake, rope brakes and sheave wedges are not acceptable alternatives.
2. Emergency Power Operation: In the event of cessation of normal building power, the elevator(s) shall brake to an emergency stop. After a predetermined time interval, emergency power shall be provided to the elevator(s) through the normal disconnect switch(s). The elevator shall start and return non-stop to the emergency power recall floor where it will stop and automatically open its doors. If there is more than one elevator in the bank, each elevator, one at a time, shall also return to the emergency power recall floor and park with its doors open until all cars have returned to that floor. When all cars have returned, a pre-selected car shall continue to run under emergency power.
3. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors will begin closing.
4. Nuisance Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
5. Independent Service; separate electrical service for each elevator.
6. Sequence starting (under emergency power).
7. If car is not placed in operation within a preset time after being called, it is returned to group operation.
8. Distributed Parking: When cars are not required for response to calls, they are parked with doors closed, distributed in predetermined zones throughout the building. One zone shall include the main floor and adjacent floors; remaining floors shall be divided into approximately equal zones.

D. Security Features: Provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.
1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car control stations. Key is removable only in deactivated position.

2.4 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

C. Door Operator: A closed loop permanent magnet VVVF high performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.

D. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by the local code.

E. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.

F. The car door shall be provided with a protective device extending the full height. This device shall be designed to sense an obstruction in its path while the doors are closing and automatically cause the car and hoistway door to return to the open position. The doors shall remain open until the expiration of a time interval; the doors will then close automatically.

G. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

H. Electronic Door Safety Device: The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

2.5 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.

C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.

D. Stainless-Steel Sheet: ASTM A240/A240M, Type 304.

E. Stainless-Steel Bars: ASTM A276, Type 304.

F. Aluminum Extrusions: ASTM B221, Alloy 6063.

2.6 CAR ENCLOSURES

A. General: Provide steel-framed car enclosures with removable interior wall panels and ceiling, with car roof, access doors, power door operators, and ventilation.
   1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
   2. Provide finished car including materials and finishes specified below.

B. Car Operating Features:
   1. Two-speed fan.
   2. On/off light switch.
   3. Car-stall protection.
   4. Ascending car uncontrolled movement protection.
   5. Top of car inspection.
   6. Battery Operated Lowering Device: The operation shall return each car automatically to first floor. Once each car has returned to the designated landing, the doors shall remain open for a predetermined amount of time.

2.7 HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.
1. Type: Single-speed side sliding.

B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:
1. Stainless-Steel Frames: Formed from stainless-steel sheet; No. 4 satin finish.
2. Stainless-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from stainless-steel sheet on interior and exterior door face; No. 4 satin finish.
3. Sight Guards: Provide sight guards on doors matching door edges.
4. Sills: Extruded aluminum, with grooved surface, 1/4 inch (6.4 mm) thick.
5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

C. Hoistway Entrance Sizes:
1. Width: 42 inches (1067 mm).
2. Height: 96 inches (2438 mm).

D. Star of Life: Provide Star of Life identification on hoistway door frame, place between 78 inches and 84 inches above the floor, visible from the lobby.

E. Braille Symbol Plates: Mechanically fastened to both sides of hoistway entrance frames at 60-inches above finished floor, identifying floor level of entrance to elevator.

2.8 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life incandescent lamps and acrylic or other permanent, non-yellowing translucent plastic diffusers or LEDs.

B. Car-Operating Panel: KONE KSS 600, traditional rectangular shape; provide a panel which contains all push buttons, key switches, and message indicators for elevator operation.
1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille; provide at the left hand side of each push button.
2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car operating panel. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.
1. Include travel direction arrows if not provided in car operating panel.

E. Hall Push-Button Stations: Provide hall push-button stations at each landing as indicated.
   1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
   2. Equip units with buttons for calling elevator and for indicating desired direction of travel.

F. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Division 28.

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:
   1. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

I. Corridor Call Station Pictograph Signs: Provided by others.

2.9 ELEVATORS

A. Building 1:
   1. Number of Stops: 2.
   2. Number of Openings: 2 at Front.
   3. Rise: 18’-0”.

B. Building 8: “False” elevator cab.
   1. Number of Stops: 0.
   2. Number of Openings: 1 at Front and 1 at Rear.
   3. Rise: 0’-0”, no rails.
   4. Provide with all electronics for operable doors, call buttons, signals and fixtures, lighting, and communications.

C. Performance Features and Components:
   1. Control Systems: Single elevator controls.
   2. Rated Capacity: 2500 pounds.
   3. Minimum Car Inside: 6’-11” wide x 4’-4” deep.
   4. Inside Cab Height: 8’-0”.
   5. Height under Ceiling: 7’-6”.
   6. Entrance Width & Type: Single-Slide Door 3’ 6” x 7’ 0”.
   7. Main Power Supply: 480, Volts + or - 5% of normal, 3 Phase, with a separate equipment grounding conductor.
   8. Lighting Power Supply: 120 Volts, 1 Phase, 15 Amps, 60 Hz.
   9. Stopping Accuracy: ±1/4" (6.4 mm) under any loading condition or direction of travel.
   10. Door Opening Time for 7ft. painted hoistway and car doors:
      a. 3.5 seconds – Single Slide 42” door.

D. Materials and Finishes: Provide manufacturer's standards, but not less than the following:
   1. Car Enclosure Finishes:
      a. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
         1) Fabricate car door frame integrally with front wall of car.
      b. Side Wall Panels: 5/8-inch thick vertical raised panels with satin stainless steel, No. 4 finish (4SS).
      c. Rear Wall Panel: Black (L423) 3D laminate.
      d. Cab Skirt: brushed stainless steel 4(SS).

e. Metal Ceiling: Rectangular/Led Light Panel (CL94) brushed SS (4SS); suspended flush panels, with cutouts for downlights in the center of each panel.
   1) Finish: No. 4 stainless steel
   2) Align ceiling panel joints with joints between wall panels, or as shown on drawings.
f. Reveals: Satin stainless steel, No. 4 finish.
g. Handrails: Round satin stainless steel, No. 4 finish, at sides and rear of car (HR61).
h. Finish Floor: Floor prepared to receive tile flooring to be installed by others (specified in Section 09 9300).

2. Subfloor: Underlayment grade, exterior plywood, 5/8-inch (16-mm) nominal thickness.
3. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet at interior and exterior door faces. Finish: No. 4 satin stainless steel.
4. Door Sills: Aluminum, mill finish; ADA compliant.
5. Protective Pads & Hangers: Provide manufacturers standard quilted fire retardant protective pads with button hooks hangers.
6. Ceiling Lights: LED down lights with stainless steel trim, recessed into ceiling panels.
   a. Quantity: 6.
7. Fabricate car with recesses and cutouts for signal equipment.

E. Auxiliary Operations and Controls:
1. Key controlled car light switch and fan switch.
2. Alarm/emergency stop button.
3. Car position and direction indicators.
4. Audible signals.
5. Automatic 2-way leveling.
6. Key switches to lockout individual floors.
7. Door nudging device.
8. Liner blanket hooks and blankets.
9. Emergency power operation.
10. Fireman's switch.
11. Emergency hospital service.
12. VIP express priority service.

F. Fire Emergency Service:
1. Elevator operation shall comply with the requirements of CBC and all applicable codes.
2. Fire key shall be kept in a suitable emergency box in a location as approved by Architect.
3. Battery-Powered Lowering: When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
4. When smoke or heat sensing devices are wired to the elevator system to initiate the foregoing operation, install three position key switch, third position to override automatic initiation by a sensing device.
5. Rated Speed: 150 fpm. Speed specified is defined in up direction with full capacity load. Variation in speed not to exceed 10 percent maximum under all load conditions
6. Operation System: Selective collective automatic operation.
7. Auxiliary Operations:
   a. Earthquake Emergency Operation: Comply with requirements in ASME A17.1.
   b. Automatic dispatching of loaded car.
   c. Nuisance call cancel.
   d. Loaded-car bypass.
8. Security Features: Keyswitch operation.

9. Signal Fixtures: Kone KSS 600 line or approved equal.
   a. Finish: Satin stainless steel, No. 4 finish.
10. Additional Requirements:
   a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
   b. Provide top-of-car railings as required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
   1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for fabrication, for installation, and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to minimize transmission of vibrations to structure and thereby minimize structure-borne noise from elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch (3 mm), up or down, regardless of load and direction of travel.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows, unless otherwise indicated:
   1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
   2. Place hall lanterns either above or beside each hoistway entrance.
   3. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

B. Operating Test: Load each elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevator(s).

B. Check operation of each elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

C. Check operation of each elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 PROTECTION

A. Temporary Use: Limit temporary use for construction purposes to one elevator. Comply with the following requirements for elevator used for construction purposes:
   1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
   2. Provide strippable protective film on entrance and car doors and frames.
   3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
   4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
   5. Do not load elevators beyond their rated weight capacity.
   6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

END OF SECTION 14 2100

SECTION 14 5300 – SLIDE POLE SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Brass slide poles and stainless steel guards.

B. Landing mats at base of slide poles.

1.3 LEED REQUIREMENTS

A. Refer to Section 01 8113 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Include special installation requirements, fire ratings, finishes, closing mechanisms, and hardware.

B. LEED Submittals: See Section 01 8113 for additional requirements; provide the following:
1. Building product disclosure and optimization - environmental product declarations – to be determined.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.
3. For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
4. Environmental Product Declaration (EPD): Manufacturer's Type III Third Party Verified product life cycle assessment documenting environmental impact of the product throughout its life cycle (i.e., from cradle to cradle) that is verified by an ISO/IEC 17065 accredited certification body.
5. CDPH Standard Method v1.1 testing report

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for the slide pole system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: McIntire Brass Works, Inc., Model 23
2. Accepted equivalent.

2.2 SLIDE POLE SYSTEM

A. Description: Steel frame at floor opening, chrome plated bronze rails and gate arms surrounding a polished brass pole that extends from floor to ceiling.
   1. The above floor unit has stainless steel guarding below the rails and gate arms and a bronze ring that rests on the floor.
   2. Two fire-resistant doors are mounted in the steel frame which is suspended from the ceiling.
   3. System to be designed to be nominally left with the power on to maintain constant infrared light beams across the opening to reflectors on the gate guards.

B. Enclosed Control Unit: mounted to the steel frame opposite the gates containing motor controllers and a small computer called a PLC, and including the following:
   1. Infrared Sensors: Two sensors mounted in the front of a small enclosure that is fastened to the stanchion across from the gates.
   2. On/off switch.

C. Gate Guard Operation:
   1. When either gate is opened or a person is on the pole and blocks the beam, the beam is interrupted and the PLC actuates motors that drop the doors to the open position.
   2. The doors remain in the open position as long as there is a person at floor level on the pole or as long as the gates are open. After the gates close and a person has slid below the floor level on the pole, the controller waits 20 seconds and closes the doors.
   3. If another person slides down the pole during this period the timer is reset and the doors will remain open or slide open in mid-cycle if need be.
   4. A temperature sensor located on the bottom of the frame will disable the operation of the pole if the temperature below the floor exceeds 180 degrees F.

D. Electrical: 12 V AC, 15 amp, GFI outlet.

2.3 SLIDE POLES

A. Construction: 2½"diameter 5/32" wall cold drawn bronze tubing.
   1. Include floor and ceiling flange.

B. Landing Mat: 32" diameter foam landing mat.
   1. Color: Black.

2.4 FABRICATION

A. General: Provide slide pole 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.

2.5 FINISH

A. Finish designations for copper alloys comply with the system for designating copper-alloy finish systems defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."

B. Buffed Finish, Lacquered: M21-O6x (Mechanical Finish: buffed, smooth specular; Coating: clear organic, air drying, as specified below).
   1. Clear Organic Coating: Lacquer specified for copper alloys, applied by air spray in 2 coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify adequate clearance on all sides of the outside of the unit to permit access to the motors and control box mounted to the frame for repairs.

B. Coordinate delivery with other work to avoid delay.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for installing slide pole system.

B. Install the above floor unit in the specified floor opening.

C. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish.

D. Connect to building electrical system.

3.3 ADJUSTING

A. Adjust and clean system after installation for proper operation.

B. Remove and replace components that are warped, bowed, or otherwise damaged.

3.4 CLEANING

A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 7419 Construction Waste Management and Disposal. Submit documentation for Credit MRp2/MRc5 to satisfy the requirements of that Section.

END OF SECTION 14 5300

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SECTION 21 0001

FIRE PROTECTION GENERAL

PART 1 – GENERAL

1.1 GENERAL

A. The General Conditions and Supplementary General Conditions are hereby a part of this Section as fully as if repeated herein.

1.2 SCOPE

A. The work includes, but is not necessarily limited to, the furnishing of all labor, materials, equipment, and services necessary for, and reasonably incidental to, providing and installing complete fire protection systems, and other work as shown or indicated in the Fire Protection Drawings and Specifications.

B. Consult all other Sections to determine the extent and character of this work specified elsewhere.

C. Specifically refer to the following:

Section 21 05 02	*Overhead Fire Protection Systems*
Section 21 10 01	*Underground Fire Service*

D. Make all connections to equipment requiring service from systems installed under this Section.

1.3 COORDINATION

A. Before submitting a bid for the fire protection work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan the work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.

B. If, after examination of the bidding documents relating to the work, the Contractor has queries concerning the nature and scope of the work or intent of the Specifications, he/she shall promptly request clarification from the Architect. After contract award, claims of ignorance of the intent and scope of the contract shall not be allowed.

C. Contractor is responsible for coordinating the schedule of inspections by Engineer at appropriate stages of construction such as rough-in, pre-final, and final, and at other times required by the Specifications or by the construction. Notify Architect and Engineer seven (7) days in advance of proposed site visit. Notification constitutes certification that construction is, or will be, complete and ready for inspection.

D. Coordination Drawings: All work of this section must be coordinated to clear all work of other sections. Provide coordination drawings for all work of this section/division; see Division 01. For site utilities, see architectural drawings for additional coordination requirements.

1.4 COORDINATION DRAWINGS

A. The contractor shall prepare and submit, for review, large scale (minimum 1/8" = 1'-0") coordination drawings showing location and elevations of all equipment, ducts, piping, cable trays, conduits, structural, and other items in the area. These shall be fully coordinated with

all other trades and Owner supplied items. Check routing and elevations of all piping, ductwork, conduit and equipment before fabricating. Report any conflicts that cannot be solved in the field to the Architect/Engineer. Extra charges shall not be allowed due to lack of coordination prior to, or during, construction. These drawings shall be distributed to, and coordinated with, all other trades that are affected.

1. In addition to plan view, indicate heights to clarify clearances from structure and from other trades. Use partial sections where necessary.
2. Provide proper clearances for access to and service of all equipment and items requiring adjustment including shutoff valves.
3. Coordinate the location of access panels in the hard ceiling areas to insure all equipment and devices have proper access for servicing and adjusting.
4. The coordination drawings shall be reviewed and checked for completeness by the general contractor. Review by the architect and engineer is to assist the contractor and to attempt to point out obvious errors. Responsibility for proper coordination shall remain with the contractor.

B. Differences or disputes concerning coordination, interference, or extent of work between sections shall be decided by general contractor.

C. Extra charges shall not be allowed due to lack of coordination (or lack of coordination drawings) prior to or during construction.

D. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work. Indicate the proposed locations of ductwork, piping, conduit, equipment, and materials. Include the following:

1. Clearances for installing and maintaining insulation, including clearances for servicing and maintaining equipment, and space for equipment disassembly required for periodic maintenance.
2. Clearances for electrical and control components and panels.
3. Equipment connections and support details.
4. Exterior wall and foundation penetrations.
5. Interior floor penetrations
6. Fire rated wall and floor penetrations.
7. Sizes and location of required concrete pads and bases.
8. Support, bracing and anchor locations for equipment and conduit.

E. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

F. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

G. Prepare reflected ceiling plans to coordinate and integrate installations, access panel and door locations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling mounted items where ceilings are to be installed.

1.5 COORDINATION DRAWINGS

A. The contractor shall prepare and submit, for review, large scale (minimum 1/4" = 1'-0") coordination drawings showing location and elevations of all equipment, ducts, piping, cable trays, conduits, structural, and other items in the area. These shall be fully coordinated with

all other trades and Owner supplied items. Check routing and elevations of all piping, ductwork, conduit and equipment before fabricating. Report any conflicts that cannot be solved in the field to the Architect/Engineer. Extra charges shall not be allowed due to lack of coordination prior to, or during, construction. These drawings shall be distributed to, and coordinated with, all other trades that are affected.

1. In addition to plan view, indicate heights to clarify clearances from structure and from other trades. Use partial sections where necessary.
2. Provide proper clearances for access to and service of all equipment and items requiring adjustment including shutoff valves.
3. Coordinate the location of access panels in the hard ceiling areas to insure all equipment and devices have proper access for servicing and adjusting.
4. The coordination drawings shall be reviewed and checked for completeness by the general contractor. Review by the architect and engineer is to assist the contractor and to attempt to point out obvious errors. Responsibility for proper coordination shall remain with the contractor.

B. Differences or disputes concerning coordination, interference, or extent of work between sections shall be decided by general contractor.

C. Extra charges shall not be allowed due to lack of coordination (or lack of coordination drawings) prior to or during construction

D. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work. Indicate the proposed locations of ductwork, piping, conduit, equipment, and materials. Include the following:

1. Clearances for installing and maintaining insulation, including clearances for servicing and maintaining equipment, and space for equipment disassembly required for periodic maintenance.
2. Clearances for electrical and control components and panels.
3. Equipment connections and support details.
4. Exterior wall and foundation penetrations.
5. Interior floor penetrations
6. Fire rated wall and floor penetrations.
7. Sizes and location of required concrete pads and bases.
8. Support, bracing and anchor locations for equipment and conduit.

E. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

F. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

G. Prepare reflected ceiling plans to coordinate and integrate installations, access panel and door locations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling mounted items where ceilings are to be installed.

1.6 SAFETY

A. Contractors must conduct a weekly safety meeting with their employees and provide documentation as to attendance and topics of discussion. Engineer's construction support services do not constitute review or approval of Contractor's safety procedures. Contractor

shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities within Contractor's Scope of Work.

1.7 BUILDING LAWS

A. Fire Protection work shall conform to all requirements prescribed by governmental bodies having jurisdiction and is to be in accordance with the California Building Code; all federal, state, and local codes and ordinances; all OSHA requirements; California Plumbing Code, California Mechanical Code, California Fire Code, and National Fire Protection Association; California State Code Title 8, Title 21, Title 24; and the Energy Conservation Standards.

B. Should any part of the design fail to comply with such requirements, the discrepancy shall be called to the attention of the Architect prior to submitting bid.

C. Should there be any direct conflict between the Drawings and/or Specifications and the above rules and regulations, the rules and regulations shall take precedence. However, when the indicated material, workmanship, arrangement, or construction is of a superior quality or capacity to that required by above rules and regulations, the Drawings and/or Specifications shall take precedence. Rulings and interpretations of enforcing agencies shall be considered as part of the regulations.

D. After a Contract is awarded, if minor changes or additions are required by the aforementioned authorities, even though such work is not shown on Drawings or overtly covered in the Specifications, they must be included at the Contractor's expense.

E. The Contractor is responsible to coordinate and make adjustments in his/her work with the full set of Contract Drawings and Specifications.

F. All piping, and equipment shall be securely anchored to building structure as required herein and by the California Building Code and NFPA 13.

1.8 UNDERGROUND CONNECTIONS

A. See Section 21 10 00 for Underground Fire Service connection requirements.

1.9 TEMPORARY CONSTRUCTION WATER

A. The Contractor shall make all arrangements and provide necessary facilities for the temporary construction water from the Owner's source. Costs for the temporary construction water shall be paid for by Owner.

1.10 PAINTING

A. See Section 09 for painting of piping, equipment, etc.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials used shall be new as listed in subheadings and indicated on Drawings. Inspect all materials and immediately remove defective materials from the site.

B. All electrical materials shall bear the label of, or be listed by, the Underwriters' Laboratories (UL), unless the material is of a type for which label or listing service is not provided.

C. Substitution:

1. No substitute materials or equipment may be installed without the written approval of the Architect.
2. Use of substitute materials or equipment may require changes in associated materials and equipment. Contractor shall submit detailed Shop Drawings and installation instructions of substitute materials and equipment to Architect for approval. Such submittals shall address all changes required in other items.
3. All additional costs incurred by the substitution of material or equipment, or the installation thereof whether Architectural, Structural, Mechanical, Plumbing, or Electrical shall be borne by the Contractor who substitutes the materials or equipment in place of the items specified.

D. Quality of Materials: Pipe fittings and equipment may be taken from stock but the Contractor will be required to submit manufacturer's certificates identifying the material and equipment furnished as conforming with these Specifications and such codes and standards as apply to the equipment specified. Any material on the site which cannot be identified by manufacturer's mark shall be removed from the site at Architect's request.

2.2 SUBMITTALS

A. The review of submittals and approval thereof by the Architect does not relieve the Contractor from compliance with the requirements and intentions of the Drawings and Specifications to which the submittals pertain. The contractor acknowledges its responsibility to submit complete shop drawings and other required submittals. Incomplete submittals will be returned to the contractor unreviewed.

B. Material List: An itemized list of material and equipment which the Contractor proposes to use shall be submitted to the Architect with number of copies indicated and within time indicated.

C. Shop Drawings and Product Data:

1. Submit all required Shop Drawings, product data, etc. at one time. Submittals shall be bound, tabbed, and properly indexed by Specification Section.
2. Each item shall be identified by manufacturer, brand, and trade name; model number, size, rating, and whatever other data is necessary to properly identify and verify the materials and equipment. The words "AS SPECIFIED" will not be considered sufficient information.
3. Each submittal shall bear the Contractor's stamp and mark indicating the Contractor has reviewed and approved the submittal.
4. Each submitted item shall refer to the Specification Section and paragraph in which the item is specified.
5. Accessories, controls, finish, etc. not required to be submitted or identified with the submitted equipment shall be furnished and installed as specified.
6. Submittals shall be all inclusive with all items requiring submittals being submitted at the same time; individual submittals will not be accepted.
7. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet construction schedule, together with any special handling charges, shall be borne by Contractor.

PART 3 - EXECUTION

3.1 DRAWINGS

A. The Contract Drawings show the general arrangement and location of the piping and equipment. Work shall be installed in accordance with the Drawings, except for changes required by conflicts with the work of other trades. The Contractor shall provide for the support, expansion, and pitch of any rearranged piping in conformance with the intent of the Drawings, Specifications, and codes.

B. Note that certain fire protection work is shown, wholly or in part, on Architectural Drawings.

C. The contractor shall field verify existing conditions and provide accurate shop coordination drawings for coordination with other trades in accordance with Division 1.

D. Fire Protection Drawings are diagrammatic and are intended to show the approximate location of equipment and piping. Dimensions shown on Drawings shall take precedence over scaled dimensions on Drawings. All dimensions shall be verified in the field by the Contractor.

E. The exact location of apparatus, equipment, and piping shall be ascertained from the Architect or the Architect's representative in the field, and work shall be laid out accordingly. Should the Contractor fail to ascertain such locations the work shall be changed at Contractor's own expense when so ordered by the Architect. The Architect reserves the right to make minor changes in the location of piping and equipment up to the time of installation without additional cost.

F. It is the intention of the Drawings and Specifications that, where certain items such as unions, expansion joints, and other mechanical components are not shown, but where such items are required by the nature of the work, shall be furnished and installed.

G. The Fire Protection Drawings and Specifications are intended to supplement each other. Any material or labor called for in one shall be furnished even though not specifically mentioned in the other.

H. Pipe sizes shown are the minimum allowable and shall be increased in size if required by code or wherever necessary to meet unusual conditions.

3.2 RECORD DRAWINGS

A. Record Drawings shall be maintained at all times showing the exact location of piping mains, branches, valves, drains, etc. installed under all Sections. Obtain from the Architect, at cost, a complete set of prints. On these prints systematically and accurately keep a dimensional record of all work installed different from those shown on Drawings. Have these Drawings readily available for reference.

B. Record Set: When above information is complete and acceptable to the Architect transfer this information accurately to reproducible tracings, purchased at cost from the Architect for this purpose, and deliver to the Architect for final review.

C. Upon completion of the Architect's review of the Record Set the Contractor shall incorporate changes, as noted on the record set, including dimensions such as elevations, valves, etc. Deliver transparencies with one (1) set of prints to the Architect. Deliver one (1) complete set of prints to building Owner within ninety (90) days of issuance of final occupancy report.

D. Inspector's Approval: Where a full-time inspector is employed by the Owner, the Record Drawing information shall be reviewed by the inspector during the course of construction and shall have the inspector's approval before submission to the Architect.

3.3 ACCEPTANCE TESTS

A. Documentation on standard NFPA Acceptance forms and inspection documents shall be submitted to the Architect and DSA Inspector of Record.

B. The required acceptance documents shall be signed by a licensed C-16 Contractor.

3.4 DAMAGE

A. Repair any damage to the building, premises, and equipment occasioned by the work under this Section.

B. Repair all damage to any part of the building or premises caused by leaks or breaks in pipe, or malfunctions of equipment furnished or installed under this Section until the warranty period expiration date.

3.5 COMPLETE WORKING INSTALLATION

A. The Drawings and Specifications do not attempt to list every item that must be installed. When an item is necessary for the satisfactory operation of equipment, is required by the equipment manufacturer, or accepted as good practice, furnish without change in Contract cost.

3.6 STORAGE

A. Provide proper protection and storage of all items and tools required for this work.

3.7 QUALITY OF WORK

A. The quality of work shall be of a standard generally accepted in the respective trade. Use only experienced, competent, and properly equipped workers. Replace work falling below this standard as directed by the Architect.

B. Systems shall be worked into a complete and integrated arrangement with like elements arranged to make a neat appearing and finished piece of work, with adequate head room and passageway free from obstructions. Such systems shall be installed by laborers experienced in the respective trades involved.

3.8 CONCRETE WALLS AND CONCRETE FOOTINGS

A. Where pipes must pass through concrete walls and footings, they shall pass through Schedule 40 galvanized pipe sleeves set in place at time of construction. The sleeves shall provide clearance in accordance with NFPA 13

B. Coordinate core drilled openings with Architect and General Contractor. Coordination shall include location, size, and spacing of openings. No slot openings will be allowed. Coordinate openings to avoid critical structural items such as reinforcing bars, tensioning tendons, etc.

C. Also see Paragraph 3.15.

3.9 ELECTRICAL REQUIREMENTS - CONTROLS AND COORDINATION WITH ELECTRICAL CONTRACTOR

A. The Fire Protection Contractor shall coordinate with the Electrical Contractor on furnishing and installing of controls, motors, starters, etc. Coordinate means informing Electrical Contractor of items requiring electrical connection, providing copies of submittal data, installation data, scheduling work to insure efficient progress, and promptly supplying those items to be installed by Electrical Contractor.

B. The specific requirements for electrical power and/or devices for each and every piece of fire protection equipment requiring electrical service, supplied and/or installed under this Contract, shall be coordinated and verified with the Fire Protection Drawings, Fire Protection Sections of these Specifications, and with the manufacturers of the equipment supplied. This shall include the voltage, phase, and ampacity; conduit requirements; and exact location and type of disconnect, control, and/or connection required. Any changes from the Drawings and Specifications required as a result of this coordination shall be part of this Contract.

C. Electrical Contractor shall furnish and install the following for all mechanical equipment:

1. Conduit and wiring for line voltage power to the equipment.
2. Disconnect switches.
3. Manual motor starters.
4. Magnetic motor starters when part of a motor control center. See Division 16 and Drawings for further information.

D. The work under this Section shall include furnishing and installing all controls on low and manual line voltage, including thermostats, auxiliary switches, relay wiring, interlock wiring; equipment control panels and transformers; and controls conduit unless specifically indicated as part of other work. Materials and methods of the control installation shall be in accordance with the Electrical Specifications.

E. The Fire Protection Contractor shall review all wiring connections which have any influence on this equipment or work and verify that these connections are correct before permitting any equipment to be operated which is furnished, installed, or modified under this Contract.

3.10 ELECTRICAL REQUIREMENTS - MOTORS AND EQUIPMENT FURNISHED UNDER THIS SECTION

A. Motors and motor control equipment shall conform to the standards of the National Electrical Manufacturer's Association (NEMA). Motors and motor control equipment shall be as specified below. The work under this Section shall include:

1. Furnishing all motors, magnetic starters and automatic control devices for equipment furnished and installed by this Contractor. Electrical Contractor shall provide magnetic starters at motor control center where indicated.
2. Installation of the above motors and control devices. Manual motor starters shall be furnished and installed by Electrical Contractor in accordance with Electrical Specifications.
3. Furnishing and installing line and/or low voltage interlock wiring shall be by the Mechanical Contractor. Installation of wire includes the connection of devices. All work shall be in accordance with the materials and methods specified in the Electrical Specifications.
4. Furnishing and installing completely wired equipment control panels with complete controls for automatic operation where indicated or when supplied with equipment.

5. Furnishing and installing all control and interlock wiring from equipment control panels to related remote devices, fans, motors, heaters, and controls.
6. Wire mounted on heat producing appliances shall be Type RHH or THHN (90°C).
7. Except as noted above, disconnect switches, power circuits from electrical panelboard to disconnect switch, starters, and motors shall be furnished and installed under the Electrical Specifications.

3.11 ELECTRICAL EQUIPMENT ROOM PRECAUTIONS

A. Piping shall not be installed in any switchgear room, transformer vault, telephone room or electric closet except as indicated. In any case, no piping shall be installed in the space equal to the width and depth of any electrical service equipment, switchboards, panel boards, or motor control centers and extending from the floor to a height of six feet above the equipment or to the structural ceiling, whichever is lower. Only sprinkler piping serving the room may be installed in those rooms.

3.12 CUTTING AND REPAIRING

A. No cutting shall be done except with Architect's approval. Cutting of structural members or footings is prohibited without the prior written consent of the Structural Engineer.

B. Where cutting of paving, walls, ceilings, etc. is necessary for the installation of the mechanical work, it shall be done under the direction of this Section. Damage caused by this cutting shall be repaired to match original and adjacent surfaces without additional expense to the Owner. Cutting of new construction shall be by the installing Contractor of that construction as directed by this Contractor.

3.13 PIPE AND VALVE IDENTIFICATION

A. Identify all piping contents with letter legend on color background identifying hazard or use of material.

B. The pipe marker system shall conform completely with "The Scheme for Identification of Piping Systems" (ANSI A13.1). More specifically, the pipe marker must possess the following:
1. ANSI specified color coded background.
2. ANSI specified color of legend in relation to background color.
3. ANSI specified legend letter size.
4. ANSI specified length of color field (marker length).

C. The following tables will serve to clarify the above mentioned requirements:

TABLE 1

Outside Diameter of Pipe or Covering	Length of Color Field	Size of Letters
3/4" to 1 1/4"	8"	1/2"
1 1/2" to 2"	8"	3/4"
2 1/2" to 6"	12"	1 1/4"
8" to 10"	24"	2 1/2"
Over 10"	32"	3 1/2"

D. All pipes 3/4" I.D. and smaller shall be marked with 1 1/2" brass tags equivalent to valve tags.

E. Provide flow markers consisting of labels similar to pipe markers with a large black arrow printed on same background color to indicate direction of flow.

F. Place pipe marker and flow marker on each pipe on both sides of walls or floors through which pipes pass. Place markers adjacent to valves and fittings or branch take-off and for exposed piping locate markers to be clearly visible to person standing on floor, and at not over 30'-0" intervals on all straight runs of pipe.

G. All valves under 3/4" I.D.: 18 gauge brass identification tags 1 1/2" in diameter with depressed 1/2" high black filled letters above 1/2" black filled numbers. Tags shall be fastened securely at specified locations. Valve tags shall show valve number, purpose, and normal condition (open or closed).

H. Tag Locations:
   1. Adjacent to each valve and fitting except on plumbing fixtures and equipment.
   2. At each branch and riser take-off.
   3. At each pipe passage through wall, floor, and ceiling construction.
   4. At each pipe passage to underground.
   5. On all horizontal pipe runs, marked every 25'-0".

3.14 VALVE TAGS AND CHART

A. Furnish and install in each mechanical room a single typed valve chart identifying all valves with their respective tag numbers, size, manufacturer, model number, service, and indicating whether each valve is normally open or normally closed. Chart shall be mounted in a neat sheetmetal frame with glass front. The frame shall be arranged so that valve chart is removable. Provide three (3) additional copies of valve chart in maintenance manuals.

3.15 SLEEVES AND SEALING

A. Provide sleeves for all pipes passing through new floors, walls, partitions, and any other building construction, of adequate diameter to allow minimum clearance all around between sleeve and pipe as required by NFPA 13.

B. Lay out work prior to concrete forming. Reinforce sleeves to prevent collapse during forming and curing.

C. All floor sleeves required shall extend 1" above finished floor except through mechanical equipment room floors and shafts where sleeves shall extend 2" above finished floor level. Sleeves through roof shall extend 8" above roof. Wall sleeves shall be flush with face of wall unless otherwise indicated. Waste stacks using carriers shall have sleeves flush with floor and sealed.

D. Sleeves shall permit free thermal expansion of pipe without binding or contact with structure.

E. Do not support pipes by resting pipe clamps on floor sleeves. Supplementary members shall be provided so pipes are floor supported.

F. Special sleeves detailed on Drawings shall take precedence over this Section.

G. Pipe sleeves as scheduled below unless otherwise indicated:

1. Plaster or Drywall:

   Schedule 40 galvanized steel pipe.

2. Concrete or Masonry Walls and Concrete Bases:

   See Paragraph 3.8.

3. Waterproof membraned floors, walls, concrete pits, foundation walls, etc. as detailed or specified in other Sections.

3.16 SUPPORTS

A. All supports and bracing shall comply with NFPA 13.

B. All equipment and piping shall be mounted on, or suspended from, foundations and supports as specified and indicated, and seismically braced to structure.

C. Seismic restraints shall be provided in accordance with NFPA 13.

D. All piping and equipment shall be securely anchored to building structure as required by the Specifications, California Title 24, the California Building Code, and NFPA 13.

E. Earthquake restraints shall be capable of resisting the gravity lateral loads required by NFPA 13.

F. Supplemental Supports: Provide supplemental supports to span building structural elements as necessary for equipment foundations and supports. Provide Shop Drawings to Mechanical and Structural Engineers for approval prior to installation.

3.17 ACCESSIBILITY

A. General: Valves, pressure gauges, and indicating equipment or specialties requiring reading, adjusting, inspection, repairing, removal, or replacement shall be conveniently and accessibly located with reference to finished building. Gauges shall be installed to be easily read from floor.

B. Panels: No unions, flanges, valves, controls, or equipment shall be placed in a location that will be inaccessible after the system is complete. Access panels or doors shall be provided where required whether or not shown on Drawings.

C. Access Panels in Walls or Ceilings:

1. Provide access panels in walls or ceilings where indicated and where required to provide access to valves, dampers, and other appurtenances. Panels shall be style as

selected by Architect and as directed by wall or ceiling construction. Panel size shall be 24" x 24" unless indicated otherwise. Panels in acoustical barriers shall have same transmission loss as barrier. Panels in rated construction shall have same rating as construction in which installed.

2. Door panels shall be no lighter than 14 gauge steel. Doors shall be equipped with concealed spring hinges and flush, screwdriver operated locks, except that key operated locks shall be used for all access doors in walls where door is within 6'-0" of floor. Locks for all key operated doors shall be keyed alike.

3. Doors in ceramic tile surfaces shall be stainless steel or chrome plated. Doors in other finished surfaces shall be prime coated.

D. Equipment Spaces: Provide aisles between equipment and piping, electrical gear, etc. for complete service and inspection of equipment. Maintain minimum 6'-6" headroom in all access aisles. Maintain minimum 36" clearance at all service panels. Provide minimum clearances at electrical equipment per NEC. Provide 36" wide, 3/4" thick plywood covered catwalks in attics from access door to equipment.

3.18 TESTING

A. Test all piping, equipment, and systems as called for in the Specifications. Notify Architect and inspection authorities prior to testing so that they may be witnessed. Protect all personnel and equipment during testing. Where Specifications do not cover specific points or methods, conform to manufacturer's specifications.

3.19 EQUIPMENT

A. All equipment shall be accurately set and leveled. Supports shall be neatly placed and properly fastened. All equipment shall be fastened in place with bolts.

B. Keep all openings closed with plugs or caps to prevent entrance of foreign matter. Protect all piping, ductwork, fixtures, and equipment against dirt, water, chemical, or mechanical damage both before and after installation. Any equipment or apparatus damaged prior to final acceptance shall be restored to original condition or replaced at the Architect’s discretion and at no additional cost to the Owner.

C. Start-Up: Equipment shall be adjusted, lubricated, aligned, etc. prior to start-up. Inspect each piece of equipment prior to start-up. Start each piece of equipment in accordance with manufacturer's directions and warranty requirements.

D. Finish: Protect all equipment and materials until in use. Any visible rust or corrosion shall be removed as directed prior to installation. All damaged factory painted finishes shall be cleaned and painted with manufacturer provided paint.

3.20 MANUFACTURER'S DIRECTIONS

A. Materials and equipment shall be installed in accordance with manufacturer's application and recommendations, requirements, and instructions, and in accordance with Contract Documents. Where manufacturer's instructions differ from those indicated or specified, they shall be brought to Architect’s attention for resolution prior to equipment ordering and installation.

B. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

3.21 FURRING AND PIPE SPACES

A. Spaces provided in the design of the building shall be utilized and the work shall be kept within the furring lines established on the Drawings.

B. Layout: Maintain maximum head room under piping and equipment. Contractor to coordinate line locations with beams, windows, etc. to provide maximum clearance. From Drawings, ascertain heights of suspended ceilings and size of pipe shafts in which piping is concealed, and location and size of structural members in and adjacent to pipe shafts. Coordinate piping installation with ductwork, lighting, and other equipment. Ensure necessary clearances on trim plates at exposed penetrations of walls and floors. If sufficient room is not available above suspended ceiling or vertical shafts obtain clarification from Architect before work is started.

3.22 SEISMIC RESTRAINTS

A. General: All work, materials and methods used shall conform to the Drawings and Specifications. NFPA 13 Guidelines shall be followed when specific details are not shown on the Drawings. Anchorage of equipment for which specific details are not shown on the Drawings shall be adequate to resist the forces based on the required "CP" factor. Such anchorage shall be approved by the Architect, Structural Engineer, and DSA

B. All supports shall be in accordance with NFPA 13 and 2010 CBC.

C. Piping:

1. Pipe bracing system shall conform to the Drawings and to Specification requirements hereinafter listed, or shall be a pre-approved manufacturer's system such as Tolco Seismic Bracing System, or approved equal.
2. The Contractor shall submit Shop Drawings indicating the location of all seismic braces and provide a legend giving load information and model specifications prior to installation. Such prearranged system shall conform to requirements of the Specifications.
3. Brace all pipes with 2 1/2" I.D. and larger in accordance with NFPA 13.
4. Transverse bracings at 40'-0" on center maximum (minimum of one brace per direction of run).
5. Longitudinal bracings at 80'-0" on center maximum (minimum of one brace per direction of run).
6. Transverse bracing for one pipe section may also act as longitudinal bracing for the pipe section connected perpendicular to it, if the bracing is installed within 24" of the elbow or tee and is connected to the largest pipe.
7. Do not use branch lines to brace main lines.
8. Provide flexibility in joints where pipes pass through building seismic or expansion joints or where rigidly supported pipes connect to equipment with vibration isolators.
9. At vertical pipe risers, support the weight of the riser at a point or points above the center of gravity of the riser wherever possible. Provide lateral guides at the top and bottom of the riser and at intermediate points not to exceed 30'-0" on center.
10. Provide large enough pipe sleeves through walls or floors to allow for anticipated differential movements.
11. Do not fasten one rigid piping system to two dissimilar parts of the building that may respond in a different mode during an earthquake (e.g., a wall and a roof).
12. Cast iron piping systems are included in these requirements.
13. All trapeze hangers shall be braced.

3.23 CLEAN-UP

A. During the course of work under this Section, all rubbish, debris, surplus materials, tools, etc. resulting from this work shall be removed from work area and shall be disposed of off-site at the end of each working day. The Owner's premises shall be left clean and in a condition acceptable to the Architect.

B. Clean all work installed under this Contract to satisfaction of Owner and submit documentation that each system has been cleaned and results witnessed by the Architect's representative.

3.24 ENGRAVED NAMEPLATES

A. Furnish and install plastic laminated engraved nameplates in accordance with NFPA 13, the local Fire Marshal and DSA.

3.25 FINAL INSPECTION

A. The Contractor shall furnish the Architect with certificates of final inspection and approval from the inspection authorities having jurisdiction.

3.26 GUARANTEE

A. The Contractor shall guarantee the quality of all work and the quality of equipment and materials in accordance with the provisions of the General Conditions and Special Conditions. Should any defects occur during this period, the Contractor shall promptly repair or replace defective items as directed by the Architect, without cost to the Owner.

3.27 SITE VISITS BY ENGINEER

A. Engineer's responsibility is limited to normal construction support services only, consisting of office consultation, site visits, and reports to the Architect at appropriate stages of construction such as rough-in, pre-final, and final. All costs incurred by the Engineer for additional site visits or office work required to complete the project as the result of incomplete coordination or supervision by the Contractor or the Mechanical Sub-Contractor shall be paid for by the Contractor.

3.28 OPERATING AND MAINTENANCE MANUALS

A. Complete sets of bound instructions containing the manufacturer's operating and maintenance instructions in accordance with specification section 21 05 00 Overhead Fire Protection System:

B. Field Instructions: Upon completion of the work and at a time designated by the Owner the services of one or more competent Engineers shall be provided by the Contractor to instruct a representative of the Owner in the operation and maintenance of the systems. These field instructions shall cover all the items contained in the bound instructions and shall be of a sufficient length and detailed nature, in the Engineer's judgment, to insure safe and efficient operation.

END OF SECTION 21 0001

SECTION 21 0501

FIRE PROTECTION GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General and Supplementary Conditions and Division 1 are a part of the requirements for the work under this Division of the Specification.

1.2 WORK INCLUDED

A. Provide labor and materials required to install, test and place into operation the fire protection systems as called for in the Contract Documents and according to applicable codes and regulations.

1.3 APPLICABLE CODES

A. 2016 California Building Code CCR Title 24, Part 2

B. 2016 California Electrical Code CCR Title 24, Part 3

C. 2016 California Mechanical Code CCR Title 24, Part 4

D. 2016 California Plumbing Code CCR Title 24, Part 5

E. 2016 California Energy Code CCR Title 24, Part 6

F. 2016 California Fire Code CCR Title 24, Part 9

G. 2016 California Green Building Standards Code CCR Title 24, Part 11

H. All local jurisdiction amendments to these codes.

1.4 QUALITY ASSURANCE

A. Comply with current governing codes, ordinances and regulations of the Authority or Authorities Having Jurisdiction over any part of the work and secure all necessary permits. Comply with the regulations and requirements of the City's insurance underwriter.

B. Where codes or standards are referenced, the applicable portions apply.

C. Drawings, specifications, codes and standards are minimum requirements. Where requirements differ, apply the more stringent.

D. Should any change in drawings or specifications be required to comply with governing regulations, notify the Architect prior to submitting bid.

E. Execute work in strict accordance with the best practices of the trades in a thorough, substantial, skillful and well-executed manner by competent workers. Provide a competent, experienced full-time Superintendent who is authorized to make decisions on behalf of the Contractor.

F. The Architect or Architect's Representative may conduct unannounced field reviews of any work completed or in progress during the Contractor's working hours. A report will be issued to the Contractor if the field review of the fire protection systems construction has revealed elements of the work, which are inconsistent with the Contract Documents. All items in the report shall be addressed in writing by the Contractor within two (2) weeks and corrections in the field shall be made as directed.

G. Abbreviations and definitions

1.5 STANDARDS ORGANIZATIONS AND ABBREVIATIONS:

1.	ANSI	American National Standards Institute
2.	ASME	American Society of Mechanical Engineers
3.	ASTM	American Society for Testing and Materials
4.	AWWA	American Water Works Association
5.	FM	Factory Mutual
6.	IEEE	Institute of Electrical and Electronic Engineers
7.	NEMA	National Electrical Manufacturers Association
8.	NFPA	National Fire Protection Association
9.	OSHA	Occupational Safety and Health Administration
10.	UL	Underwriters Laboratories Inc.

B. Definitions:
1. Where it is stated in the specifications to submit to Architect or Engineer for review, refer to Architectural General and Special Conditions for proper procedures.
2. "PROVIDE" means to "Furnish" and "Install".
3. "INSTALL" means to join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to the City, complete and ready for regular operation.
4. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application.
5. "AS DIRECTED" means as directed by the Architect, or the Architect's Representative.
6. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings.
7. "SUBMIT" means submit to the Architect for review.

1.6 GUARANTEE

A. Submit a single guarantee stating that the work is in accordance with Contract Documents. Guarantee work against faulty and improper material, fabrication, installation, start-up and commissioning for a period of one (1) year from date of final acceptance by the City, except that where guarantees or warranties for longer terms are specified herein, the longer term shall apply. Correct any deficiencies, which occur during the guarantee period, within 24 hours of notification, at no additional cost to the City, to the satisfaction of the City. Obtain similar guarantees from subcontractors, manufacturers, suppliers and sub-trade specialists.

1.7 USE OF THE ARCHITECT'S AND ENGINEER'S DRAWINGS

A. The Contractor shall obtain, at the Contractor's expense, from the Architect or Engineer a set of digital data files in AutoCAD or compatible format architectural and engineering drawings on electronic media where desired by the Contractor and/or required by the Specifications for use in preparing the shop drawings, coordination drawings, and record drawings. The Contractor shall provide to the Architect and Engineer a written release of liability acceptable to the Architect and Engineer prior to receiving the electronic media files.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Provide products and materials that are new, clean, free of defects and free of damage and corrosion.

B. Products and materials shall not contain asbestos, PCBs or any other material that is considered hazardous by the Environmental Protection Agency or any other Authority Having Jurisdiction.

C. Replace materials of less than specified quality and relocate work incorrectly installed as directed by the Architect.

D. Provide name/data plates on major components of equipment with manufacturer's name, model number, serial number, capacity data and electrical characteristics attached in a conspicuous place.

E. Install materials and equipment with qualified trades people.

F. Maintain uniformity of manufacture for equipment used in similar applications and sizes.

G. Applicable equipment and materials to be listed by Underwriters Laboratories and manufactured in accordance with ASME, AWWA, or ANSI standards, and as approved by Authorities Having Jurisdiction. The energy-using products shall be certified for use in the State of California and meet State energy efficient standards.

H. Fully lubricate equipment when installed.

I. Install floor-mounted equipment on a 4-inch high concrete pad. Concrete work shall be provided by another trade. Coordinate size and location with actual equipment used and accepted layout shop drawings.

J. Secure equipment with bolts, washers and locknuts of ample size to support equipment. Embedded anchor bolts to have bottom plate and pipe sleeves. Grout machinery set in concrete under entire bearing surface. After grout has set, remove wedges, shims and jack bolts and fill space with grout.

K. Locate valves, dielectric unions, access doors, etc., to be easily accessible, either in mechanical spaces or through access panels specified. Obtain Architect's approval of access panel locations.

L. Follow manufacturers' recommendations and instructions for installing, connecting, and adjusting equipment. Provide a copy of such instructions at the equipment during installation.

M. Equipment capabilities, etc., are scheduled or specified for job site operating conditions. Equipment sensitive to altitude shall be derated with the method of derating identified on shop drawings.

2.2 ALTERNATIVE EQUIPMENT AND MATERIALS

A. Contract Documents are based on materials specified and on equipment manufacturers indicated. Acceptance of alternative equipment manufacturers does not relieve Contractor of the responsibility to provide equipment and materials, which meet the quality and performance as stated or implied in the Contract Documents.

B. Equipment manufacturers listed in individual sections are acceptable for this project, subject to requirements of Contract Documents.

C. Submit proposals to supply alternate materials or equipment, in writing, with sufficient lead time for review prior to the date equipment must be ordered to maintain project schedule. Reimburse City for costs associated with the review of the proposed alternative whether alternative is accepted or rejected.

D. Include revisions required to adapt alternatives in such proposals, including revisions by other trades. No increase in the contract price will be considered to accommodate the use of alternative equipment.

E. Wherever quality standards (such as serviceability, longevity or durability) and operating results (such as noise levels, quantity delivered or pressure obtained) are specified or scheduled, or when the manufacturer and size of equipment, for which such operating results are published or determinable, is specified, the substitution being proposed must conform substantially to the quality and quantities specified or implied. The substitution must fit into available space conditions and must function properly in coordination with the rest of the system.

F. Proposed changes and substitutions of systems, equipment and manufacturers shall be submitted and include the following information with the proposal:
   1. A description of the difference between the existing contract requirements and that proposed, the comparative features of each, and the effect of the change on the end result performance. Include the impact of all changes on other contractors and acknowledge the inclusion of additional costs to other trades.
   2. Schematic drawings and details to supplement the description.
   3. A list of the contract requirements that must be revised if the change is accepted, including any specification revisions.
   4. Complete list of materials and equipment proposed for use in the change.
   5. Include a description and estimate of costs the City may incur in implementing the change, such as additional space requirements, permits, architectural and aesthetic impact, design costs, tests, permits evaluation, operating and support costs.
   6. A projection of any effects the proposed change would have on collateral costs to the City.
   7. A statement of the time by which a contract modification accepting the change must be issued, noting any effect on the contract completion time or the delivery schedule.
   8. A statement indicating the reduction to the contract price if the City accepts the change. Be responsible for appropriate modifications to all trades.

PART 3 - EXECUTION

3.1 FEES

A. Pay all required fees and obtain required permits related to the fire protection installation.

B. Pay royalties or fees in connection with the use of patented devices and systems.

C. Provide controlled or witnessed inspection where required by Authorities Having Jurisdiction or by these specifications.

3.2 SUBMITTALS AND REVIEWS

A. Submit shop drawings, manufacturer’s data, samples and test reports as specified.

B. After notice to proceed by the City or City's Representative, or after execution of City/Contractor Agreement, submit a complete typed list of all fire protection equipment manufacturers and material suppliers for the equipment proposed to be provided on this project as well as names of all subcontractors.

C. After notice to proceed by the City or City's Representative or after execution of City/Contractor Agreement, prepare an index of all submittals for the project. Include a submittal identification number, a cross-reference to the specification sections or drawing number, and an item description. Prefix the submittal identification number by the specification sections to which they apply. Indicate, on each submittal, the submittal identification number in addition to the other data specified. All subcontractors shall utilize the assigned submittal identification number.

D. After the Contract is awarded, obtain complete shop drawings, product data and samples from the manufacturers, suppliers, vendors, and all subcontractors, for all materials and equipment as specified. Submit data and details of such materials and equipment for review. Prior to submission, certify that the shop drawings, product data and samples are in compliance with the Contract Documents. Check all materials and equipment upon their arrival on the job site and verify their compliance with the Contract Documents. Modify any work, which proceeds prior to receiving accepted shop drawings as required to comply with the Contract Documents and the shop drawings.

E. Review of submittals is for general compliance with the design concept and Contract Documents. Comments or absence of comments does not relieve the Contractor from compliance with the Contract Documents. The Contractor remains solely responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of construction, for performing the work in a safe manner, and for coordinating the work with that of other trades.

F. No part of the work shall be ordered, procured, started in the shop or in the field until the shop drawings and samples for that portion of the work have been submitted, reviewed and returned with either "No Exceptions Noted" or "Exceptions Noted" marked on the submission.

G. A minimum period of ten (10) working days, exclusive of transmittal time, will be required in the Architect/Engineer's office each time a shop drawing, product data and/or samples are submitted for review. Bulk submittals are unacceptable. Contractor shall prioritize submittal reviews where multiple submittals are sent for review. This time period must be considered by the Contractor in the scheduling of the work.

H. Submit three (3) opaque bond prints of all items requiring shop drawings. Submit three (3) paper copies of manufacturer's product submittals. One (1) copy of submittals will be returned. Additional copies are the responsibility of the Contractor.

I. Electronic submittals where acceptable to the Architect will be submitted in PDF format through a project file sharing website.

J. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
   3. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., HFTC-230923.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., HFTC-230923.01.A).

4. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
5. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Architect, containing the following information:
   a. Project name.
   b. Date
   c. Name and address of Architect and Engineer
   d. Name of City
   e. Name of Contractor
   f. Name of firm or entity that prepared submittal
   g. Names of subcontractor, manufacturer, and supplier
   h. Category and type of submittal
   i. Specification Section number and title
   j. Drawing number and detail references, as appropriate
   k. Related physical samples submitted directly
   l. Indication of full or partial submittal
   m. Transmittal number [numbered consecutively]
   n. Submittal and transmittal distribution record
   o. Remarks
6. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name
   d. Product name

K. Submissions (paper or electronic) will be stamped as follows:

Stamp	Interpretation
No Exceptions Noted	Fabrication, manufacture, or construction may proceed providing submittal complies with the Contract Documents.
Exceptions Noted: [ ] Resubmit for Record [ ] No Resubmission Required	Fabrication, manufacture, or construction may proceed providing submittal complies with the Contract Documents and Engineer's notations are complied with. Within this category are two options. A resubmission for our records is required when corrections are necessary. A resubmission is not required if there are only minor comments.
Revise and Resubmit	The submittal does not comply with the Contract Documents; do not proceed with fabrication, manufacture, or construction. The work and shop drawings are not permitted at the job site. Resubmit appropriate shop drawings.

L. Submit materials and equipment by manufacturer, trade name and model number. Include clear, legible copies of applicable brochure or catalog material. Provide statement of compliance with referenced standards, installation or application of testing agency labels and seals. Maintenance and operating manuals are not suitable substitutes for shop drawings.

M. Identify each sheet of printed submittal pages (using arrows, underlining or circling) to show applicable sizes, types, model numbers, ratings, capacities and options actually being

proposed. Cross out non-applicable information. Note specified features such as voltages, motor efficiencies, special tank linings, pump seals, materials or paint finishes. Cross out all references to “options”. Cross out statements such as “subject to change without notice” or “not for construction”. Anything not specifically excluded is assumed to be included.

N. Include dimensional and required clearance data for roughing in and installation. Note on submittal required coordination with other elements of the work., Include technical data sufficient to verify that equipment meets requirements of the Contract Documents including performance curves at project site and operating conditions. Include wiring diagrams showing factory installed and field wiring requirements, piping and service connection data, motor sizes complete with voltage ratings, and schedules.

O. Maintain a complete set of the most current reviewed and stamped shop drawings and product data on site.

P. Prepare and submit detailed shop drawings for piping work and other distribution services in minimum ¼-inch to 1-foot scale, including elevations and locations and sizes of openings in floor decks, walls and roofs.

Q. The work described in shop drawing and product data submittals shall be carefully checked by all trades for clearances (including those required for code compliance, maintenance and servicing), field conditions, maintenance of architectural conditions and proper coordination with other trades on the job. Each submitted shop drawing to include a certification that related field conditions and requirements have been checked by all Contractors and Subcontractors and that conflicts do not exist.

R. The Contractor is not relieved of the responsibility for dimensions or errors that may be contained on submissions or for deviations from requirements in the Contract Documents. The noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the shop drawings, product data and samples, the Contract Documents govern the work and are neither waived nor superseded in any way by the review of shop drawings, product data and samples.

S. Inadequate or incomplete shop drawings, product data and/or samples will not be reviewed and will be returned to the Contractor for resubmittal.

T. Indicate the following in the lower right hand corner of each shop drawing, and on the front cover of each product data brochure: the submittal identification number; title of the sheet or brochure; name and location of the Project; names of the Architect, Engineer, Contractor, Subcontractor, Manufacturer, Supplier, and Vendor; the date of submittal; and the date of each correction, version and revision. Number all pages and drawings in product data brochures, test reports or submittals consecutively from beginning to end. Unless the above information is included, the submittal will be returned for resubmission. Resubmittals of shop drawings or product data or brochures shall include a cover letter summarizing the corrections made in response to the review comments.

3.3 COORDINATION OF WORK

A. The Contract Documents establish scope, materials and quality but are not detailed installation instructions. Drawings are diagrammatic.

B. The Contract Documents show the general arrangement of equipment, ductwork, piping and accessories. Follow these drawings as closely as the actual construction and the work of other trades will permit. Provide offsets, fittings, and accessories, which may be required but not shown on the Drawings. Investigate the site and review drawings of other trades to

determine conditions affecting the work and provide such work and accessories as may be required to accommodate such conditions.

C. Certain products will be provided by other trades. Examine the Contract Documents to ascertain the requirements for installation of these products.

D. Carefully check space requirements with other trades to ensure that material can be installed in the spaces allotted.

E. Wherever work interconnects with work of other trades, coordinate with other trades to ensure that they have the information necessary so that they may properly install the necessary connections and equipment. Identify items (valves, etc.) requiring access in order that the ceiling and partition contractors can install access doors and panels in the correct locations.

F. Consult with other trades regarding equipment so that, wherever possible, motors, motor controls, pumps and valves are of the same manufacturer.

G. Furnish and set sleeves for passage of pipes and conduits through structural masonry and concrete walls, roofs and floors and elsewhere as will be required for the proper protection of each pipe passing through building surfaces.

H. Install firestopping around all pipes, conduits, etc., which pass through rated walls, partitions and floors in strict accordance with the manufacturer's published approval listing and rating.

I. Provide detailed information on openings and holes required in structural elements and pre-cast panels or components for fire protection work.

J. Provide required structural or architectural supports and hangers for piping and equipment, designed so as not to exceed allowable loadings of structures.

K. Examine and compare the Contract Drawings and Specifications with the drawings and specifications of other trades, report any discrepancies between them to the Architect and obtain written instructions for changes necessary in the work. Install and coordinate the work in cooperation with other related trades. Before installation, make proper provisions to avoid interferences.

L. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale to coordinate the work with the work of other trades. Detailed work shall be clearly identified on the Drawings as to the area to which it applies. Submit these drawings to the Architect for review. At completion include a set of these drawings with each set of record drawings.

M. Before commencing work, examine adjoining work on which this work is in any way dependent and report conditions that prevent performance of the work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

N. Adjust location of pipes, panels, equipment, etc., to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each pipe prior to fabrication.
   1. Right-of-Way: Lines which pitch have right-of-way over those which do not pitch. For example, condensate, steam, and plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have right-of-way over lines whose elevations can be changed.

2. Provide offsets and changes in direction of pipes as required to maintain proper head room and pitch on sloping lines. Provide traps, air vents, drains, etc., as required to effect these offsets and changes in direction.

O. Install fire protection work to permit removal (without damage to other parts) of controls, sheaves and drives, and any other parts requiring periodic replacement or maintenance. Arrange pipes and equipment to permit access to valves, starters, motors, and control components, and to clear the openings of swinging doors and access panels.

P. In cases of doubt as to the work intended, or in the event of need for explanation thereof, request supplementary instructions from the Architect.

3.4 CONTRACTOR'S COORDINATION DRAWINGS

A. The Contractor shall coordinate efforts of all trades and shall furnish (in writing, with copies to the Architect) any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. The Contractor and all trade contractors shall prepare a complete set of construction Coordination Drawings indicating the equipment actually purchased and the exact routing for all lines such as piping, busway, conduit, ductwork, etc., including conduit embedded in concrete floors and walls. The Coordination Drawings shall be submitted complete to the Architect and the Engineer within three (3) months after notice to proceed is given and in compliance with the construction schedule for the project. The sheet metal drawings, at a scale of not less than ¼-inch to 1-foot, shall serve as the base drawings to which all other Contractors shall add their work. Each separate Trade Contractor shall draw their work on separate layers with different color assignments to facilitate coordination. Each Coordination Drawing shall be completed and signed off by the other Trade Contractors and the Contractor prior to the installation of the HVAC, plumbing, electrical, fire protection and fire sprinkler work in the area covered by the specific drawing. The Contractor's work shall be installed according to the shop drawings and Coordination Drawings. If the Contractor allows one trade to install their work before coordination with the work of other trades, the Contractor shall make all necessary changes to correct the condition at no additional cost to the City.

C. The Contractor's Coordination Drawings shall indicate structural loads at support points for all piping 10-inch and larger, racked piping and racked conduit. Submit to Structural Engineer for review and approval. The elevation, location, support points, static, dynamic and expansion forces and loads imposed on the structure at support and anchor points shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. Work routed underground or embedded in concrete shall be indicated by dimension to column and building lines and shall be coordinated. Coordination Drawings shall document all required structural penetrations for initial construction. Penetrations shall be dimensioned for walls, floors and roofs. These structural coordination requirements require review and approval by the Structural Engineer prior to completion and submittal of the Drawings.

D. This requirement for Coordination Drawings shall not be construed as authorization for the Contractor or trade contractors to make any unauthorized changes to the Contract Documents. Contract document space allocations shall be maintained such as ceiling height, designated clearance for future construction and flexibility, chase walls, equipment room size, unless prior written authorization is received from the Architect to change them.

E. Prior to final acceptance of the work, the Contractor shall submit the Coordination Drawings as part of the Record Drawing submittal.

3.5 EXAMINATION OF SITE

A. The Contract Documents do not make representations regarding the character or extent of the subsoils, water levels, existing structural, mechanical and electrical installations, above or below ground, or other sub-surface conditions which may be encountered during the work.

B. Evaluate existing conditions that may affect methods or cost of performing the work, based on examination of the site or other information. Failure to examine the Drawings or other information does not relieve the Contractor of responsibility for satisfactory completion of the work.

3.6 EXCAVATION AND BACKFILL

A. Provide excavation for the work of this Division. Excavate all material encountered, to the depths indicated on the Drawings or as required. Remove excavated materials not required or suitable for backfill from the site. Provide grading as may be necessary to prevent surface water from flowing into trenches or other excavations. Remove any water that accumulates. Provide sheeting and shoring as may be necessary for the protection of the work and for the safety of personnel.

B. Provide trenches of widths necessary for the proper execution of the work. Grade bottom of the trenches accurately to provide uniform bearing and support the work on undisturbed soil at every point along its entire length. Except where rock is encountered, do not excavate below the depths indicated. Where rock excavations are required, excavate rock to a minimum overdepth of four inches below the trench depths indicated on the Drawings or as required. Backfill overdepths in the rock excavation and unauthorized overdepths with loose, granular, moist earth, thoroughly machine tamped to a compaction level of at least 95 percent of standard proctor density or 75 percent relative density or as specified by the Architect. Whenever unstable soil that is incapable of properly supporting the work is encountered in the bottom of the trench, remove soil to a depth required and backfill the trench to the proper grade with coarse sand, fine gravel or other suitable material.

C. Excavate trenches for utilities that will provide the required minimum depths of cover from existing grade or from indicated finished grade, whichever is lower, unless otherwise specifically shown.

D. Trenches shall not be placed within ten (10) feet of foundation or soil surfaces that must resist horizontal forces.

E. Do not backfill trenches until all required tests have been performed and the installation observed by the Architect. Comply with the requirements of other sections of the specifications. Backfill shall consist of non-expansive material with limited porosity. Deposit backfill in 6-inch thick layers and tamp carefully until the fire protection work is covered by not less than 12 inches of material. Backfill and tamp remainder of trench at 1-foot intervals until complete. Uniformly grade the finished surface.

3.7 CUTTING AND PATCHING

A. Where cutting, channeling, or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of piping or equipment, lay out the work carefully in advance. Repair any damage to the building, piping, equipment or finishes using skilled tradesmen for all required work.

B. Do not cut, channel or drill unfinished masonry, tile, etc. unless written permission is obtained from the Architect. Perform this work in a manner acceptable to the Architect.

C. Where piping or equipment are mounted on a painted finished surface, or a surface to be painted, paint to match the surface. Cold galvanize bare metal whenever support channels are cut.

D. Provide slots, chases, openings and recesses through floors, walls, ceilings and roofs as required. Where these openings are not provided, provide cutting and patching to accommodate penetrations at no additional cost to the City.

3.8 PROHIBITED LABELS AND IDENTIFICATIONS

A. Prohibited Markings: In all public areas, tenant areas, storage areas and similar locations within the project, the inclusion or installation of any equipment, fixture or assembly which bears on any exposed surface any name, trademark, or other insignia which is intended to identify the manufacturer, the vendor, or other source(s) from which such object has been obtained, is prohibited.

B. Exception: Required Underwriters Laboratories labels shall not be removed nor shall identification specifically required under the various technical sections of the Specifications be removed.

3.9 EQUIPMENT PAD AND ANCHOR BOLTS

A. Provide concrete pads under all floor-mounted fire protection equipment. This includes electrical components, equipment mounted on legs and pipe support stands. Equipment pads shall conform to the shape of the piece of equipment it serves with a minimum 2-inch margin around the equipment and supports. Pads shall be a minimum of 4 inches high and made of a minimum 28-day, 2,500-psi concrete reinforced with 6-inch by 6-inch 6/6-gauge welded wire mesh. Trowel tops and sides of pad to smooth finishes, equal to those of the floors, with all external corners bullnosed to a ¾-inch radius. Use shop drawings stamped “NO EXCEPTIONS NOTED” or “EXCEPTIONS NOTED” for dimensional guidance in sizing pads.

B. Provide galvanized anchor bolts for all equipment placed on concrete equipment pads, inertia blocks, or on concrete slabs. Verify bolts size, number and embed depth recommended by the manufacturer of the equipment with seismic calculations as specified, and locate by means of suitable templates.

C. Where equipment is mounted on gypsum board partitions, the mounting screws will pass through the gypsum board and be securely attached to the partition studs. As an alternative, the mounting screws may pass through the gypsum board and be securely attached to 6-inch square, 18-gauge galvanized metal backplates that are attached to the gypsum board with an approved non-flammable adhesive. Toggle bolts installed in gypsum board partitions are not acceptable.

3.10 DELIVERY, DRAYAGE AND HAULING

A. Include all drayage, hauling, hoisting, shoring and placement in the building of equipment specified and be responsible for the timely delivery and introduction of equipment to the project as required by the construction schedule. If any item of equipment is received prior to the time it is required, be responsible for its proper storage and protection until the time it is required. Pay for all costs of demurrage or storage.

B. If equipment is not delivered or installed at the project site in a timely manner as required by the project construction schedule, the Contractor shall be responsible for disassembly, re-

assembly, manufacturer's supervision, shoring, general construction modification, delays, overtime costs, etc., at no additional cost to the City.

3.11 EQUIPMENT AND MATERIAL PROTECTION

A. Protect the work, equipment and material of other trades from damage by work or workers of this trade, and correct damage caused without additional cost to the City.

B. The Contractor shall be responsible for all work, materials and equipment until finally inspected, tested and accepted. Protect work against theft, injury or damage; and carefully store material and equipment received on site that is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of dust, dirt, water or other obstructing material. Cover and protect equipment and materials from damage due to water, moisture, humidity, paint, spray-on fireproofing, construction debris, etc. Store equipment subject to moisture damage, such as insulation or electrical components in dry heated spaces.

C. Provide adequate means for fully protecting finished parts of the materials and equipment against damage from whatever cause during the progress of the work until final acceptance. Protect materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred, and moving parts are kept clean and dry. Do not install damaged items; take immediate steps to obtain replacement or repair. Replace all wet or damp insulation.

3.12 ELECTRICAL EQUIPMENT AND ELECTRICAL ROOM PRECAUTIONS

A. Do not install piping or equipment above switchboards, disconnects, panelboards, dimmers, control panels, VFDs, motor control centers, individual motor controllers, electronics, etc or the code-required service space for these electrical devices.

3.13 EQUIPMENT GUARDS

A. Provide easily (without tools) removable expanded metal guards for all hot surfaces, belts, couplings, and other moving parts of machinery. Provide tachometer openings in the guards at least 2 inches in diameter, for all belt-driven, gear-driven or variable speed machinery. Comply with OSHA requirements for all equipment guards.

3.14 LUBRICATION

A. Provide means for lubricating all bearings and other machine parts. If a part requiring lubrication is concealed or inaccessible, extend a metallic lubrication tube with suitable fitting to an accessible location and identify it with permanent laminated plastic nameplates. Identify this location in the maintenance manual.

B. After installation, properly lubricate all parts requiring lubrication and keep them adequately lubricated with a lubricant recommended by the equipment manufacturer until City acceptance.

3.15 DATE OF COMPLETION AND TESTING OF FIRE PROTECTION SYSTEMS

A. Comply with the project construction schedule for the date of final performance and acceptance testing, and complete work sufficiently in advance of the Contract completion date to permit the execution of the testing and commissioning prior to occupancy and the Contract closeout. Complete any adjustments and/or alterations that the final acceptance

tests indicate as necessary for the proper functioning of all equipment prior to the completion date. See individual sections for extent of testing required.

B. Provide a detailed schedule of completion indicating when each system is to be completed and outlining when tests will be performed. Update this schedule periodically as the project progresses.

3.16 OPERATING INSTRUCTIONS AND OPERATOR TRAINING

A. Provide the services of factory-trained specialists to supervise the operation of all equipment and systems specified and train the City's operating and maintenance personnel for a ten (10) day operating/instruction period. Operating instruction time is defined as straight time working hours and not including nights, weekends or travel time to and from the project. Refer to individual sections for additional training and instruction by manufacturer's trained specialists.

B. In addition to the operating/instruction period, organize and conduct a training seminar to instruct the City's Representatives in the operation and general preventative maintenance of equipment and systems provided at the completion of the project.

C. Instruct City's operating personnel in the basis of design, the available documentation, the proper starting sequences, operation, shut-down, minor adjustments, trouble-shooting, recommended spare parts, and regular maintenance procedures., Instruction for both normal and emergency operations procedures shall be provided.

D. Make arrangements to give instructions by system and not by building areas. Organize training session and the video recording to present segments for equipment types, and overall systems following the Table of Contents of the Operating and Maintenance manuals.

E. Provide services of qualified personnel, including each sub-trade, each major equipment supplier to attend seminar and instruct on respective equipment or systems. Seminar shall be conducted by the Contractor and shall be videotaped. Video recording shall be professional quality with sufficient lighting and narration. The seminars may be attended by the Architect or Architect's Representative.

F. Submit seminar agenda, schedule and list of representatives to the City for review thirty (30) days prior to seminar. Confirm attendance at seminar by written notification to participants.

G. At seminar, submit final copies of record drawings and operating and maintenance manuals to City.

H. Submit a written record of the seminar, complete with an attendance list to the City. Provide two copies of the training video recording on DVDs with minimum 640 x 480 resolution in .mp4 file format or other video file type acceptable to the City. Provide a transcript of the video narration in PDF format.

3.17 OPERATING AND MAINTENANCE MANUALS

A. Provide operating instructions and maintenance manuals for all equipment and materials furnished under this Division. Manuals shall be available at the operations training seminar.

B. Submit three (3) final hard paper copies of operating and maintenance manuals for review at least four (4) weeks before the completion date. Assemble data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item.

C. After the Architect's and Engineer's review, and any required Contractor revisions, the operating and maintenance manuals shall be delivered to the City as three (3) hard paper copies in a binder as described below and separately on electronic media in PDF format.

D. Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   1. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   2. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name,and subject matter of contents. Indicate volume number for multiple-volume sets.
   3. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   4. Supplementary Text: Prepared on 8½-by-11-inch white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

E. Manual Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system.

F. Maintenance information shall include complete lubrication, cleaning, and servicing data compiled in clearly and easily understandable format. Show model and serial number of each piece of equipment, complete lists of replacement parts, capacity ratings, and actual loads.

G. Provide the following equipment operating and maintenance information where applicable:
   1. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
   2. Identifying equipment manufacturer, product name and drawing number
   3. Locations (where several similar items are used, provide a list)
   4. Performance curves and data
   5. Wiring diagrams
   6. Lubrication charts
   7. Manufacturers' recommended operating and maintenance instructions, with all non-applicable information deleted
   8. Assembly and disassembly instructions with exploded view Drawings, where necessary
   9. Startup procedures.
   10. Routine and normal operating instructions
   11. Normal and emergency shutdown instructions
   12. Trouble shooting diagnostic instructions, where applicable

3.18 RECORD DRAWINGS

A. The Contractor shall maintain on a daily basis at the project site a complete set of Record Drawings. The Record Drawings shall initially consist of a set of bond paper prints or AutoCAD files of t Contractor's Coordination Drawings. The prints shall be marked or the AutoCAD files electronically updated to show the precise location of all buried or concealed work and equipment, including embedded piping and valves, and all changes and deviations in the fire protection work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without definite written instructions from the Architect or Engineer. The updated Coordination Drawings shall be used to produce the final Record Drawings that shall be delivered to the City in AutoCAD electronic format media upon project completion.

B. Record dimensions clearly and accurately to delineate the work as installed. Suitably identify locations of all equipment by at least two (2) dimensions to permanent structures. Provide record drawings to the following items as a minimum:
1. Dimensional changes to Drawings.
2. Revisions to details shown on Drawings.
3. Locations and depths of underground utilities.
4. Revisions to routing of piping and conduits.
5. Actual equipment locations.
6. Locations of concealed internal utilities.
7. Changes made by Change Order.
8. Field records for concealed conditions.
9. Record information on the Work that is shown only schematically in the contract documents.

C. The Contractor and subcontractor shall mark all in-progress Record Drawings on the front lower right hand corner with a rubber stamp impression or an AutoCAD image similar to the following:

RECORD DRAWING
(⅜-inch high letters)

To be used for recording Field Deviations and Dimensional Data Only
($^{5}/_{16}$-inch high letters)

D. Upon completion of the work, the Contractor and subcontractors shall certify all Record Drawings on the front lower right hand corner adjacent to the above marking with a rubber stamp impression or an AutoCAD image similar to the following:

RECORD DRAWING
CERTIFIED CORRECT
(⅜-inch high letters)

(Printed Name of General Contractor)
(5/16-inch high letters)

Date:

(Printed Name of Subcontractor)
(5/16-inch high letters)

Date:

E. Prior to final acceptance of the work of this Division, the Contractor shall submit properly certified Record Drawings to the Architect and Engineer for review and shall make changes, corrections, or additions as the Architect and/or Engineer may require to the Record Drawings. After the Architect's and Engineer's review, and any required Contractor revisions, the Record Drawings shall be delivered to the City on electronic media in AutoCAD format and a complete set of hard copy plots of Record Drawings. The Architect and Engineer do not assume any responsibility for the accuracy or completeness of the Record Drawings.

F. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. After review, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
4. Architect will provide data file layer information. Record markups in separate layers

3.19 CERTIFICATION

A. Any certifications required by the Specifications, in addition to those required for shop drawings, product data, equipment and other items, are to be so certified in writing by the City, a Partner, or a Corporate Officer of the firm required to provide the Certification, or by another person duly authorized to sign binding agreements for and on behalf of the City, Partner or Corporation.

3.20 FINAL REVIEW

A. At a time designated by the City, the entire system shall be reviewed for compliance with the Contract Drawings and Specifications. Be available at all times during this review.

B. Demonstrate to the City and/or the Architect's personnel prior to the Final Review that systems and equipment have been properly balanced and adjusted and are in compliance with the requirements of the Contract Documents. After these demonstration tests are satisfactorily completed, but prior to the Final Review, submit a written certification that attests to the Contract Document compliance for this project; and Prior to the final review, the Contractor shall confirm the following items regarding the status of key elements of the work.

Negative responses to any of the items indicate that the construction is not substantially complete, and the building is not ready for a final review. The Contractor shall confirm the following in writing:

1. Building fire protection systems are completely installed, commissioned, operating, and connected to the required city, public or private utilities and pressure tested.
2. Building has normal electrical power.
3. Building systems have been cleaned.
4. Seismic restraints have been inspected as specified. Any required special inspections have been completed.
5. Building fire and life safety systems have been tested and accepted by the local authorities. Any required special inspections have been completed.
6. There are no deviations or non-compliance with the Contract Documents; otherwise, provide a detailed account of any and all deviations or non-compliance.
7. All items on field review reports have been responded to in writing and are resolved to the satisfaction of the City.
8. All outstanding items on submittals and shop drawings have been addressed in writing and are resolved to the satisfaction of the City.
9. Schedule the final review only after providing written confirmation of all items above.

C. Certificates and Documents required by the Contract shall be presented to the Architect prior to the Final Review.

D. After the Final Review, any changes or corrections noted as necessary for the work to comply with the Contract Documents shall be accomplished without delay in order to secure final acceptance of the work.

END OF SECTION 21 0501

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SECTION 21 0502

OVERHEAD FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.1 GENERAL

A. The General Conditions, any Supplementary Conditions, Section 21 00 01, *Fire Protection General*, and Division 1 are hereby a part of this Section as fully as if repeated herein.

1.2 SCOPE

A. Furnish all labor, materials, equipment and services required for and/or reasonably incidental to the completion of the complete hydraulic calculated sprinkler system per NFPA 13, NFPA 14, NFPA 20, NFPA 22, NFPA 24, and other governing agencies.

1.3 WORK INCLUDED IN THIS SECTION

A. Furnish all labor, materials, equipment and services required for and/or reasonably incidental to the completion of the following work:

1. Sprinkler risers sized by hydraulic calculation complete with as detailed on the drawings.
2. Complete hydraulic wet-pipe automatic fire sprinkler system through all portions of the FS#6/Classroom Building 1 and Apparatus Building 2. Building 1 is calculated for Ordinary Hazard Group 1, supplied by underground storage tank and pump with 250 gpm outside hose flow provided by private fire service hydrants shown on the drawings. Building 2 is calculated for Ordinary Hazard Group 1, plus 250 GPM outside hose flow as shown on the drawings.
3. Vertical turbine fire pump, controller, associated piping, valves, sensing lines, wiring and conduit complete as shown on the drawings.
4. Jockey pump, controller, associated piping, valves, sensing lines, wiring and conduit complete as shown on the drawings.
5. Wet well float sensors as shown on the drawings.
6. Wall mounted FDC (fire department connection as shown on the drawings).
7. Wall mounted hose test header complete with angle hose valves as shown on the drawings.
8. Sprinkler heads and piping are required at all areas shown on Architectural and/or Structural Drawings.
9. Furnish and install alarm bell flow switch riser. See Drawing for location of riser. Alarm bell shall be located a minimum of 7’-6” above the ground in accordance with NFPA 72.
10. Prime and finish painting of portions of the fire protection system as required by the DSA, Architect or Rating Agency. See also Division 09, *Painting*.
11. Conformance to all design requirements of the local Fire Marshal and the Rating Agency. Preparation of all required Shop Drawings and details for the approval and installation of the system.
12. Coordination of installation of electrical conduit for supervisory systems. Provide all contacts required.
13. Arranging for all required inspections by the local official and by the Rating Agency. Cost of all testing and of special inspections required by them.

1.4 RELATED WORK UNDER OTHER SECTIONS

A. The following work is not in the work under this Section, but is covered in other Sections.
   1. Installation and connection of the electrical conduit for supervisory systems as shown on the Electrical drawings.
   2. Installation of the fire alarm systems as shown on the Electrical drawings.
   3. Installation of the underground fire service.

1.5 CODE REQUIREMENTS

A. All work shall conform to the requirements of the applicable Federal, State and local building and safety codes, ordinances and regulations.

B. Special attention shall be given to local fire regulations and the regulations of the local fire department and building department.

C. Special attention shall be given to local rulings of the Rating Agency.

D. Nothing in this Specification or on the Drawings shall be construed as permitting a departure from any applicable Federal, State or local building and safety code, ordinance or regulation, or from any requirements of the local fire department, building department and/or Rating Agency.

1.6 RATING AGENCY

A. Whenever the words "Rating Agency" are used in this Specification, they shall mean the insurance underwriters.

1.7 SUB-CONTRACTOR QUALIFICATIONS

A. This Contractor must be a C-16 Contractor, licensed by the State of California Contractor's Licensing Board. No portion of the fire protection system (performed on the job site) shall be subcontracted.

B. All fire sprinkler installers shall be certified and registered in accordance with the Automatic Fire Extinguishing Systems Certification requirements of CCR, Title 19, Division 1, Chapter 5.5.

1.8 SUBMITTALS

A. Submit for review, within fifteen (15) days after signing contract, the required number of copies of a complete list of materials proposed for use, including sizes, capacities, etc. See Division 1 for requirements. This list includes:.
   1. Sprinklers.
   2. Piping.
   3. Fittings.
   4. Hangers and Bracing.
   5. Pressure Gauges.
   6. Sprinkler Head Cabinet.
   7. Valves.
   8. Check Valves.
   9. Flow Switch.

10. Fire Pump.
11. Automatic Air Release.
12. Flow Meter.
13. Fire Pump Controller.
14. Jockey Pump.
15. Jockey Pump Controller.
16. Sensing Lines.
17. Wet Well Level Switches.
18. FDC (fire department connection).
19. Hose Test Header.
20. Hose Test Valves.

B. Contractor shop drawings shall show all details and information required by NFPA 13, NFPA 14, NFPA 20, NFPA22, and/or NFPA 24. In addition, all earthquake bracing (longitudinal and lateral) shall be shown. If unnecessary deviation from Drawings are made by Contractor which cause additional cost to the Owner, Contractor shall submit the changes to the Architect for compliance verification and the additional cost shall be borne by the Contractor

C. Final Record Drawings shall be submitted in accordance with Paragraph A above and paragraph Record Drawings of this Section, showing exact dimensional locations of all underground piping and of all risers, mains and cross-mains

D. On completion of the job, furnish the Architect with a copy of the "Contractor's Material and Test Certificate" (Part A and/or B), signed by the local Fire Marshal, and a copy of the Transmittal Letter sending the certificate to the Rating Agency and DSA.

1.9 DESIGN OF SYSTEM

A. The riser locations are shown on the Drawings. Any request for changes must be submitted to the Architect 48 hours prior to bid times for consideration.

B. All work shall be designed in accordance with the requirements of DSA, the Rating Agency, the latest editions of NFPA 13, , NFPA 14, NFPA 20, NFPA22 and NFPA 24 and the appropriate edition of the California Building Code and the California Fire Code (as modified by local ordinance or ruling).

C. Each building’s sprinkler system shall be hydraulically calculated for the hazards or commodity indicated in Section 1.4.

D. Calculations shall be based upon the water supply available at the connection with the City water main.

E. Calculations shall demonstrate the system has a design cushion of at least ten percent of the available static pressure, or as required by local authority if greater.

F. The Sprinkler Contractor shall refer to the Architectural, Structural, Mechanical, and Electrical Drawings and coordinate the system layout to not interfere with the arrangement of lighting fixtures, grilles, diffusers, ductwork, equipment and piping in the Building.

G. All piping shall be installed for routing as shown on Drawings, including cross-mains, if shown. Also, piping shall be installed as close as practical to the roof structure so as to provide the maximum possible clear height. Cross-mains shall follow the roof line (tight to the bottom of

the beams, purlins or joints) so as to remain at an approximately constant distance from the roof throughout.

H. Fire protection system lines shall be designed so as to avoid all other utility lines, conduit and structural components shown on the Drawings. Fire protection system lines must give way to all gravity lines. Notify Architect if conflicts cannot be coordinated in the field.

I. Cutting structural members shall not be allowed, unless otherwise approved by the Structural Engineer or the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall be new and currently listed in the Underwriters' Laboratories, Inc. Fire Protection Equipment List and shall be acceptable to DSA. Material that is pending approval shall not be acceptable.

B. Underground piping shall be installed in strict accordance with the manufacturer's installation guide.

C. Cast or ductile iron shall be installed to within 5'-0" of building and under all footings and slabs.

D. Above ground piping to be ANSI/ASTM A135 electric resistance welded and seamless carbon steel pipe. 1 1/2 in. and smaller use Schedule 40 with threaded fittings, 2” and greater shall be welded or roll grooved, minimum wall thickness for 300 psi in accordance with Schedule 10 up to 5 in., 0.134 in. wall for 6 in. pipe, and 0.188 in. wall for 8 in. and 10 in. pipe.

E. Backfill shall be accomplished in strict accordance with the manufacturer's installation guide and the "Backfill" Section of these Specifications.

F. Overhead piping, fittings and hanger material shall conform to the requirements outlined in NFPA 13.

G. Chrome plated escutcheon plates shall be provided where sprinkler piping passes through walls, floors or ceilings.

H. The escutcheons shall be the same size throughout the building and shall match ceiling decor.

I. A metal box containing replacement sprinkler heads shall be mounted near the riser inside the building and shall contain at least 6 heads and at least 2 of each type of head installed in the building. Also included shall be one wrench for each type of head used in the building.

J. Bushings shall not be used unless specifically approved by the Architect.

K. Provide and install head guards on sprinkler heads in areas where they could be damaged (stairwells, mechanical rooms, electrical rooms, emergency generator rooms, etc.).

L. Water flow switches shall be furnished and installed where indicated on the Drawings. Flow switch shall be UL rated by Notifier or approved equal. Flow switches shall be CSFM approved**.** Each switch shall have minimum of two poles for 120 V operation.

M. Tamper-proof switches shall be 120 V tamper switches for each isolation and control valve in each area. Electrical wiring and annunciating. Tamper switches shall be CSFM approved.

N. Remote inspector's Test station to be per NFPA 13, at location shown on Drawings. Test station to be provided with isolation valve and orifice equal to one sprinkler head flow, with drain to sanitary sewer.

2.2 HANGERS, INSERTS, AND SUPPORT

A. General: Provide hangers, brackets, supports, anchors and related appurtenances as required to support all piping and equipment provided under this Section. Piping and

B. Piping supports shall conform to hanger details on DSA approved drawings and NFPA 13.

C. Manufacturers: Tolco or approved equal.

D. Floor Supports: Provide, where required, necessary floor supports for piping and equipment. Supports shall be fabricated from structural members or shall be masonry piers.

E. Sway Bracing: Per NFPA 13, DSA approved drawings and details.

2.3 SPRINKLER VALVES

A. Manufacturer: Selection based on Stockham. Stockham, Kennedy, Walworth or Lunkenheimer, only, unless otherwise noted. All valves must be submitted and meet rating as scheduled below. No foreign manufactured valves shall be used.

B. Valve pressure not less than 175 PSIG, except drain valves.

C. Main Drain Valves: 2" Nibco T-301-W, bronze body and trip, UL

D. Riser Check Valve: Tyco CV-1 riser swing check valve.

E. Riser Control Valve: Tyco BFV-N indicating butterfly valve with two sets of factory spot (single pole double throw) switches.

F. Inspectors Test Valve: Tyco 1 1/4" model F350 test and drain valve with 5.6K test orifice, shut-off valve and visual flow indicator.

G. Gauges: 3 1/2", 0-300psi, Ashcroft type 1005P, XUL fire protection sprinkler service -gauge fitted with gauge valve shut-off, UL, FM approved.

H. Combination Inspectors Test and Main Drain: AGF TestAnDrain Assembly 1 1/4" model 1011A test and drain valve with 5.6k test orifice, shut off valve and visual flow indicator.

I. Air Release Valve: Potters PAV 1/2" NPT inlet x 1/2" MNPT outlet to drain, 5/64" orifice brass connection. UL listed, FM approved, automatic air release valve for sprinkler systems

2.4 HOSE VALVES

A. Hose Valve: FPPI Angled Hose Valve, 300 psi rated, 2 ½"FNPT Inlet X 2 ½" MNST hose thread outlet, with brass chain and cap or approved equal.

2.5 SPRINKLER HEADS

A. Exposed Ceiling Construction:

1. Quick Response: Exposed upright automatic glass bulb type, plain brass finish, equal to Tyco, TY-FRB.

2. Standard Response: Exposed upright automatic glass bulb type, plain brass finish, equal to Tyco, TY-B.

B. Finished Ceiling: Contractor to check with Architect on color to have manufacturer paint cover plates.
   1. Concealed: Concealed pendent automatic glass bulb type, equal to Tyco, “Royal Flush II”.
   2. Recessed: Recessed pendent automatic glass bulb type, equal to Tyco, TY-FRB.
   3. Hard Ceiling: Pendent automatic glass bulb type equal to Tyco, TY-FRB with Tyco 401 style escutcheon.
   4. Cooler/Freezer: Dry pendent, quick response, standard coverage, equal to Tyco, DS-1.

C. Sidewall Heads: Contractor to check with Architect on color to have manufacturer paint cover plates.
   1. Recessed horizontal sidewall automatic glass bulb type equal to Tyco, TY-FRB.

D. Special Heads, Combustible Concealed Space: Upright automatic glass bulb type, plain brass finish, equal to Tyco, CC3.

E. All heads, except as noted, to have temperature rating at 200ºF. Set head at and around heating devices suitable under normal operation to eliminate false alarm by generated heat.

F. Submittal: Submit 2 of each type of sprinkler head, complete with canopy, for Architect’s review prior to ordering heads.

2.6 ALARM RELATED COMPONETS

A. Electric Bell: Potter 10” PBA1210, UL, FM approved CSFM listed, or approved equal.

B. Riser Flow Switch: Potter VSR vane type waterflow alarm switch with retard, UL, FM approved, CSFM listed, with (2) single pole adjustable switches.

C. Shunt Trip Flow Switch: Potter VS-SP vane type waterflow alarm switch without retard, UL, FM approved, CSFM listed, with (2) single pole switches.

2.7 ACCESSORIES

A. Sprinkler Cabinet: Tyco 12 head cabinet part number P/N 1124.

B. Access Panel: 24” x 24” Croker FRPWB1865 fire rated access panel with 16 gauge steel door, continuous hinge and dry wall bead frame.

2.8 PRESSURE GAUGE

A. 3 1/2” 0-300psi Ashcroft type 1005P, XUL fire protection sprinkler service gauge fitted with gauge valve shut-off, UL, FM approved.

2.9 SEISMIC JOINT

A. Seismic Joint: Metraflex fireloop seismic loop joint MLUG80XX series sized as shown on the plans. Seismic joint shall allow for a minimum of +/- 4” of seismic movement.

2.10 EXPANSION PLATE

A. Viking 12620 expansion plate to conceal 1” annular clearance around pendent head recessed escutcheons in suspended lay in ceilings.

2.11 FIRE PUMP

A. The electric motor driven fire pump shall be of the vertical turbine type design and shall be U.L.listed and F.M. approved for fire pump service. The pump will be designed to operate at a maximum of 1770 RPM. The pump will provide a rated capacity of 500 GPM at a differential pressure of 100 PSI requiring 40 BHP. At 150% of the rated capacity the pump shall develop 80 PSI and shall not exceed 118 PSI at zero capacity. Aurora Model 11 FGM 5 Stage or approved equal. The pump shall have 125# discharge casting , with OLS column, and bronze basket strainer. Length of pump will be determined after field setting point is fabricated.

B. The motor shall have a maximum of 40 horsepower, 3 phase, 60 hertz, 460 Volt. It shallbe open drip proof with a 1.15 service factor and shall comply with the provisions of NFPA. 70, National Electric Code as described in NFPA. 20.

C. The motor controller shall be listed by Underwriters Laboratories and approved by Factory Mutual for fire pump service. It shall be compatible with the motor horsepower and voltage. It shall be of the across the line starting, full service type with a withstand rating of 100,000 amperes RMS symmetrical. The controller shall be completely assembled, wired, and factory tested by its manufacturer. The controller will also be equipped with a UL Listed automatic transfer switch, integral with main fire pump controller, utility secondary power source type. Tornatech Model GPS/GPU for approved equal, Soft start type with integral transfer switch Enclosure shall be NEMA 2.

D. The jockey pump shall be designed to deliver 10 GPM at 110 PSI total dynamic head. The pump shall be a vertical multistage centrifugal type, close coupled to a ODP motor. The motor will operate at 1.5 HP, 3450 RPM, 460 Volt, 3 phase, 60 Hertz power.

E. The jockey pump controller will be furnished with a fusible disconnect, pre piped mercoid pressure switch, front mounted HAND-OFF-AUTO selector switch, and overload relays. Tornatech model JP3 or approved equal. Enclosure shall be NEMA 2.

F. Fire pump fittings shall include a 2" automatic air release valve, (0-300) PSIG suction and discharge gauges (3.5 inch dials).

G. Other features : Gerand model K-500 grooved venturi & flow meter or approved equal, UL Listed and FM approved for fire pump service and 4” hose header with 2-1/2” angle style hose valve, cap, and chains

H. The fire pump will be factory tested in accordance with the requirements of NFPA., U.L. and F.M. Additionally, the entire package system will be hydrostatically tested at the factory prior to shipment and installed by contractor with a C-16 license.

I. Field acceptance testing shall be conducted by the pump supplier without additional cost to the owner.

2.12 AUTOMATIC AIR RELEASE

A. Aurora aarv ½”, ½” automatic air release valve or approved equal.

2.13 SENSING LINES

A. Series 200 stainless steel with ½ nominal size fittings, complete with 2 check valves and 2 globe isolation valves each in accordance with NFPA 20.

2.14 LEVEL SWITCHES

A. Mercury free snap action witch, pipe mounted, with high and low levels, Eco-Float or approved equal.

2.15 FDC (Fire Department Connection)

A. 4”x 2 ½” x 2 ½” Flush wall mount with cast brass body, double clapper inlet, back outlet, brass plate branded “Auto Spkr”, caps, and chains, Croker 6010 or approved equal.

2.16 HOSE TEST HEADER

A. 4” ductile iron ASTM 536-65, fusion bonded red epoxy allowing 250 gpm per test connection complete with 4 Cla-Val HV-100-25 Hose Valves.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Prior to bid, visit the job site and familiarize with local conditions, including verification of the location of the existing utilities.

B. The contractor shall field verify existing conditions and provide accurate shop coordination drawings for coordination with other trades in accordance with Division 1. The contractor is responsible for providing accurate shop drawings, determining material cut lengths, and listing materials, based on their verification of field conditions.

C. The fire sprinkler system shall be installed in accordance with the approved DSA drawings and details. The contractor shall notify the architect of coordination issue and conflicts for resolution and issue of any required change documents to DSA for approval.

D. All piping shall be pressure tested and flushed according to the procedures set forth in NFPA 13, NFPA 14, NFPA 20, NFPA22, and NFPA 24, and witnessed by the General Contractor, and the DSA Inspector of Record.

E. All equipment installed under this Contract shall be properly thrust blocked and earthquake braced. This Contractor shall be responsible for the proper design and installation of the equipment and for satisfying DSA, CSFM and the Architect that these requirements have been met. Drawings shall show locations of earthquake bracing, both lateral and longitudinal.

F. All equipment installed under this Contract shall be protected from external damage. This Contractor shall be responsible for the proper design and installation of the equipment, and for satisfying DSA, CFSM and the Architect that these requirements have been met. Shop Drawings shall show details of protective equipment.

G. The Contractor shall furnish and install all sleeves required for his/her work where it passes through concrete. If sleeves are not installed, all penetrations shall be core drilled. All penetrations shall be approved by the Architect before drilling.

H. This Contractor shall be responsible for any damage to other work caused by this installation or by leaks in the fire protection lines.

I. This Contractor shall be responsible for coordinating his/her work with the General, Electrical, Mechanical, and Plumbing Contractors, and with other trades.

J. All work shall be done in a neat and workmanlike manner. All heads to be located as shown in the fire protection ceiling plans, on center or quarter points of ceiling tiles unless otherwise noted. Location of sprinkler heads shall take note of obstructions.

K. Escutcheons shall not be permitted closer than 6" to T-bar ceiling members if conflicts with lights or grilles do not permit the centering of the heads in the tiles. Architect shall have final approval on exact location of sprinkler heads. Escutcheons shall not be mounted closer than 6" to any other ceiling mounted device.

L. The contractor shall install a fire pump and jockey pump in accordance with the requirements of NFPA 20. The fire pump shall be listed by Underwriters Laboratories and/or approved by Factory Mutual for fire pump service at the specified rating. The contractor shall assume unit responsibility for the proper operation of the entire system as specified herein.

3.2 TOOLS

A. All special tools for proper operation and maintenance of the equipment provided under this Section shall be delivered to the Owner's representative and a receipt requested for same.

3.3 IDENTIFICATION

A. Valves:

1. Riser control valve and floor control valves shall be clearly identified in the Riser Room.

B. Piping Identification:

1. Apply color coded polyvinyl chloride pipe bands identifying service per Section 21 00 00.
2. On exposed piping, apply bands at 20'-0" on centers at straight runs, at valve locations, and at points where piping enters and leaves a partition, wall, floor, or ceiling.
3. On concealed piping installed above removable ceiling construction, apply bands in manner described for exposed piping.
4. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply bands at valves or other devices that are made accessible by means of access doors or panels.
5. Apply bands at exit and entrance points at each piece of equipment.
6. Band widths shall be 8" for pipes up to 10" diameter, and 16" for larger diameter piping. Letter heights stating service shall be pre-printed on band, 3/4" high for 8" bands and 1 1/4" high for 16" bands.
7. Colors shall conform to ASA Standard A13.1.
8. Tags and bands shall be approved for this service
9. Where flexible sprinkler hose fittings are installed and supported by suspended ceilings, the ceiling shall meet ASTM C 635 and ASTM C 636. Additionally, a label limiting relocation of the sprinkler shall be provided on the anchoring component. (NFPA 13-10, 9.2.1.3.3.2 & 9.2.1.3.3.4).

3.4 SPRINKLER DRAINS AND TEST CONNECTION

A. Provide all necessary drain valves, drain risers, capped nipples, auxiliary piping, etc. as required to drain the system risers and mains, and all trapped portions of the system. Drain valves which are not connected to drain pipes leading to floor drains shall be hose end type.

B. Main drains and test connections shall be piped to sanitary sewer. Provide air gap at discharge location shown on the plans.

C. Provide all piping required to spill the drains and test connections to the floor, funnel or other drainage connections provided under the plumbing contract, or arrange with the plumbing trade to provide additional drainage facilities, in which case pay all charges related to the additional plumbing construction work.

3.5 TAGS

A. Provide all designated signs on shut-off valves, control valves, alarms, etc. as required by the agencies having jurisdiction.

3.6 TESTING

A. All sprinkler system piping must be hydrostatically tested for a period of two (2) hours in the presence of the Owner or his/her designee**,** and the DSA Inspector of Record.

B. Hydrostatic tests shall be made not less than 200psi for 2 hours or 50psi above static pressure in excess of 150psi.

C. Leakage from any fittings may be corrected by tightening or replacement of defective materials only. Use of sealant materials is expressly prohibited and unacceptable to the Owner as a corrective measure.

D. Gauges used in testing shall be identified as to accuracy, or provided by Owner, at his/her option.

E. Blind flanges or inserts used for testing shall be placed in the system and removed from the system in the presence of the Owner or his/her designee. These devices shall be clearly marked and vividly painted to permit casual observance of their addition to the system.

3.7 RECORD DRAWINGS

A. Keep a current set of Record Drawings on the job at all times. These Drawings shall be updated as changes are made and shall be kept in the Construction Office. Also, see Special Conditions and Fire Protection General, Section 21 00 00.

B. Keep a current set of Specifications and material lists, with catalog cuts, in the Construction Office at all times.

3.8 CLEAN-UP

A. Perform the work under this Section so as to keep affected portions of the site neat, clean and orderly at all times. Upon completion of the work under this Section, immediately remove all surplus materials, rubbish and equipment associated with or used in the performance of this work. Failure to perform such clean-up operations within 24 hours of notice by the Architect or General Contractor shall be considered adequate grounds for the work to be done by others at this Sub-Contractor's expense.

3.9 OPERATIONAL AND MAINTENANCE MANUALS

A. Four (4) complete sets of operational and maintenance (O&M) booklets shall be supplied to the Architect with Record Drawings. One (1) set shall be retained by the engineer of record.

B. O&M booklets shall be complete and include:

1. Record/As built drawings.
2. Record/As built hydraulic calculations.
3. Material Data.
4. System operation and maintenance instruction.
5. Inspection and Testing Log.

END OF SECTION 21 0502 (EOS)

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SECTION 21 0529

HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work of this Section shall include, but is not limited to, the following:
1. Pipe and un-isolated equipment hangers, anchors and supports.
2. Sleeves, escutcheons.
3. Through-penetration firestopping in fire-rated construction and through-penetration smoke-stopping in smoke partitions, including methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.

1.2 RELATED DOCUMENTS

A. Section 21 0501 – Fire Protection General Provisions

B. Section 21 0548 – Vibration Isolation and Seismic Restraints for Fire Protection

1.3 REFERENCE STANDARDS

Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section where cited below:

A. ASME – American Society of Mechanical Engineers
1. ASME B16.19: Factory-Made Wrought Butt-Welding Fittings

B. ASTM – American Society for Testing and Materials
1. ASTM A123 / A123M: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM B695: Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
3. ASTM C1107 / C1107M: Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
4. ASTM E814: Standard Test Method for Fire Tests of Penetration Firestop Systems

C. CIE/DIN Age Testing
1. Commission Internationale de L'Éclairage (CIE)
a. CIE 170-1: – Fundamental Chromaticity Diagram with Physiological Axes
2. Deutsches Institut für Normung (DIN)

D. ISO – International Organization for Standardization
1. ISO 9001: Quality Management System Requirements

E. MSS – Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
1. SP-58-2002: Pipe Hangers and Supports – Materials, Design and Manufacturer
2. SP-69-2003: Pipe Hangers and Supports – Selection and Application
3. SP-89-2003: Pipe Hangers and Supports – Fabrication and Installation Practices

F. UL – Underwriters Laboratories Inc.
1. UL Standard 1479: Fire Tests of Through-Penetration Firestops

2. UL Fire Resistance: Fire Resistance Directory set
   a. Through-penetration firestop devices (UL-XHCR)
   b. Fire resistance ratings (UL-BXUV)
   c. Through-penetration firestop systems (UL-XHEZ)
   d. Fill, void, or cavity material (UL-XHHW)
3. UL Building Materials: Building Materials Directory
4. UL Component Listing Test Criteria
5. Warnock Hersey Mark (Certification of Building Products)

1.4 QUALITY ASSURANCE

A. Hangers and supports to be constructed and applied according to the following standards:
   1. NFPA standards for fire protection system piping.
   2. Firestopping materials shall have been tested to provide fire rating at least equal to that of the construction.
   3. Deliver products in original, unopened packaging with legible manufacturer's identification.
   4. Mechanical sleeve seals shall be manufactured in an ISO 9001 certified facility.
   5. Submit written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

1.5 SUBMITTALS

A. Include on piping shop drawings a layout of masonry and concrete floor and wall sleeve locations for pipes. Include elevations and sleeve sizes.

B. Submit product data on through-penetration firestop. Submittal data for firestopping systems shall include the UL System Numbers listed in the UL Building Materials Directory under which the material was tested in accordance with ASTM E814 (UL 1479) for use in a Through-Penetration Firestop System. Where there is a firestop application that has not been tested by UL, obtain from the manufacturer an engineered judgment that the proposed application of the firestop product is suitable. Submit the engineered judgment to the Authority Having Jurisdiction.
   1. Product Data: Manufacturer's specifications and technical data including detailed specification of construction and fabrication, manufacturer's installation instructions and details of each proposed assembly identifying intended products and applicable UL system number or UL classified devices.
   2. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements:
      a. Manufacturer or manufacturer's representative shall provide qualified engineering judgments and drawings relating to non-standard applications as needed.

C. Submit details of hangers, anchors and supports for each pipe size and service, and individual pieces of equipment.

D. Submit written guarantee as per sub-Clause 1.04, A.5.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Pipe Hangers: Anvil, Fee & Mason, Elcen, Tube-Turn, F&S, Pipe Shields, B-Line Kindorf, Michigan Hanger, Power Strut, Unistrut, or approved equal. Anvil figure numbers are listed below; equivalent material by specified manufacturers is acceptable.

B. Sleeves: Pipe Shields, Insul, RK Industries

C. Pipe Wrap Tape: Polycen, Nassua, 3M

D. Firestop: Nelson, Dow, 3M, Hilti

E. Escutcheon Plates: Beaton & Corbin Manufacturing

F. Mechanical Sleeve Seals: Pipeline Seal and Insulator, Thunderline Linkseal, Calpico Pipe Linx, Metraflex Metraseal

2.2 GENERAL

A. Provide hangers of heavy construction suitable for the size of pipe to be supported. Materials shall be of steel, except pipe rolls of wrought or malleable iron.
1. Hangers for pipes six-inches or less shall be swivel ring, wrought pipe clamp, or adjustable wrought clevis type. Anvil Figure 260, MSS-SP-69, Type 1.
2. Hangers for ductile iron or cast iron pipes four-inches or less shall be swivel ring, wrought pipe clamp or adjustable wrought clevis type. Anvil Figure 590, MSS-SP-69, Type 1.
3. Hangers for pipes eight-inches and above shall have two rods and cross-rod with cast iron pipe roll complete with adjustable sockets and nuts. Anvil Figure 177, MSS-SP-69, Type 41.
4. When an oversized clevis type hanger is used (i.e., insulate pipe) a pipe spacer shall be placed over the clevis bolt as a spacer to assure that the lower U-strap will not move in on the bolt.

B. Multiple or trapeze pipe hangers shall be steel channels with welded spacers and hanger rods if hanger load calculations are submitted.

C. Wall support shall be welded steel bracket with hanger.
1. Light Duty Wall Support: Anvil Figure 194, MSS-SP-69, Type 31.
2. Medium Duty Wall Support: Anvil Figure 195, MSS-SP-69, Type 32.
3. Heavy Duty Wall Support: Anvil Figure 199, MSS-SP-69, Type 33.

D. Metal Framing Channels:
1. Provide perforated epoxy painted finish, 12-gauge minimum steel channels securely anchored to wall structure with interlocking, split type, bolt-secured, galvanized pipe/tubing clamps. B-Line type B22, S pattern with B-2000 series clamps, Power-Strut Type PS200 H with PS 1200 clamps or equal.
2. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion, or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Power-Strut PS 004T – PS 106N Series or equal.

E. Support stationary vertical piping with carbon steel double bolt riser clamps attached to the pipe. Weld shear lugs to the pipe. In general, use one clamp for each two floors and one clamp at each floor for copper tubing. Where pipes are in open shafts, provide forged steel bar brackets fixed to wall. Riser clamps shall be copper plated when used with copper pipe. Locate riser clamp immediately under coupling or other fitting. Anvil Figure 261, MSS-SP-69, Type 8 for steel pipe; Anvil Figure CT121, MSS-SP-69, Type 8 for copper pipe.

F. Floor Support for Pipe:
1. Sizes up to 4 inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support. Anvil Figure 264, MSS-SP-69, Type 38.
2. Sizes 5 inches and over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support. Anvil Figure 265, MSS-SP-69, Type 38.
3. Provide pipe stanchions for support of pipe elbows at base of riser and vertical piping. Stanchions shall be complete with base plate and vent hole. Anvil Figures 62 and 63.

G. Select hangers and supports in accordance with the manufacturer's recommended maximum loading. Hangers shall have a safety factor of 5 to 1.

H. Hangers shall not be disengaged by movement of supported pipe.

I. Provide copper-plated or felt-lined hangers for copper piping or provide 10-mil pipe wrap tape on pipe at hangers. Tape shall extend a minimum of 2 inches beyond hanger saddle on both ends and be wrapped around pipe a minimum of 2 turns. Install vinyl-coated hangers for all plastic piping.

J. Steel hanger rods shall be threaded both ends, threaded one end, or continuous threaded, black finish. Provide rods complete with adjusting and lock nuts. Anvil Figures 146, 140 or 253.

K. Pipe Support Recommendations for Rigid Grooved Joint Systems: The maximum hanger spacing in the specification to ANSI/ASME B31.1 or NFPA as noted and should be used only in conjunction with Victaulic 07 zero-flex rigid couplings. For flexible systems the hanger, support, spacing and location refer to the pipe support recommendations section in the Victaulic "Field Assembly and Installation Pocket Handbook" or equivalent provided by Grooved Joint Manufacturer.

L. Beam Clamps:
1. Provide MSS SP-69 Type 23 malleable black iron clamp for attachment to beam flange up to 0.62 inches thick for single threaded rods of ⅜-, ½-, and ⅝-inch diameter, for use with pipe sizes 4-inch and less. Furnish with a hardened steel cup point set screw. Anvil Figure 86.
2. Provide MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes up to 1.5-inch diameter but limited in application to pipe sizes 8-inch and less without prior approval. Anvil Figure 228.

M. Continuous Concrete Insert Channels:
1. Provide steel inserts with industry standard pre-galvanized finish, nominally 1⅝-inch wide by 1⅜-inch deep by length to suit the application, designed to be nailed to concrete forms and provide a linear slot for attaching other support devices.
2. Installed channels shall provide a load rating of 2,000 pounds per foot in concrete. Manufacturer's standard brackets, inserts, and accessories designed for use with continuous concrete inserts are acceptable.
3. Select insert length to accommodate all pipe and conduit in the area.

N. Anchors shall be fabricated using welding steel shapes, plates, and bars to secure piping to the structure.

O. Concrete inserts shall be MSS SP-69 Type 18 wedge type or universal concrete inserts.
1. Wedge type shall be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to ⅞-inch diameter. Wedge design shall allow the insert to be held by concrete in compression to maximize the load carrying capacity. Anvil Figure 281.
2. Universal type shall be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to ⅞-inch diameter. Anvil Figure 282.
3. Use drilled steel shell with plug type inserts when the inserts are placed after the concrete is poured.

P. Drainage Piping: Provide MSS-SP-69 Type 8 or MSS-SP-69 Type 42 riser clamps for vertical piping, and MSS-SP-69 Type 52, spring hangers at the base of vertical piping.

2.3 SLEEVES

A. Construct sleeves for pipes passing through walls (other than foundation walls), floors, partitions, hung or furred ceilings, etc., of minimum 18-gauge galvanized steel, flanged on each side of wall, partition, hung or furred ceiling, etc.

B. Provide standard weight galvanized steel pipe sleeves with welded anchor flanges at foundation walls and reinforced concrete or masonry walls.

C. Provide cast iron or fabricated “wall pipe” equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Provide manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing and underdeck clamping ring with setscrews.

E. Provide mechanical sleeve seals at exterior wall and tank wall penetrations. Seal shall be of the modular sealing element unit type, designed for field assembly, to fill annular space between pipe and sleeve.
1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates Carbon steel with corrosion-resistant coating. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

F. Install escutcheons at exposed piping through floors, ceilings, walls and partitions in finished areas, within cabinets and millwork, and piping through all fire-rated separations. Provide manufactured wall and ceiling escutcheons and floor plates, with an inside diameter to closely fit around pipe, tube, and insulation of insulated piping and an outside diameter that completely covers opening. Escutcheons shall be cast iron or cast brass, deep-pattern escutcheons if required to conceal protruding fittings, sleeve hubs or firestopping projections.

2.4 PENETRATION FIRESTOP

A. Fire-Rated Construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, and sound or vibration absorption, and at other construction gaps.

B. Smoke Barrier Construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

C. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free. Mortar systems must be Warnock Hersey approved.

D. Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.

E. All firestopping products must be from a single manufacturer.

F. Through-penetration smoke-stopping at smoke partitions: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded in a non-fire rated smoke barrier.

G. Seal all pipe penetrations through fire-rated construction with factory-built devices or with manufactured fill, void, or cavity materials “Classified” by Underwriters Laboratories Inc. for use as a Through-Penetration Firestop. All firestop devices and systems shall be approved for such use by the Authority Having Jurisdiction. The firesafing system used shall maintain the fire-resistance rating of the building component that is penetrated.

H. All materials shall be non-hardening and non-toxic. The firesafing system used shall accommodate expansion and contraction of the floating fire protection piping systems without damaging the firestop or reducing its effectiveness as a smoke barrier or water seal.

2.5 GROUT

A. Grout shall be slow-hardening after application, volume-adjusting, non-staining, non-corrosive, non-gaseous, and recommended for interior and exterior applications.

B. Provide ASTM C1107/C1107M, Grade B, non-shrink and non-metallic, dry hydraulic-cement grout.

C. Design Mix: 5,000 psi, 28-day compressive strength from a premixed and factory pre-package.

PART 3 - EXECUTION

3.1 HANGERS AND SUPPORTS

A. Deflection of pipes shall not exceed 1/240th (0.416 percent) of span. Support horizontal piping in accordance with the following schedule:

Pipe Size (inches)	Maximum Hanger Spacing (feet)								Hanger Rod Diameter (inches)		
	Steel	Cast Iron	Copper	Plastic					Steel / Cast Iron	Copper	Plastic
				CPVC	PVC	PP	PVDF	FG			
up to 1	7	–	5	3.5	3	2.75	2.5	10	⅜	⅜	⅜
1.25	9	–	7	3.5	3	2.75	3	10	⅜	⅜	⅜
1.5 & 2	9	5	8	3.5	3.5	2.75	3	10	⅜	⅜	⅜
2.5	12	5	9	3.5	3.5	3.5	3.5	10	0.5	0.5	0.5
3	12	5	10	3.5	3.5	3.5	3.5	10	0.5	0.5	0.5
3½	–	5	11	–	–	–	–	–	⅝	0.5	–
4	12	5	12	4	4	4	4	10	⅝	0.5	⅝
5	12	5	13	4	4	4	4	10	⅝	0.5	⅝
6	12	5	14	4	4	4	4	10	0.75	⅝	0.75
8 to 12	12	5	14	–	4	4	–	12	⅞	0.75	⅞

(C)PVC: (Chlorinated) Polyvinyl Chloride Plastic; PP: Polypropylene plastic; PVDF: Polyvinylidene Fluoride Plastic; FG: Fiberglass

B. Provide hangers at each change in direction and both sides of valves 4-inch and larger. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item. Provide hanger on both sides of “no-hub” mechanical joints.

C. Support hangers from concrete inserts or beam clamps. Furnish, locate and set inserts. Construct inserts of malleable iron or pressed steel with space for rods of all sizes. Install inserts for pipes 3 inches and larger in size with a reinforcing rod ⅝-inch in diameter run through a slot in the insert specifically provided for this purpose.

D. If piping is required in a space where no inserts have been provided, drill holes in the slab (subject to Structural Engineer’s prior approval) and provide rods and hanger attached to an approved fishplate or install double expansion shields connected by a 2-inch by 2-inch angle, from which the hanger rod is to be suspended. For pipe size 2 inches and under use single shields but the hanger spacing shall be reduced to 5 feet. The carrying capacity and size of each shield shall be calculated on the basis of the spacing indicated above but the minimum size shall be ⅜-inch. Install additional shields of the same size so that the number of hangers is of adequate size to support the loads, which they carry. Shields may be used in concrete slabs only. Obtain from the expansion shield manufacturer an ICBO Evaluation Report for the product and submit to the Architect.

E. Regardless of the type of construction (i.e., concrete, concrete-deck-steel or other variations) take particular care to support main lines and large and heavy pipes in an approved manner, including the provision of supplementary steel, if required. Supplementary steel shall be mill-rolled sections. Submit shop drawings, indicating support methods, point loadings to the building structure and hanger locations for review sufficiently in advance of concrete pouring schedules to permit evaluation, critique and any necessary changes to handling and support methods.

F. Hangers shall be directly bolted to steel beams of building construction, where they occur if approved by the Structural Engineer. Smaller pipes shall be suspended from crosspieces of

pipe or steel angles, which in turn, are securely fastened to building beams or hung from building concrete construction by means of rods and inserts. The intention is to provide supports which shall be amply strong and rigid for the load, but which will not weaken or unduly stress the building construction.

G. Attachments to existing steel deck shall be limited to loads of 500 pounds. Heavier loads shall be supported by supplementary structural steel connected to structural beams. Provide all required supplementary steel.
   1. Attachments with loads up to 500 pounds shall be accomplished by drilled-in expansion shield type anchors located on the centerline of the concrete-filled ribs.
   2. No attachments shall be permitted to new or existing electrified decks. If hanger attachments are not existing, all new attachments shall be supported from supplementary steel.
   3. 500-pound load attachments shall be spaced not less than 60 inches apart, and shall be located as close to steel beams as possible.

H. Provide approved roller support, floor stands, wall brackets, etc., for lines running near the floor or near walls, which can be properly supported or suspended by the floors or walls. Pipelines near walls may also be hung by hangers carried from approved wall brackets at a higher level than the pipe.

I. Do not hang piping from supports for other services. Installed supports shall accommodate free expansion of the piping system.

J. Wherever hangers using pipe rolls are used, provide approved steel pipe covering protection saddles, spot-welded to the piping at each hanger location.

K. Anchor piping where shown to localize expansion or to prevent undue strain on piping and branches. Anchors shall be entirely separate from hangers and of heavy forged or welded construction of approved design. All anchor designs, when submitted for approval, shall include piping reactions which respective anchors are capable of supporting. Provide indicated expansion loop.

L. Install anchors where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

M. Support copper tubing individually by approved hangers not more than 6 feet apart. Hangers for uncovered lines shall be specially designed for copper tubing and of exact outside diameter of tubing. Hangers for covered tubing shall be broad straps fitting outside of covering.

N. For piping 4 inches and larger, support the elbows of the piping adjacent to pumps with steel supports from the concrete housekeeping pad, or from the inertia base where pump is mounted to prevent loading heavy weights of piping on pump flanges or casing. Where inertia base or spring vibration isolation is not provided, base elbows shall be supported on concrete pad with 1-inch neoprene pad.

O. Use hangers, which are vertically adjustable 1.5-inch minimum after piping is erected. Install hangers so that ½-inch minimum clearance is maintained between finished covering of pipe and adjacent work.

P. Support riser piping independently of connected horizontal piping.

Q. Adjust hangers to obtain pipe slope where specified.

R. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior review.

S. Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

T. Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123/A123M, 1.5-ounces/square foot of surface, each side. Mechanical galvanize threaded products, ASTM B695 Class 150, 2.0 mil coating. Field cuts and damaged finishes shall be field-covered with zinc-rich paint of comparable thickness to factory coating. Corrosive atmospheres include the following locations:
1. Exterior locations, parking ramps, carwash areas
2. Wet wells, meter pits
3. Sanitary and storm sewer pumping stations
4. Locker/shower rooms

3.2 SLEEVES

A. Provide sleeves for pipe passing through floors, walls or partitions, hung or furred ceilings, of sufficient diameter to accommodate pipe covering where such is required. Locate sleeves secure in place so that an equal space is around the pipe, after the pipe is installed.

B. For sleeves at penetrations of metal deck, nail, screw or weld to the deck prior to the pouring of the deck concrete. Set sleeves in such a manner so that no concrete fills their interior during the concrete pouring and finishing operations.

C. For exposed pipes, caulk floor sleeves with firestop material watertight and project sleeve approximately 2 inches above the finished floor. Finish sleeves with specified flanges flush with the bottom of slab and also with the finished faces of wall.

D. Provide sleeves with an inside diameter at least ½-inch greater than outside of pipe served, including pipe insulation which must be continuous through sleeve.

E. Where piping penetrates walls (other than foundation walls), partitions, floor slabs, etc., pack space between piping and sleeve with mineral wool (for depth of sleeve), or firestop material.

F. Do not support pipes by resting clamps on sleeves. Clamps shall extend beyond sleeve and be supported outboard of sleeve in an approved manner. In no case shall sleeves be cut or slotted to accommodate pipe clamps.

G. Provide escutcheon plates of the proper size for piping in sleeves passing through floors, walls, soffits, furrings, partitions, hung ceilings, etc., throughout the building where exposed. Exposed escutcheons shall be cast brass chromium plated, bell type, with setscrews of sufficient diameter to include any required pipe insulation. Attach escutcheon to building material, not to pipe. Do not penetrate vapor barriers.
1. Split-casting, deep-pattern type cast-brass type with concealed hinge and set screw with polished chrome-plated and rough brass finish.

2. Split-casting, floor-plate type cast brass with concealed hinge and set screw.

H. Exterior-wall pipe penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install aboveground steel pipe for sleeves smaller than 6 inches.
2. Install aboveground cast-iron “wall pipes” for sleeves 6 inches and larger.
3. Install underground cast-iron “wall pipes” for all sleeves.
4. Mechanical Sleeve Seal Installation:
   a. Select type and number of sealing elements required for pipe material and size.
   b. Position pipe in center of sleeve.
   c. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve.
   d. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
   e. For wall thickness up to 12 inches provide one mechanical sleeve seal at the interior side of sleeve, for wall thickness greater than 12 inches provide two mechanical sleeve seals, one at the interior side of sleeve and one at the exterior side of sleeve.

3.3 FIRESTOPPING

A. Where space for future pipes and conduits is required, provide sleeves and fill with lightweight concrete or firestop.

B. Provide firestopping and grouting around pipes penetrating concrete slabs, concrete walls and masonry walls with cement grout in the sleeved opening extending full depth through wall or floor slab. Provide sheet metal cover over the insulation before applying grout. Around pipes through fire rated gypsum board construction, pack the annular space between the wall sleeve and the insulation sheet metal cover with noncombustible approved firestop material and finish with escutcheons on pipe where exposed. Attach escutcheons to wall.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

D. Environmental Requirements:
1. Provide adequate ventilation if using solvent.
2. Provide forced-air ventilation during installation if required by manufacturer.
3. Keep flammable materials away from sparks or flame.
4. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.
5. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

E. Clean surfaces that will be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

F. Install penetration seal materials in accordance with the UL Fire Resistance Directory or Mortars per Warnock Hersey approval and in accordance with manufacturer’s instruction.

G. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

H. Where large openings are created in walls or floors to permit installation of pipes or other items, close unused portions of opening with firestopping material tested for the application. See UL Fire Resistance Directory or Warnock Hersey approvals.

I. Install smoke stopping as specified for firestopping.

3.4 GROUTING

A. Mix, install and cure grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout. Provide forms as required for placement of grout. Avoid air entrapment during placement of grout.

C. Place grout, completely filling equipment bases.

D. Place grout on concrete bases and provide smooth bearing surface for equipment.

E. Place grout around anchors.

END OF SECTION 21 0529

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SECTION 21 0548

VIBRATION ISOLATION AND SEISMIC RESTRAINTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work of this Section shall include, but is not limited to, the following:

B. Seismic restraints Fire Protection equipment and piping

C. Supervision and inspection of installed seismic restraints, anchorage and associated hardware

1.2 RELATED DOCUMENTS

A. Section 21 0501 – Fire Protection General Provisions

B. Section 21 1319 – Fire Protection Systems

1.3 REFERENCE STANDARDS

Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section where cited below.

Refer Structural Drawings for Seismic Criteria.

A. ASCE – American Society of Civil Engineers
1. ASCE 7-10 – Minimum Design Loads for Buildings and Other Structures

B. NFPA – National Fire Protection Association
1. NFPA 13, – Standard for the Installation of Sprinkler Systems
2. NFPA 13HB, – Automatic Sprinkler Systems Handbook
3. NFPA 14, – Standards for the Installation of Standpipe and Hose Systems
4. NFPA 70, – National Electrical Code

1.4 QUALITY ASSURANCE

A. Comply with Reference Standards.

1.5 SUBMITTALS

A. Shop Drawings: Concrete reinforcing details and templates for all foundations, bases, supports, hanger bolts, etc.; support frame details, pipe support details; equipment weight, center of gravity and operating speed, location and installation details. Include in the submittal drawing the following information based on equipment submittals released for construction:
1. Seismic restraint calculations stamped by a California State licensed structural or civil engineer, confirming compliance with ASCE 7-05.
2. Note compliance with seismic code regulations and the project specification on the submittals.

3. Number and location of seismic restraints and anchors for each piece of equipment including but not limited to vertical pipe risers, bolt sizing and embedment depth.
4. Specific details of restraints including anchor bolts for mounting and maximum loading at each location.
5. Drawings showing methods of suspension, support guides for piping.
6. Provide installation instructions, drawings and field supervision to assure proper installation and performance.

1.6 MANUFACTURER RESPONSIBILITIES

A. Manufacturer of seismic restraints shall have the following responsibilities:
1. Determine seismic restraint sizes and required locations.
2. Provide piping and equipment seismic restraints as scheduled or specified.
3. Provide installation instructions, drawings and field supervision to assure proper installation and performance.
4. Seismic restraints shall be designed for the lateral and vertical forces required by the Building Code for the specific project type and site. Confirm lateral and vertical forces and site-specific design criteria with the project Structural Engineer.

1.7 DEFINITIONS

A. Life Safety Systems:
1. All components involved with fire protection including sprinkler and standpipe piping, fire pumps, jockey pumps, fire pumps control panels, service water supply piping, water tanks, fire smoke dampers, emergency pressurization systems, smoke exhaust systems, etc. Life safety system restraints shall be designed with an Importance Factor of 1.5.

B. Positive Attachment:
1. A positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double-sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided “C” type beam clamps for support rods of overhead fire protection piping or any other equipment are not acceptable as seismic anchor points.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Piping Seismic Bracing: Kin-Line, Super Strut, Mason Industries

B. Equipment Seismic Bracing: Mason Industries (MII), Vibration Mountings & Control (VMC), Amber-Booth (AB), Vibration Eliminator (VEC), Vibrex Vibration Control Systems (VVC)

2.2 SEISMIC RESTRAINTS

A. General:
1. Provide restraints capable of safely accepting forces defined by the project Structural Engineer, without failure, to maintain equipment and piping in a captive position. Restraints must not transmit objectionable vibration or noise. Submit calculations by a structural or civil engineer licensed and registered in California to verify seismic restraint and cable capacities.
a. Seismic Restraint, Type I: All directional seismic snubbers shall consist of interlocking steel members restrained by molded neoprene bushing compounded to bridge bearing specifications. Bushing shall be replaceable and

a minimum of ¼-inch thick. Rated loadings shall not exceed 1,000 psi. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than ⅛ inch or more than ¼ inch. Snubbers shall be installed with factory set clearances. The capacity of the seismic snubber at ⅜-inch deflection shall be equal or greater than the load assigned to the mounting grouping controlled by the snubber multiplied by the applicable "G" force. Submittals shall include the load deflection curves up to ½-inch deflection in the X-, Y- and Z-planes. Snubbers shall have an anchorage pre-approval "OPA" number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings.

Type Z-1225-1..... MII

b. Seismic Restraint, Type III: Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through bolts to provide proper attachment. Seismic solid brace assembly shall have anchorage pre-approval number from OSHPD in the State of California verifying the maximum certified load ratings.

Type SSBS..... MII

PART 3 - EXECUTION

3.1 GENERAL

A. Install in accordance with manufacturer's recommendations and written instructions.

3.2 SEISMIC RESTRAINTS

A. General:
1. Where solid brace restraints are located, the equipment or piping support rods shall be angle braced for compression loads.
2. At all locations where solid brace restraints are attached to pipe clevises, the clevis cross bolt shall be reinforced with cross braces.
3. Provide drill-in concrete anchors for ceiling and wall installation and female wedge type for floor-mounted equipment.

B. Seismic Restraint of Piping:
1. Fire protection piping shall be braced in accordance with 2016 California Building Code, ASCE 7, NFPA 13, and NFPA 14 standard.

C. Seismic Restraint of Equipment:
1. All fire protection equipment is considered life safety equipment and shall be seismically restrained using the seismic force levels for life safety equipment.

END OF SECTION 21 0548

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SECTION 21 0550

ACCESS DOORS IN GENERAL CONSTRUCTION FOR FIRE PROTECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work of this Section shall include, but is not limited to, the following:
1. Furnishing access doors for installation in general construction and color-coded identification dots.

1.2 RELATED DOCUMENTS

A. Section 21 0501 – Fire Protection General Provisions

B. Section 21 0553 – Systems Identification for Fire Protection

1.3 REFERENCE STANDARDS

A. ASME – American Society of Mechanical Engineers
1. ASME A13.1: Scheme for the Identification of Piping Systems

B. ASTM – American Society for Testing and Materials
1. ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
2. ASTM A1008: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy

C. NAAMM – National Association of Architectural Metal Manufacturers
1. AMP 500-06 – Metal Finishes Manual for Architectural and Metal Products

D. UL – Underwriters Laboratories Inc.
1. UL Fire Resistance : Fire Resistance Directory set

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain doors for the entire project from a single manufacturer.

B. Fire-Resistive Rating: Wherever access doors are required in construction where a fire-resistive classification is indicated, on the Architectural documents, provide access door assembly with panel door, frame, hinge and latch from manufacturer listed in Underwriters Laboratories Inc.'s "Building Materials Directory" for required rating.

C. Provide UL Label on each fire-rated access door.

D. Furnish inserts and anchoring devices that must be built into other work for installation of access doors.

1.5 SUBMITTALS

A. Shop Drawings: Submit access door locations superimposed on the fire protection piping layout shop drawings. Submit manufacturer's data on access doors including size and type.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Access Doors: Milcor Inc., Karp Associates, Inc., J.L. Industries, Acudor, Williams Brothers

B. Color-Coded Identification Buttons: Brady/Seton, Stranco

2.2 ACCESS DOOR CONSTRUCTION

A. Provide recessed type as required to accept matching ceiling tile or drywall, etc.

B. Provide UL-rated doors for fire-rated construction.

C. Provide flush type steel framed panel with concealed continuous piano hinges for masonry or concrete construction. Provide textured frame for drywall construction.

D. Provide cam type locking device. Provide cylinder lock type access doors located in public corridors and washrooms complete with master keys.

E. Provide insulated doors in insulated or acoustically rated construction.

F. Furnish access doors of proper size for access to concealed equipment. Unless otherwise indicated, minimum size to be 12-inch by 12-inch for hand access and minimum 18-inch by 18-inch for valve and actuator access and 24-inch by 24-inch for equipment access. The following schedule is based on Karp Associates Inc.:
   1. Rated Construction: Fire-rated access door UL “B” Label Model KRP
   2. Non-Rated Dry Wall Construction: Model KDW
   3. Non-Rated Masonry, Concrete: Model DSC 214-M
   4. Non-Rated Ceramic Tile, Stainless Steel, Satin Finish: Model DSC 214-M
   5. Non-Rated Plaster Wall: Model DSC 214-PL
   6. Non-Rated Plaster Ceilings: Model DSC 210-PL

G. Provide color-coded dots on access doors and accessible ceiling tiles to indicate type of service.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate location of access doors in hung ceilings, furred spaces, walls, etc., to provide access to concealed work items requiring maintenance and/or adjustment. Obtain approval of the Architect for the locations of such access doors.

B. Locate and group equipment requiring access doors. Coordinate location of equipment with other trades to minimize number of access doors in one area.

C. Provide access doors for maintenance or adjustment purposes for fire protection system components, including but not limited to the following:
   1. Valves
   2. Flow switches
   3. Concealed equipment

D. Access doors shall be marked by small color markings at corner of tile or door in accordance with the following color assignments:

E. Fire Protection: Red

END OF SECTION 21 0550

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SECTION 21 0553

SYSTEMS IDENTIFICATION FOR FIRE PROTECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work of this Section shall include, but is not limited to, the following:
1. Valves, automatic control valves, dampers (including smoke and combination fire/smoke dampers) and automatic control dampers identification
2. Equipment identification
3. Piping identification
4. Signage

1.2 RELATED DOCUMENTS

A. Section 21 0501 – Fire Protection General Provisions

B. Section 21 0550 – Access Doors in General for Fire Protection

1.3 REFERENCE STANDARDS

A. NFPA Standard 13

B. ASME – American Society of Mechanical Engineers
1. ASME A13.1: Scheme for the Identification of Piping Systems

C. ASTM – American Society for Testing and Materials
1. ASTM D709: Standard Specification for Laminated Thermosetting Materials

D. APWA – American Public Works Association
1. Recommended Guidelines for Underground Utilities

1.4 QUALITY ASSURANCE

A. Above ground piping identification shall comply with NFPA requirements.

B. Underground piping identification shall comply with APWA Recommended Guidelines for Underground Utilities.

1.5 SUBMITTALS

A. Submit the following:
1. Valve identification chart
2. Automatic control valve identification chart (obtain from the Building Management System contractor for inclusion with this submittal)
3. Damper identification chart (including smoke and combination fire/smoke dampers)
4. Automatic control damper identification chart (obtain chart from the Building Management System contractor for inclusion with this submittal)
5. Lists of pipe and equipment to be labeled
6. Color chart

B. Product Data: Manufacturer's latest published data for materials, equipment and installation, including samples of valve tags, equipment identification and piping identification.

C. Maintenance Manuals: Provide valve tag schedules for inclusion in maintenance manuals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Seton

B. Stranco

C. Kolbi

2.2 VALVE IDENTIFICATION

A. All tagged components shall be in accordance with NFPA.

B. For valves, use metal tags 2-inch minimum diameter, fabricated of 19-gauge polished brass, stainless steel or aluminum.
1. Attach tags with jack chain "S"-hook or split ring of same materials.
2. Provide engraved/stamped tags with black ink-filled ¼-inch high letters and ½-inch high numbers.
3. Provide minimum $^{5}/_{32}$-inch hole for fastener.

2.3 PIPE IDENTIFICATION

A. Pipe markers shall have 1.25-inch high letters and integral directional flow arrows. Smaller letters may be used only when space does not permit 1.25-inch high lettering.

B. For piping up to 5-inch diameter, use pre-formed snap-on markers. For piping 6-inch diameter and up, use pre-formed strap-on markers with nylon straps.

C. Material: Semi-rigid colored vinyl; 15 gauge up to 1-inch pipe, 30 gauge for all other pipe sizes.

D. Seton "Setmark" or equal.

E. Pressure-sensitive tapes are unacceptable.

F. Exterior Underground Pipe Markers:
1. Material shall be detectable tape, nominal 5-mil thick, minimum 3 inches wide with aluminum backing.
2. Tape color, size and depth to be in accordance with APWA standards with black lettering and appropriate warning message.

2.4 EQUIPMENT IDENTIFICATION

A. Fire Protection equipment shall be identified by means of nameplates permanently screw-fastened to the equipment. Nameplates shall be black surface, white core laminated bakelite with engraved letters. Plates shall be a minimum of 3-inch long by 1-inch wide with white letters ⅜-inch high.

2.5 SIGNAGE

A. Provide engraving stock melamine plastic laminate, complying with ASTM D709, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for fastening except where adhesive mounting is necessary because of substrate.
   1. Thickness: $^{1}/_{16}$-inch for signs up to 20 square inches or 8-inch length; ⅛-inch for larger signs.
   2. Fasteners: Self-tapping stainless steel screws, except contact type permanent adhesive where screws cannot or should not penetrate substrate.

PART 3 - EXECUTION

3.1 VALVE IDENTIFICATION

A. Provide schedules of all valves showing identification number, size, type and service of each valve. Provide separate list for each separate type of system. Incorporate in maintenance manuals.

3.2 EQUIPMENT IDENTIFICATION

A. Identify equipment with identical letter and/or number as used on the Drawings. Where space is available, use full name of equipment. Attach nameplates in a permanent manner in a location that will be clearly visible after installation is complete.

3.3 PIPING IDENTIFICATION

A. Piping identification shall be in conformance with NFPA.

B. Identify piping systems with color-coded bands, sharply contrasting with background. Locate bands near strategic points, such as valves, items of equipment, changes in direction, wall penetrations, capped stub-out for future connection and every 40 feet of straight runs. If necessary, paint a strip background of black or white to obtain contrast.

C. Apply bands where they can be easily read. Provide bands with backgrounds of different colors.

3.4 ACCESS IDENTIFICATION

A. Identify service, piping and equipment behind all architectural access doors.

B. Removable ceiling tile shall be marked by small color markings at corner of tile or door in accordance with the following color assignment:
   1. Fire Protection Red

3.5 INSTALLATION OF IDENTIFICATION

A. Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.6 UNDERGROUND PIPING IDENTIFICATION

A. During backfilling/topsoil of each exterior underground piping system, install continuous detectable underground type plastic line marker, located directly over, buried in accordance with APWA standards.

END OF SECTION 21 0553

SECTION 21 1001

UNDERGROUND FIRE SERVICE

PART 1 - GENERAL

1.1 GENERAL

A. The General Conditions, any Supplementary Conditions, Section 21 00 00, Fire Protection General, and Division 1 are hereby a part of this Section as fully as if repeated herein.

B. Section Includes: Description of requirements for materials and installation of site utilities and related work as shown on Drawings and necessary to provide a complete and proper installation.

C. The work includes under this section consists essentially of, but not necessarily limited to installing new site utilities in areas indicated on Drawings.

D. Related work:

Section 21 00 01	*Fire Protection General*
Section 21 05 02	*Overhead Fire Protection Systems*

1.2 SCOPE

A. Furnish all labor, materials, equipment and services required for and/or reasonably incidental to the completion of the following work:

1. Connection to private fire main shown on civil drawings five feet outside the new buildings with minimum 8” diameter sprinkler main.
2. Connection to private fire main shown on civil drawings 5 feet outside of underground fire water storage tank.
3. Underground fire sprinkler mains from five feet outside of new buildings, minimum 6” diameter, complete with in-building riser ending at a flange 12” above finish floor, with a blank flange bolted on top. Risers shall be located as shown on the fire protection drawings.
4. Underground fire water storage tank supply, minimum 4” as shown on the drawings.
5. Underground fire water storage tank vent, minimum 4” as shown on the drawings.
6. Pump well link seal and pump well epoxy lining.
7. Trenching and backfill for underground sprinkler main to five feet outside building.
8. Backflow assembly, underground check valves, gate valves, post indicators, fire hydrants, and fire department connections beyond five feet outside of building shall be in accordance with Division 33.

1.3 SUBMITTALS

A. Submit for review, within fifteen (15) days after signing Contract, the required number of copies of a complete list of materials proposed for use, including sizes, capacities, etc. See Division 1 for requirements. This list includes:

1. Piping.
2. Fittings.
3. Valves.
4. Tracer wire.

5. Warning tape.
6. In-Building Riser.
7. Polyethylene Encasement for Protection Against Corrosive Soil.
8. Mechanical Joint Restraint.
9. Underground Fire Water Storage Tank.
10. Tank Deadmen.
11. Angle Float Valve.
12. Link Seal.
13. Wet Well Epoxy Lining.

1.4 COORDINATION

A. Before submitting a bid for the mechanical work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan his/her work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.

1.5 BUILDING LAWS

A. Mechanical work shall conform to all requirements prescribed by governmental bodies having jurisdiction and is to be in accordance with the Uniform Plumbing Code, California Mechanical Code, California Fire Code, National Fire Protection Association; California State Code Title 8, Title 21, and Title 24; and the Energy Conservation Standards.

B. Should any part of the design fail to comply with such requirements, the discrepancy shall be called to the attention of the Architect prior to submitting a bid.

C. Should there be any direct conflict between the Drawings and/or Specifications and the above rules and regulations, the rules and regulations shall take precedence. However, when the indicated material, workmanship, arrangement or construction is of a superior quality or capacity to that required by above rules and regulations, the Drawings and/or Specifications shall take precedence. Rulings and interpretations of enforcing agencies shall be considered a part of the regulations.

D. After a Contract is awarded, if minor changes or additions are required by the aforementioned authorities, even though such work is not shown on Drawings or overtly covered in the Specifications, they must be included at the Contractor's expense.

E. The Contractor is responsible to coordinate and make adjustments in his/her work with the full set of Contract Drawings and Specifications.

1.6 PERMITS, FEES AND UTILITIES

A. The Contractor shall obtain and pay for all permits and fees. The Contractor shall arrange for all required inspections.

1.7 UTILITY CONNECTIONS

A. The Contractor shall route site utilities to approximately 5'-0" outside of building, or as shown on Drawings.

1.8 MATERIALS AND WORKMANSHIP

A. All equipment provided shall deliver full rated capacity at efficiency for which designed. All equipment shall meet requirements indicated and be suitable for installation shown. Notify Architect of any shortcomings found at least ten (10) days prior to bid date. Equipment not meeting all specified requirements will not be accepted even though specified by name along with other manufacturers.

B. Where two or more units of the same class of equipment are furnished in the same Section of the Specification, provide each from the same manufacturer. Furnish all equipment and materials new and free from defects.

C. Capacities, dimensions or sizes specified or indicated are minimum. Tolerances used in rating or testing standards specified not allowed in determining capacities of equipment.

D. Materials and equipment shall be installed in accordance with the manufacturer's application recommendations, requirements, and instructions, and in accordance with Contract Documents. Where manufacturer's instructions differ from those indicated or specified, they shall be brought to Architect’s attention for resolution prior to equipment ordering and installation. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

E. All non-metallic piping below grade shall have tracer wire and warning tape installed as part of this scope of work.

1.9 SITE CONDITIONS

A. Information on Drawings relative to existing conditions is approximate. During progress of construction, deviations found necessary to conform to actual conditions shall be reported to Architect for determination of procedure to be followed. Contractor is responsible for any damage caused to existing systems. Promptly notify Architect if utilities are found which are not indicated.

B. Existing equipment, piping, wiring, construction of City sidewalk, street, etc. which interferes with work of this Section shall be removed and promptly returned to service. Replace damaged items with new material to match existing. The City of Brentwood and private utilities must be informed of property owned by them that has been damaged and replaced.

C. Remove materials not required for present or future use of facility and not claimed by Owner shall become the property of the Contractor and shall be removed from the premises. Consult Owner before removing any material from the premises. Materials claimed by the Owner shall be removed carefully to prevent damage and delivered on-site where directed.

D. Existing piping and wiring not reused and concealed in building construction may be abandoned in place, but all such piping and wiring which is exposed or indicated to be removed shall become the property of the Contractor and shall be removed from the premises.

E. Verify all dimensions, lines, and levels at the site for all work specified herein. All inverts, slopes, and elevations shall be established by instrument working from established datum. Provide elevation markers and lines for Owner's use in determining that slopes and elevations are in accordance with contract requirements. Accurately locate trenches in relation to building and boundary lines as indicated.

2.1 PIPING AND MATERIALS

A. Fire and sprinkler mains to 5’-0” from the building shall be Manville “Blue Brute” PVC, FM Class 200, DR14, “Certainteed” C900, or approved equal, with ringtite joint for 4” or larger. Lubricate per manufacturer’s recommendations (see Thrust Block detail). For 3” and smaller, Schedule 40 PVC pipe with solvent joints (rated at 200 PSI fittings).

B. Tracer wire for all non-metallic piping shall be minimum size #10 AWG copper wire with U.L. approval for direct-burial with an insulating jacket of Yellow Color. Piping shall have a contiguous trace wire strapped to the pipe every 5 lineal feet and shall be accessible at every riser and in-grade valve box. Contractor shall provide both warning tape and trace wire for all underground piping.

C. All fire and sprinkler service materials shall be new and currently listed in the Underwriters’ laboratories, Inc. Fire Protection Equipment List and shall be acceptable to DSA. Material that is pending approval shall not be acceptable.

D. All underground piping shall be installed in strict accordance with the manufacturer’s installation quide.

E. Sprinkler mains and underground fire service piping shall be cement lined class 50 ductile iron when installed to within 5’-0” of building and under all footings and slabs.

F. All metallic piping fittings shall be coated and wrapped. Metallic piping and fittings shall be polyethylene encased for corrosive soil conditions.

G. All bolt-up sets (nuts, bolts, and washers) and tie rods for valves, fittings, and buries shall be stainless steel, ASTM A-276 Type 316.

H. Backfill shall be accomplished in strict accordance with the manufacturer’s installation guide and the “Backfill” Section of these Specifications.

I. Tamper-proof witches shall be 120 V tamper switches for each isolation and control valve in each area. Electrical wiring and annunciating. Tamper switches shall be CSFM approved.

2.2 FLOAT VALVE

A. Angle float valve, size as shown on plans, 300 psi pressure rating, brass float rod, 316 stainless steel base plate, and 304 stainless steel float with stilling well, Cla-Val 624-01 or approved equal.

2.3 IN BUILDING RISER

A. Ames series IBR, 304 stainless steel, UL/FM approved.

2.4 VALVE BOXES

A. Valve boxes shall be of cast iron, screw adjustable type with loose cast iron cover as manufactured by M&H, Mueller, Iowa or Pacific States Cast Iron. Covers shall be lettered "Water" or as detailed and specified on Drawings.

2.5 THRUST BLOCKS

A. Provide concrete thrust blocks at all changes in direction of fire and fire sprinkler main. Minimum face area against undisturbed soil shall be 6 ft2 on water mains, or as indicated; 1/2" diameter rods shall be bent around pipe and anchored into 2000 lb strength concrete. Thrust blocks shall be provided in addition to mechanical joint restraint per local fire marshal.

2.6 MECHANICAL JOINT RESTRAINT

A. Provide mechanical joint restraint at all changes in direction of the fire and fire sprinkler mains. Mechanical joint restraint for C900 PVC pipe shall be EBAA Iron Megalug series 2000PV or approved equal. Mechanical joint restraint for ductile iron pipe shall be EBAA Iron Meglug series 1100 or approved equal.

2.7 VALVES

A. All valves shall be the product of a single manufacturer, Mueller, Stockham, Kennedy or Clow. Valves shall be mechanical joint and be AWWA approved.

2.8 POLYETHYLENE ENCASEMENT

A. All metallic pipe fittings and appurtenances below grade shall be wrapped for protection from corrosive soil with a minimum of 8 mil polyethylene encasement in accordance with ANSI/AWWA C105/A21.5. Polyethylene encasement shall be US Pipe Polyethylene Encasement or approved equal.

2.9 LINK SEAL

A. EPDM Modular seal, 316 stainless steel bolts and nuts, with cast in place HDPE wall sleeve, Link Seal S-16 and Century Seal wall liner for ductile iron pipe or approved equal.

2.10 WET WELL EPOXY LINER

A. NSF/ ANSI 61 corrosion resistant epoxy coating for use with concrete for continuous water exposure. Raven Aquata Poxy A-6 or approved equal.

2.11 FIRE WATER STORAGE TANK

A. Cylindrical, Underground Steel Fire Protection Water Storage Tank(s) for the storage of fire-suppression water near atmospheric pressure. The fire protection water storage tank:
   1. Must be fabricated with a HighDRO polyurethane liner or approved equal.
   2. Shall be installed underground with top access near or above grade level.

B. Nominal Fire Protection Water Storage Tank Capacity: 30,000 gallons.

C. Nominal Dimensions:
   1. Nominal Diameter 10 feet 6 inches.
   2. Nominal Length: 46 feet 6 inches.

D. Conformance:
   1. The fire protection water storage tank shall be designed and fabricated in accordance with UL-58 Standard for Steel Underground Tanks, Single-Walled construction.
   2. Pressure testing of new tank. The fire protection water tank, welds, seams and connecting fittings must be factory-tested for tightness using standard engineering practices. Tank must be guaranteed by the manufacturer to be tight.
   3. Fire protection water storage tank Corrosion Control System shall be in strict accordance with Underwriters Laboratories, Inc. Subject UL-1746 Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks and HIGHGUARD® External Corrosion Protection Specifications.
   4. The fire protection water storage tank shall have the structural strength to withstand static and dynamic hydraulic loading while empty and during operating conditions

5. The fire protection water storage tank's dimensions and thickness shall be in strict compliance with Roark's Formulas for Stress and Strain as presented in UL 58.
6. Calculations, signed and stamped by a Registered Professional Engineer shall be submitted to document structural strength under specified overbearing or external pressure.

E. Construction:

F. Water storage tank shall be of single-walled construction.
1. Water storage tank shall be fabricated of mild carbon steel with shell seams of continuous lap weld construction.
2. The water storage tank shall be fabricated, inspected and pressure tested for leakage before shipment from the factory by manufacturer as a completely assembled, single vessel ready for installation. The water storage tank shall be a pre-packaged, pre-engineered, ready to install unit. Sectionalized, bolted steel storage tanks are not permissible.

G. Loading Conditions - Water storage tank shall meet the following design criteria:
1. Internal Load – Water storage tank shall withstand a 5-psig air test (3-psig for >12') with a 5:1 safety factor.
2. Vacuum Test - To verify structural integrity, water storage tank shall be designed to withstand a vacuum test to 11.5" of mercury.
3. Surface Loads – Water storage tank to withstand surface H-20 axle loads when installed per manufacturer's installation instruction and PEI/RP100.
4. External Hydrostatic Pressure – Water storage tank shall be capable of being buried in ground with five feet of overburden over the top of the tank, the hole fully flooded and a safety factor of 5:1 against general buckling.
5. Ancillary Equipment – Water storage tank shall be capable of supporting internal pump platforms, drop/fill/suction tubes, submersible pump(s) and ladders when installed according to storage tank manufacturer's current installation instructions.

H. Product Storage:
1. Storage tank shall be capable of storing water products with a specific gravity up to 1.1

I. Flanged Fittings: Flanged fittings with flange protectors shall be supplied as follows:
1. 6 Inch Diameter ANSI/ AWWA C110 compatible flange with anti-vortex plate intended for draft hydrant connection as shown on the drawings.

J. Manholes and Extensions:
1. Manhole and extension, circular, minimum 24" in diameter. Manhole to be located as indicated on the Drawings. Extensions to terminate below grade at a distance determine by the type of frame and cover at grade. Manhole covers at grade shall be rated for H20 traffic loading.

K. Vent:
1. A vent assembly of at least 14 square inches open area in accordance with NFPA 22 shall be furnished and installed above the maximum water level of sufficient capacity so that as maximum design rate of water fill or withdrawal, the resulting interior design pressure / vacuum will not exceed = 2.0 / -0.5 ounces per square inch.
2. The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including a 4 mesh (1/4" opening size) galvanized screen.

L. Bottom Drain Pipe and Vortex Breaker

1. Bottom Drain Pipe allows for connection to a vertical pump vault in order to remove water from the tank at the specified rate of flow (fire flow).
2. The Bottom Drain Pipe (to pump well) shall be equipped with a vortex breaker installed inside the tank according to NFPA-22. The vortex breaker shall be designed to eliminate air entrainment that is potentially damaging to the vertical pump.

M. Fill Pipe:

1. The Fill connection shall consist of a 4 inch diameter Class 51 ductile iron pipe with ANSI/ AWWA C110 compatible flange through 24 inch minimum manway with angled float valve termination with 6 minimum air gap.

N. Corrosion Protection System:

1. Exterior Protective Coating:
   a. Surface Preparation: Steel Grit blast - SSPC-SP 6/NACE No.3 Commercial Blast Cleaning.
   b. Finish: External surfaces coated with 75 mils DFT HighGuard Self-Reinforcing Polyurethane.
   c. Polyurethane coating shall have a high cross-link density, which is, in essence, self-reinforcing or self-fibrating. Artificial fillers or reinforcement (chopped fiberglass or FRP roving) shall not be permitted.
   d. Coating shall be subjected to a 15,000 volt spark test after application to ensure coating integrity and effective corrosion protection.
2. Interior Protective Coating:
   a. Surface Preparation: Steel Grit blast - SSPC-SP 10/NACE No. 2, Near-White Blast Cleaning.
   b. Finish: Internal surfaces coated with 15 mils DFT HighDRO®-Liner Plus Polyurethane Lining
   c. The lining must comply with NSF/ANSI 61 - Approved for potable water.
   d. The liner shall be applied on all internal surfaces in accordance with AWWA D102, ICS #4.

O. Lifting lugs shall be provided at balancing points to facilitate water storage tank handling and installation.

P. Identification plates: Plates to be affixed in prominent location and be durable and legible throughout equipment life.

Q. G. Fire Protection Water Storage Tank(s) Options/Accessories:

1. UL listed Liquid Level Sensors and Controls:
2. Water storage tank(s) shall be supplied with an audible and visual alarm system that indicates high level in the tank.
3. Level sensor to be intrinsically-safe, tank-mounted magnetic float probes.
4. Level sensor floats to be made of stainless steel.
5. The control panel shall be NEMA 4X (FRP).
6. A silence control shall be provided for the audible alarms.
7. Power to the control panel is to be 120 volt, 1 phase.

R. Polyester Hold-down straps:

1. When water storage tank(s) anchoring is required, manufacturer provided corrosion resistant polyester hold-down straps with turnbuckles and a cable restraint system will be provided.
2. Steel hold-down straps with neoprene liners shall be provided where polyester straps are not applicable.

S. Prefabricated Concrete Deadmen Anchors:

1. Buoyancy calculations shall be submitted by the contractor and signed by an engineer of the tank manufacturer demonstrating the pre-engineered and pre-fabricated concrete deadmen anchors are an acceptable means of anchoring the water storage tank(s)..
2. The concrete deadmen must be supplied by the tank manufacturer and have been a standard product for at least five years.
3. All pre-fabricated concrete deadmen shall be sized and installed in accordance with the tank manufacturer's guidelines.

T. Cylindrical and/or rectangular steel Grade Level Manways designed to AASHTO H20 requirements:

1. Grade Access Manholes will consist of:
2. Structural steel frames with integral concrete anchors and 12" deep steel concrete retention skirts. Manhole access covers shall be flush style, skid free composite construction with recessed picking handles for easy removal. All manholes will be H-20 truckload rated. Manholes shall be furnished by tank manufacturer.
3. Level sensor riser pipes shall be recessed below one single grade access manhole or multiple manholes as shown on contract drawings.

U. All grade access manholes for a complete storage tank installation shall be supplied by the manufacturer for single source supply.

V. Fill Tube:

1. Provide Drop/Fill tube per drawings.
2. Pipe shall be carbon steel coated and terminate per engineer's drawing.

W. Internal Ladder:

1. Ladder shall be manufactured and installed in accordance with OSHA 1910.27 of carbon steel, coated per AWWA D102 ICS #4] utilizing 15 mils DFT HighDRO®-Liner Plus Polyurethane lining; NSF/ANSI 61 approved for potable water.

3.1 GENERAL REQUIREMENTS

A. Prior to bid, visit the job site and familiarize with local conditions, including verification of the location of the existing utilities.

B. All fire and sprinkler piping shall be installed in a manner acceptable to the local CFSM and DSA and the Rating Agency.

C. All fire and sprinkler piping shall be pressure tested and flushed according to the procedures set forth in NFPA 13, NFPA 14, and NFPA 24, and witnessed by the General Contractor and the DSA Inspector of Record.

D. This Contractor shall be responsible for any damage to other work caused by this installation or by leaks in the fire protection lines.

E. This contractor shall be responsible for coordinating his/her work with the General, Electrical, Mechanical, and Plumbing Contractors, and with other trades.

3.2 EXCAVATION AND BACKFILL

A. Perform all necessary excavation and backfill required for installation of mechanical work. Any work damaged during excavation and backfilling shall be repaired at Contractor's expense.

B. Trenches are to be excavated to necessary depth and width. Provide additional excavation to facilitate crossovers, additional offsets, etc. as required. Excavation material is unclassified. Width of trench adequate for proper installation of piping.

C. Bedding shall be on minimum 6" deep layer of sand placed on leveled trench bottom. Sand removed to necessary depth for piping bells and couplings to maintain contact of pipe on sand for entire length. All other piping laid on smooth level trench bottom to maintain contact for entire length.

D. All backfill shall be bank run sand and/or gravel to 6" above piping up to slab on interior piping below slabs. All backfill placed in layers not exceeding 8" deep and compacted to 95% of maximum density at optimum moisture content per AASHO Standard T-99.

E. During progress of work, Owner may have compaction tests made under direction of testing laboratory for all compacted fill. If found not to meet Specification, Contractor shall excavate and recompact fill at no additional cost to Owner.

F. Following backfilling, grade all trenches to level of surrounding subgrade. All excess soil shall be located per Owner's instructions.

3.3 SETTING OF THRUST BLOCKS

A. Thrust Blocks: Plugs, caps, tees, and bends deflecting 22 1/2° or more, either vertically or horizontally, on water lines 4" in diameter or larger and fire hydrants shall be provided with thrust blocking. Thrust blocking shall be concrete of a mix not leaner than 2 parts cement; 2 1/2 parts sand; 5 parts gravel; and having a compressive strength of not less than 2,000 PSI at 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair.

3.4 UNDERGROUNG FIRE WATER STORAGE TANK

A. Installation and testing shall be in strict accordance with the tank manufacturer’s Installation Instructions.

B. No modifications shall be made to the water storage tank(s) without the prior written approval of the manufacturer and the Engineer. This includes any welding on tank shell, adding penetrations, modifying the tank structure, or repairing damage that might affect the integrity of the water storage tank(s).

C. Contractor shall install water storage tank(s), piping, and equipment (valves, sensors, pumps, vents, gauges, etc.) in accordance with the manufacturers' installation instructions, industry standard recommended practices and federal, state and local regulations.

D. Water storage tank(s) shall be handled, lifted, stored, and secured in accordance with the manufacturer's instructions.

E. Securely store the tank at the job site. The location should be selected to minimize tank relocations as work progresses.

F. The hazards associated with the cleaning, entry, inspection, testing, maintenance or other aspects of storage tank(s) are significant. Safety considerations and controls should be established prior to undertaking physical activities associated with storage tank(s).

G. Never enter a storage tank or enclosed space, under any condition, without proper training and OSHA approved equipment. (Consult OSHA guidelines 29 CPR, Part 1910 “Permit Required Confined Spaces.”)

H. Entry and cleaning of water storage tank(s) must be per federal (OSHA), state, and local regulations as well as company requirements.

I. Before Placing Water Storage Tank(s) in Excavation:
   1. Remove dirt clods and similar foreign matter from storage tank(s).
   2. Visually inspect storage tank(s) for damage.
   3. Notify site supervisor of damage to storage tank(s).
   4. Repair or spark test damaged areas of storage tank coating in accordance with manufacturer’s instructions in Highland Tank Installation Instructions.
      a. Spark Testing: Set holiday detector at a minimum of 10,000 volts.
      b. Coat holidays, damaged storage tank(s) coating, and exposed steel surfaces in accordance with manufacturer’s instructions with compatible coating furnished by tank manufacturer.
      c. Retest holidays at 10,000 volts.

J. Install underground Fire Protection Water Storage Tank(s) in accordance with manufacturer’s instructions.

K. Install water storage tank(s) at locations and to elevations indicated on the Drawings.

L. Ensure water storage tank(s) excavation is free from materials that may cause damage to storage tank(s) or tank’s coating.

M. Do not allow foreign matter to be introduced into excavation or backfill during water storage tank(s) installation.

N. Bottom of Excavation: Cover with clean sand or gravel to depth indicated on the Drawings, suitably graded and leveled.

O. Fire Protection Water Storage Tank(s) Placed on Concrete Pad for Anchoring Purposes
   1. See division 33 for cast in place concrete pad specifications.

P. Fire Protection Water Storage Tank(s) Handling:
   1. Ensure equipment to handle water storage tank(s) is of adequate size to lift and lower storage tank(s) without dragging, dropping, or damaging storage tank or tank’s coating.
   2. Carefully lift and lower water storage tank(s) with cables or chains of adequate length attached to lifting lugs provided.
   3. Use spreader bar where necessary.

4. Do not use chains or slings around water storage tank's shell.
5. Maneuver storage tanks with guidelines attached to each end of the tank.

Q. Hold-Down Straps:
1. Install polyester hold-down in accordance with manufacturer's instructions in Highland Tank Installation Instructions.
2. If steel hold-down straps are used, ensure hold-down straps are separated from water storage tank by separating pads made of inert, insulation dielectric material.
3. Separating Pads:
a. Minimum 2 inches wider than width of hold-down straps.
b. Place separating pads at locations on water storage tank where hold-down straps could come into direct contact with storage tank shell.

R. Backfill:
1. Backfill Material: Clean sand, ASTM D 448 #8 crushed aggregate or fine gravel.
2. Place backfill material along bottom side of water storage tank(s) by shoveling and tamping to ensure storage tank(s) are fully and evenly supported around bottom quadrant.
3. Deposit backfill material carefully around and over water storage tank(s) to avoid damage to storage tank(s) and tank coating.
4. Deposit backfill material to depth over water storage tank(s) as indicated on the Drawings.

S. Plugs:
1. Remove plugs at unused water storage tank(s) openings, add pipe compound, and reinstall plugs in unused openings.
2. Do not cross-thread or damage storage tank(s) fittings when replacing plugs or installing tank's piping.

T. Inspection before Placing Backfill over Fire Protection Water Storage Tank(s):
1. Final Inspection: Visually inspect water storage tank(s), tank coating, and pipe connections.

3.5 REQUIREMENTS OF REGULATORY AGENCIES

A. In addition to requirements shown or specified, comply in general with applicable portions of latest current local and/or State ordinances and codes.

B. Include all items of labor and material required to comply with such standards and codes. Where quantities, sizes or other requirements indicated are in excess of standard or code requirements, specified requirements shall govern.

3.6 COORDINATION

A. Do all work to receive or joint with work of all trades; cut new service into existing mains; extend piping; and make necessary connections as required to prevent interruption of service. All work shall be coordinated with work of other trades to provide clearances for installation and maintenance of all mechanical equipment. Drawings and Specifications are arranged for convenience only and do not necessarily determine which trades perform various portions of the work.

B. Before shutdown of any utility service for new connections, coordinate with and notify Owner, County, and utility company(s). Contractor to verify with Architect for approval for areas of interference with existing facilities and operation of departments before doing any work. Contractor to work out schedule of construction and get approval by Architect before starting any work.

3.7 DRAWINGS

A. Drawings are diagrammatic and do not show all offsets, bends, elbows, etc. which may be required for proper installation of work. Such work shall be verified by Contractor at building site. Provide additional bends and offsets as required by riser and main locations, or other conditions, to complete work at no additional cost to Owner.

B. Drawings and Specifications are complementary and what is called for by one shall be as binding as if called for by both. Items indicated are not necessarily included in Specifications. Specifications shall supersede Drawings in case of conflict.

3.8 TESTING

A. Test all piping, valves, clean-outs, etc. as listed below and provide the Architect with certified copies of test results. The inspection authority having jurisdiction and the supervising Architect shall be notified at least 24 hours prior to performance of all tests so that they may be witnessed.

1. All new fire main piping shall be hydrostatically tested to 200 PSI for 2 hours in the presence of the Local Fire Marshall and DSA Inspector of Record.

END OF SECTION 21 1001 (EOS)

SECTION 21 1319

FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Under this Division, the Contractor shall furnish all labor, equipment, appliances, and materials to perform all operations in connection with the installation of a complete and tested fire protection system as described in the Contract Documents.

1.2 RELATED DOCUMENTS

A. Section 21 0501 – Fire Protection General Provisions

B. Section 21 0548 – Vibration Isolation and Seismic Restraints

C. Section 21 0550 – Access Doors in General Construction and for Fire Protection

1.3 SYSTEM DESCRIPTION

A. Applicable Standards:
1. All Fire Protection design, products, and installation shall comply with the applicable provisions and recommendations of the following jurisdictional codes, authorities and guidelines:
a. California Building Code
b. California Fire Code
c. National Fire Protection Association Standard 13 “Installation of Sprinkler Systems”
d. National Fire Protection Association Standard 14 “Installation of Standpipe and Hose Systems”
e. National Fire Protection Association Standard 24 “Installation of Private Fire Service Mains and Other Appurtenances”
f. National Fire Protection Association Standard 25 “Testing and Maintenance of Water Based Fire Protection Systems”
g. National Fire Protection Association Standard 70 “National Electrical Code”
h. National Fire Protection Association Standard 72 “National Fire Alarm Code”
i. City of Hayward Fire Department 2010 Administrative Bulletins
j. Local Codes, Code Amendments and Requirements
2. Provide fire protection products including valves, fittings and couplings, supports, anchors, fire stops, sprinklers, fire hose stations, hose valves, etc., that are Underwriters Laboratories listed.
a. Fire protection and smoke control design, products and installation shall comply with the applicable provisions and recommendations of the authorities.

B. Design Parameters:
1. Scope of Fire Protection:
a. The Fire Protection Drawings issued as part of the Contract Documents indicate the following in diagrammatic manner: location of water services, check valves, shutoff valves, fire standpipe risers, fire sprinkler areas, alarm zoning, and special conditions. As such, these Drawings are an interpretation of the project requirements and are to be used as a guide in the layout and design of the

complete fire protection system for the entire building floor area; however, it does not relieve the Contractor from providing all work and equipment necessary to provide a complete and operational system, according to the project requirements and applicable standards.

b. All equipment and devices shall be Underwriters Laboratories listed, Factory Mutual-approved or allowable per applicable FM Global property loss prevention data sheets and local Fire Department approved. Fire Protection Contractor shall sign and seal shop Drawings prior to issuance to Building and Fire Departments for approval. No work shall be installed without approved shop Drawings.

c. It shall be the responsibility of the Contractor to coordinate the location of all sprinkler heads with final reflected ceiling Drawings.

d. Fire sprinkler mains shall not interfere with the HVAC contractor's ability to place HVAC main ducts tight to bottom of fire proofed structural elements.

e. The Contractor shall provide all offsets, drains and drain plugs for trapped piping, and drainage piping. The Contractor shall notify the Architect, in writing, of all discrepancies in sprinkler head locations where local codes are violated; i.e., allowable distance from walls or exterior glass, small room spacing, stairs, etc.

f. Fire protection shop drawings shall indicate hydraulic reference points that correspond with compatible reference points in the hydraulic calculation sheets.

g. Fire protection contractor shall hydraulically calculate the remote area which represents the largest hydraulic demand in the portion by its design basis.

h. Fire Service Main:

i. System piping shall be hydraulically designed throughout all areas in accordance with the rules and regulations of the applicable standards using the design densities indicated herein:

1) Fire Sprinklers: The fire sprinkler hydraulic calculations shall include hose allowances as defined for the hazard for inside and outside hose streams as required to meet applicable standards.

2) Hydraulically designed sprinkler systems should be designed for a supply pressure of at least 10 percent, but not less than 10 PSI, between available water pressure from flow test and system design demand pressure from the hydraulic calculation.

3) The velocity of water through the fire protection piping system shall not exceed maximum allowable velocities allowed by applicable standards.

4) Entire project shall be sprinklered.

5) All sprinkler system pipes shall be installed so that it can be drained.

6) Standpipes: Pipe sizes based upon providing 250 GPM at the most hydraulically remote fire hose valve connections on the standpipe and at the topmost outlet of each of the other standpipes at a minimum 100 PSI residual. The minimum flow rate for the most remote standpipes shall be 500 GPM and 250 GPM for each additional standpipe for building with floor areas that do not exceed 80,000 ft^2 per floor.

For buildings that exceed 80,000 ft^2 per floor, the minimum flow rate for additional standpipes shall be 500 GPM for the second standpipe and 250 GPM for the third standpipe if the additional flow is required for an unisprinklered building.

The maximum flow rate shall be 1,000 GPM for buildings that are sprinklered throughout in accordance with NFPA 13, 1nd 1,250 GPM for buildings that are not sprinklered throughout, in accordance with NFPA 13.

j. The hydraulic calculations shall be based on current flow data obtained from local water authority. Confirm flow data prior to design and layout of fire protection systems.
k. Water Supply:
1) Location: 1500 West Winton Ave
2) Fire Main Size: To be field verified
3) Date: 02/23/2015
4) Static Pressure:120 PSI
5) Residual Pressure: 114 PSI
6) Water Flow: 1592 gal/min
l. Primary water supply from the city water source. Water flow on the primary water supply is required to check compliance of the primary water supply with the 2013 Fire Code Requirements.

2. Wet Fire Sprinkler Density Requirements:
a. All sprinkler systems shall be hydraulically calculated in accordance with HFPA 13.
3. Standpipe Systems:
a. Class I systems manual dry standpipes with 2½ -inch hose valves.
b. Provide with drain risers adjacent to each standpipe equipped with 3 inch internal threaded swivel fittings having threads as designated by local fire authority.
c. Provide 2½ -inch pressure reducing type hose valve where pressure will exceed 100 pounds per square inch.
4. Zoning of the Fire Protection System:
a. Wet Sprinkler System: Water flow detection zoning shall be per floor basis with areas not exceeding maximum allowable per NFPA.
5. Elevator Machine Room and Elevator Machine Spaces Requirements:
a. Elevator Machine Rooms and Elevator Machine Spaces: Automatic sprinklers shall not be installed in elevator machine rooms and elevator machine spaces for occupant evacuation elevators in accordance with CBC Section 3008.3.1 “Prohibited Locations” and Section 3006.4.1. “Automatic Sprinkler System”.
b. Elevator Hoistways, Elevator Control Spaces: Automatic sprinklers are permitted to be omitted per CBC Section 903.3.1.1.1 “Exempt Locations”.
6. Elevator Pit Requirements:
a. Install automatic sprinkler heads in elevator pits such that the water spray pattern shall not spray higher than 2 feet above the pit floor, with a spray pattern directed level and down.
b. An accessible sprinkler shut-off valve shall be provided outside of and near the pit. The valve shall be normally open, with no provision to shut off elevator power.
c. Do not locate automatic sprinkler heads on a car entrance side or interfere with pit access.
d. Provide drain valve and plug at the lowest point of the automatic sprinkler piping in the pit and installed to avoid mechanical damage. Piping shall enter the shaft at the floor level of the bottom landing and be wall mounted, fit tight against the wall, and maintain proper clearance to the car and counterweights. In walk-in pits, sprinkler piping may enter the pit in an approved manner other than the floor level of the car’s lowest landing.

C. No pipes or other apparatus shall be installed so as to interfere in any way with the full swing of doors, building access doors, and access doors in ductwork. The arrangement, positions, and connections of pipes, drains, valves, etc., shown on the Drawings shall be taken as a close approximation and while they shall be followed as closely as possible, the right is reserved by the Project Representative to change the locations to accommodate any conditions which may arise during the progress of the work without additional compensation

to this Contractor for such changes, provided that the changes are requested prior to the installation of this Contractor's work.

D. Piping typically shall be installed concealed in or above building construction; i.e.; hung ceilings, and shall be so arranged that relocation of lighting fixtures, or plumbing and mechanical systems, will not cause any interference.

E. Coordinate with the fire sprinkler and alarm trades to ensure full awareness of the location of all control valves, flow switches, tamper switches, and alarm and signal switches.

1.4 SUBMITTALS

A. Prior to construction submit for approval the following materials and equipment. Submittal should be submitted in a binder and should include equipment cut sheets, dimensions, capacities, wiring diagram and electrical loads, special installation details, etc. Drawings submitted without these items will be returned un-reviewed:
1. Layout drawings, coordinating sprinkler head and piping installation with structure, lighting, sound speakers, mechanical ductwork, diffusers and other ceiling installed items. All submitted plans shall be readable and indicated scale.
2. Name, address, phone number, and fax number of Contractor.
3. Site plan to show the entire project site.
4. Full height cross section, or schematic diagram if required for clarity; including ceiling construction including height. Show beam size, material, and location on plan.
5. Sprinkler and escutcheon plates. Include Sprinkler Identification Number (SIN) nomenclature on fire sprinkler product data, manufacturer's model number, response type, temperature rating, sprinkler type, orifice size and any other information for all sprinklers used.
6. Number of sprinklers protecting floor.
7. Hydraulic calculation criteria.
8. The information on the hydraulic data nameplate for the most remote area.
9. Hydraulic reference points shown on the plan shall correspond with comparable reference points on the hydraulic calculation sheets. Outline/highlight remote area.
10. Provide on the plan the minimum application rate (density) and the design area of application.
11. Provide on the plan the total quantity of water the pressure required noted at the riser.
12. Relative elevations of sprinklers, distance of sprinkler deflector to ceiling, junction points, and supply or reference points.
13. Provide end-of-line restraint for end sprinkler on each branch line.
14. Fire sprinkler system calibration hydraulic flow labels must be installed at each floor showing required information at completion of all sprinkler system.

B. Shop Drawings:
1. Fire Protection Contractor shall sign and seal Shop Drawings prior to issuance to State Fire Marshal for approval. No work shall be installed without approved Shop Drawings.
2. Obtain approval on systems in accordance with construction schedule with fire sprinkler head layout as schedule dictates.
3. Submit fire sprinkler system Shop Drawings and hydraulic calculations with the submittal of product data together.
4. Submit detailed layout Shop Drawings of complete sprinkler systems. Shop Drawings shall indicate plan locations and elevations of piping and hangers, including bottom elevation of major piping and be coordinated with building conditions, ductwork and other mechanical and electrical services, location size and length of riser nipple or drop.

C. As-Built Drawings

1. Contractor shall provide a complete and accurate set of as-built drawings at completion of the project. These shall include, but not be limited to:
   a. Reflected ceiling plans at ⅛" = 1'0" scale showing sprinkler locations and sprinkler piping.
   b. Drawings shall be CAD-generated in AutoCAD Release, most current version (with no third party software), shall be submitted in one (1) hard copy and two (2) on disk, and shall otherwise comply with reasonable standards established by S.B.M. from time to time.
   c. Submit detailed layout Shop Drawings of standpipe. Shop Drawings shall indicate plan locations and elevations of piping and hangers, including bottom elevation of major piping and be coordinated with building conditions, ductwork, and other mechanical and electrical services.
   d. Project close out shall include copies of all warranties, guarantees, operating and maintenance manuals delivered to Landlord.

D. Written statement that coordination has been accomplished with work of other contractors and installers.

E. Maintenance and Operation Manual:
   1. Fire Protection System: Supply a standardized and listed maintenance and operation manual for the system. This manual must include all necessary instructions to operate and maintain the system, and be explicit regarding the inter-action between the hydraulic aspect and the detection portion. Emergency procedures must form an integral part of the manual.

1.5 QUALITY CONTROL

A. All welders shall be certified by ANSI B31.1.0-1967—"Standard Qualification Welding Procedures, Welders and Welding Operators." Furnish welder performance qualification test certificates for positions 2G and 5G made in strict compliance with the above codes. Welders shall be certified for the type of pipe materials specified herein. All costs incident to procedures and welder's qualification tests shall be assumed by this Contractor. Two (2) copies of the qualification test report and certification with welder's identification number, letter, etc., shall be delivered to the Project Representative for his file before any welding commences. Each weld shall bear the welder's identification mark permanently indented in the weld. Welding procedures shall also be in accordance with the requirements of the American Welding Society, current edition where applicable.

B. Only Subcontractors and workmen experienced and regularly engaged in the installation of automatic sprinkler type fire protection systems for the past five (5) years and licensed as required by the Authority having jurisdiction shall be permitted to install the system.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Following is a list of manufacturers whose products may be submitted for review. All items submitted as being equal to that specified, shall have same quality, finish, material construction, etc., as those specified under base Specification.

B. Acceptable Manufacturers:
   1. Valves: Jenkins, Kennedy, Walworth, Crane, CLA-Val, Nibco, Milwaukee, Victaulic, Wilkins, Clow
   2. Fire Hose Valves: Wilkins, Croker, Potter Roemer, Standard Fire West, Elkart

3. Sprinkler Heads: Viking, Grinnell, Tyco, Reliable
4. Waterflow Switches: Potter Electric Co., Potter Roemer, Notifier, System Sensor.
5. Valves Supervisory Switches: Potter Electric Signal Company or approved equal
6. Inspector Stations: Victaulic or approved equal
7. Identification Signs: Potter Reomer or approved equal
8. Pressure Gauges: Weiss, Marsh
9. Pipe Hangers: Grinnell or approved equal

2.2 PIPING AND FITTING MATERIALS

A. General Characteristics for Threaded Pipe and Fittings: Field Pipe Threading: Comply with ASME B1.20.1 “Pipe Threads, General Purpose (inch)”.

B. General Characteristics for Welded Pipe and Fittings: Welding: Shop Welded and in compliance with AWS B2.1 “Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing”.

C. Buried Fire Main: Cement-Lined Mechanical Joint Ductile Iron Pipe: ANSI/AWWA C151/A21.51, C150/A21.50, C111/A21.11, Class 52, 53, or 54.
   1. Interior of Pipe: Cement-lined and seal coated, ANSI/AWWA C104/21.4 and listed by approved certifying agency as conforming to requirements of ANSI/NSF 61.
   2. Outside of Pipe: Asphaltic Coated, ANSI/AWWA C153/A21.53.

D. Automatic Fire Sprinkler Systems and Standpipe Systems:
   1. Above Grade Piping Systems Pipe Sizes 2 inch and Smaller: Piping: ASTM A135, or A53 B, Schedule 40 carbon steel pipe.
   2. Above Grade Piping Systems Pipe Sizes 2½ inches and Larger: Piping: ASTM A135 or A53B, Schedule 10 carbon steel pipe.
   3. Fittings:
      a. Pipe Sizes 2 inch and Smaller:
         1) Class 125 cast iron threaded fittings for working pressures under 175 pounds per square inch, conforming to ANSI B16.4.
         2) Class 150 malleable iron threaded fittings for working pressures under 300 pounds per square inch, conforming to ANSI B16.3.
         3) Class 250 cast iron threaded fittings for working pressures up to 400 pounds per square inch, ANSI B16.4
         4) Class 300 malleable iron threaded fittings for working pressures greater than 175 pounds per square inch up to 800 pounds per square inch, conforming to ANSI B16.3.
      b. Pipe Sizes 2½ inch and Larger: ASTM B16.9, B16.25 welded fittings, cast iron flanges, and vee-butt welded joints.
      c. Pipe Sizes 1½ inch and Larger:
         1) Various Victaulic “Firelock” fittings/couplings may be acceptable, however mechanical T-style fittings 920, 921 and Hooker-style fittings, etc. will not be permitted. Contractor to submit list of fittings he intends to use and in which systems.
   4. Grooveless clamp or saddle fittings are not acceptable.

E. Standpipe Fittings:
   1. Threaded, cast iron ANSI B16.4, 250 pounds per square inch class.
   2. Threaded, cast iron flanges and flanged fittings, ANSI B16.1, 250 pounds per square inch class.

2.3 VALVES

A. All fire protection valves shall be Underwriters Laboratories label, Factory Mutual approved or allowable per applicable FM Global Property Loss Prevention Data Sheets and to be rated of minimum 175 PSI working pressure rating or where line pressure exceeds 175 PSI, extra heavy. Shut off valves shall be of the indicating type. Where pressure exceeds 175 pounds per square inch, extra heavy rated valves shall be provided.

B. All valves on underground fire protection water mains controlling water supplies to sprinklers shall be FM approved indicating valves. These valves shall be provided with tamper alarms.

C. Pressure reducing valves (PRVs) shall be in accordance with Data Sheet 3-11. PRVs should not be used in series connections.
1. If the PRVs cannot be avoided, then permanent drain tests and relief valves shall be provided downstream of each PRV.
2. On sprinkler systems, the smallest drain size is 1½". Drain shall be sized such that the highest demand flow of the associated sprinkler system can be tested. For sprinkler systems (if acceptance to FM Global), field flow tests through the 1½" drains can be conducted to record the available system flwo and pressure at each PRV. This data will be recorded and submitted to FM Global and the Owner for future reference during periodic sprinkler system tests.
3.
4. In some cases, a smaller PRV will need to be installed parallel to the larger PRV.
5.

D. Floor Control, Riser and Isolation valves:
1. 175 PSIg Working Pressure:
a. Gate Valves:
1) Gate valves up to and including 2 inch Kennedy Figure 66, 175 PSIg cold water, UL listed, FM approved, bronze body, bronze trim, single disc, outside screw and yoke, threaded bonnet valves with seats of bronze, threaded ends, United #18.
2) Gate valves 2½ inch through 12 inch Kennedy Figure 4068, 175 PSIg cold water, UL listed, FM approved, and approved iron body, outside screw and yoke bolted bonnet valves with double or single disc, Class 125 ANSI B16.1 flanged ends, bronze trim, bronze seats.
b. Butterfly Valves:
1) 2½ inch through 8 inch UL listed for specification 1091, FM approved under Approval Standard 1112, ductile iron body conforming to ASTM A536 coated with polyphenylene sulfide blend, ductile iron disc conforming to ASTM A536 with EPDM coating providing bubble tight shut-off, approved weatherproof manual actuator suitable for indoor or outdoor use with two single pole, double throw supervisory switches either pre-wired (WRD) or unwired (UWD) monitoring the open position as required to meet design requirements, grooved ends for installation with grooved mechanical couplings and rated for service up to 175 PSI (1,200 kPa) working pressure, equivalent to Victaulic Series 700 or W709, Gruvlok AN7722-3 FD, or Nibco GD4765-4N.
2) UL listed, FM approved, slow-open quarter turn valve with built in tamper switches, 175 PSI, threaded ends. Valve shall be provided with tamper switches rated for 0.5 Amps, 28 VDC; equivalent to "No. BB-SCS02" by Milwaukee Valve, No. KG-505W by Nibco.

E. Check Valves:
1. 175 PSIG Working Pressure:

a. Check Valve – 2½ inch and larger: Iron body, swing check, 175 PSI working pressure, bronze mounted, flanged pattern, UL listed, FM approved; equivalent to “Fig. F-908-W” by Nibco.
b. Check Valve – 4 inch and larger: Iron body, swing check, 175 PSI working pressure, bronze mounted, flanged pattern, UL listed, FM approved; equivalent to “Fig. F-908-W” by Nibco.

2. 250 PSIG Working Pressure:
   a. No. 7800 FP by Grinnel, No. CV-IF by Tyco (300 PSI).

F. Spring Loaded Check Valve – 4 inch to 8 inch Line Sizes: Dual disc, spring loaded, check valves, UL listed and FM approved for a single check and anti-water hammer service and for horizontal or vertical installation, supplied drilled, tapped and plugged at bosses where required, Grade “E” EPDM seal, housing cast of ductile iron conforming to ASTM A536 or malleable iron to ASTM A47 with grooved ends for installation with Victaulic grooved end couplings rated for service up to 250 PSI working pressure; equivalent to “Series 716 and 717 Vic-Check” by Victaulic, Series 717 Firelock by Victaulic.

G. Pilot Operated Pressure Regulating Valve:
1. Size to operate within 20 percent to 80 percent of its maximum flow rate capacity at sprinkler demand.
2. Horizontal Globe Valve, 300 lb. Class, flanged or threaded, 300 ANSI B16.24 (Bronze) UL, 300 ANSI B16.42 (Ductile Iron) ULC:
   a. Inlet Pressure 300 PSI maximum.
   b. Pressure Differential 10 PSI minimum.
   c. Pressure Adjustment Range: 30 – 165 PSI.
   d. Temperature Range: Water to 180 degrees F maximum.
3. Materials:
   a. Main valve body & cover: Epoxy Coated Cast Steel ASTM A216-WCB UL, ULC Bronze ASTM B62 UL, ULC.
   b. Main valve internal trim: Bronze ASTM B61 Pilot control system.
   c. Pilot control valve: Bronze ASTM B62 with Stainless Steel 303 internal trim.
   d. Pilot tubing: Copper tubing with brass fittings.
4. Product: Model “90G-21” (up to 165 PSI) by CLA VAL, with materials listed, (No Known Equal)
5. Product: Model 09G-71 (166 to 400 PSI), non-UL listed and FM non-approved.

H. Pressure Relief Valve:
1. UL Listed FM approved Pressure Relief Valve is a direct-acting, spring loaded, diaphragm type relief valve capable of being installed in any position and will open and close within very close pressure limits.
2. Inlet pressure rated for 400 PSI.
3. Pressure adjustment screw to vary the spring load on the diaphragm. Pressure range of 20 to 200 PSI. To prevent tampering, the adjustment cap, provide wire seal through lock wire holes provided in the cap and cover,
4. Product: Model “55L” by CLA VAL, with material listed, (No Known Equal) adjustment range 20-200 PSI.
5. Product: Model 55F, non-UL listed and FM non-approved. Adjustment range 100-300 PSI.

I. Fire Hose Valve:
1. Fire Hose Valve:
   a. Line pressure under 175 PSI:
      1) 2½ inch x 3 inch angle rough brass hose valve equivalent to No. V-20 or H 25 by Elkhart.
      2) 2½ inch angle hose valves x 3 inch MPT outlet rough brass with cap and chain, No. V-20 or H 14 by Elkhart.

b. Line pressure over 175 PSI: 2½ inch angle rough brass hose valve, with cap and chain with ⅛ inch hole drilled in cap to relieve pressure; equivalent to "PRESSURE-TRU #Z 3000" by Wilkins.

2.4 FLEXIBLE JOINTS

A. Buried Flexible Expansion Joints:
1. Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material properties of ANSI/AWWA C153/A21.53.
2. Provide double ball joint design with each flexible expansion joint shall be pressure tested against its own restraint to a minimum of 350 PSI (250 PSI for flexible expansion joints 30 inches and larger).
3. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20 degrees, 3 inches-expansion and total expansion range of not less than 6 inches.
4. All internal surfaces parts shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1,500 volt spark test conforming to said specification. All external surfaces shall be coated with a catalyzed coal tar epoxy conforming to the material requirements of AWWA C210.
5. Install with polyethylene wrap over all joints.
6. Provide restrained mechanical joint or flange ends as required to mate rigidly to piping at both ends. Consult with factory authorized manufacturer representative for guidelines for installations and pipe connection and support accessories required for complete and effective installation.
7. Provide thrust restraint devices to complete installation including thrust restraint products to adequately transfer loading to expansion joint.
8. Product: "Double ball configuration FLEX-TEND" as manufactured by EBAA Iron, Inc. or equal (No known equal).

B. Above Ground Flexible Joint: UL listed, expansion joint capable of movement of 6 inches, including seismic, thermal growth and building settlement in all directions; "Fire loop" by Metroflex or equal (No known equal).

2.5 ROOF MANIFOLD

A. Cast brass three (3) way with 6 inch by 2½ inch by 2½ inch.

B. Cast brass three (3) way manifold with inlet as indicated on drawings and fire valves with 2½ inch angle hose valves x 3 inch mpt outlet chrome plated brass with cap and chain.

C. Provide with three (3) fire hose valves.

2.6 FIRE DEPARTMENT CONNECTION

A. Fire department connections shall be two-way type, polished chrome finish with plugs and chains, outlet size and orientation as required.

B. Signage shall be raised or engraved letters at least 1" in height.

2.7 VALVES SUPERVISORY SWITCH

A. Provide UL listed and FM approved, tamper switches with two single pole, double throw micro switches on all valves with alarm signal to register on fire alarm panel on all control valves. PIV switches shall be weather-resistant and shall monitor target position. Acceptable Manufacturers: Potter Electric Signal or approved equal.
   1. Valve Tamper Switches: 2 sets of single pole double throw Form C synchronized sets of contacts rated at 15A, 125/250 VAC and 2.5 A, 0-30 VDC, located within tamper resistant NEMA 6P enclosure with electrical. Plug type switches will not be acceptable.
      a. OS&Y Gate Valve Tamper Switch: “Model OSYSU-2” by Potter Electric Signal Manufacturing. OS&Y switches shall monitor stem movement and shall be complete with mounting J-bolts.
      b. Butterfly unless tamper switch is built integral to butterfly valve, use: “Model PCVS-2T” by Potter Electric Signal Manufacturing or equal.

B. Plug and loop type tamper switches shall not be used.

C. All wiring shall be provided under Division 26.

2.8 SPRINKLER HEADS

A. General:
   1. Fire sprinklers shall be of one manufacturer throughout building. No mixing of sprinkler brands shall be permitted, unless otherwise noted for window protection sprinkler heads.
   2. Sprinklers shall be of all brass frame construction with a coated metal-to-metal seating mechanism.
   3. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited, including O-Rings.
   4. Sprinklers shall have a quick response frangible bulb type fusible element with a temperature rating of 155 or 200 degrees F or shall have a fast response metal type fusible element with a temperature rating of 165 to 212 degrees F.
   5. Sprinklers to be installed in areas with no ceilings shall be of a brass finish and shall be of adequate temperature for the hazard.
   6. Exposed sprinklers subject to corrosive atmospheres shall have a factory applied corrosion resistant coating.
   7. Provide approved sprinkler head wire guards for sprinkler heads located 7 feet 6 inches or lower above finished floor level.
   8. Provide sprinkler heads with minimum ½ inch discharge orifice.

B. Finished Ceiling Areas:
   1. General:
      a. Fire sprinklers shall be of one manufacturer throughout building. No mixing of sprinkler brands shall be permitted.
      b. Sprinklers shall be of all brass frame construction with a coated metal-to-metal seating mechanism.
      c. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited.
      d. Sprinklers shall have a quick response frangible bulb type fusible element with a temperature rating of 155° F or 200° F or shall have a fast response metal type fusible element with a temperature rating of 165° F or 212° F with appropriate identifying color on frame.
      e. Exposed sprinklers subject to corrosive atmospheres shall have a factory applied corrosion resistant coating.

f. Provide approved sprinkler head wire guards for sprinkler heads located 7' -6" or lower above finished floor level.
g. Quick response flush sprinklers shall be listed for installation in an Ordinary Hazard occupancy if installed in an Ordinary Hazard occupancy.
h. Only quick response sprinkler heads are acceptable.
i. Sprinklers to be installed in skylights shall be of high temperature for solar gain temperatures.

2. Provide UL listed and FM sprinkler heads of the solder-type, available in temperature ratings of 165° F, through 212° F. Provide sprinkler heads with standard ½-inch discharge orifice with nominal 5.56K factor.
3. Finished Ceiling Areas:
   a. Quick response flush style pendent sprinkler: ½-inch NPT, a standard orifice, nominal K Factor of 5.6, 165° F, UL listed and FM approved; similar to Viking Horizon, SIN VK402. Finish: Bright Brass, Polished Chrome, White Polyfinish, and Navajo White Polyester.
   b. Quick response concealed style pendent sprinkler: ½-inch NPT, a standard orifice, nominal K Factor of 5.6, 165° F, UL-listed and FM approved; finish similar to Viking Horizon Mirage, SIN VK404. Finish: Bright Brass, Brushed, Brass, Antique Brass, Polished Chrome, Brushed Chrome, and Brushed Copper, Painted White, Painted Custom Color.
   c. Quick response concealed sidewall style sprinkler: Push-on type cover plate, pull-off assembly with a 2¾-inch diameter ½-inch NPT, a standard orifice, nominal K Factor of 5.6, 165° F, UL listed and FM approved; finish similar to Viking Horizon Mirage, SIN VK408. Finish: Bright Brass, Brushed, Brass, Antique Brass, Polished Chrome, Brushed Chrome, and Brushed Copper, Painted White, Painted Custom Color.
   d. Quick response sidewall style sprinkler: ½-inch NPT, a standard orifice, nominal K Factor of 5.6, 165° F, UL listed and FM approved; finish similar to Viking Horizon Mirage, SIN VK304. Finish: Bright Brass, Brushed, Brass, Antique Brass, Polished Chrome, Brushed Chrome, and Brushed Copper, Painted White, Painted Custom Color.
4. Unfinished Ceiling Spaces:
   a. Quick response upright style sprinkler: ½-inch NPT, a standard orifice, nominal K Factor of 5.6, 165° F, UL listed and FM approved; finish similar to Viking Horizon Mirage, SIN VK300. Finish: Bright Brass, Brushed, Brass, Antique Brass, Polished Chrome, Brushed Chrome, and Brushed Copper, Painted White, Painted Custom Color.
5. Dry Pendant Sprinkler:
   a. Quick response dry pendent barrel shall be of steel construction with an electro-deposited epoxy base coating. Quick response dry pendent sprinklers shall have a 3 mm frangible bulb type fusible element. Quick response dry pendent sprinklers shall have a 1-inch NPT, a standard orifice, and a nominal K Factor of 5.6. The installation of quick response dry pendent sprinklers shall be in conformance with the manufacturer's installation guidelines. Quick response dry pendent sprinklers shall be UL listed. Quick response dry pendent sprinklers shall be listed for installation in an Ordinary Hazard occupancy if installed in an Ordinary Hazard occupancy. Quick Response Dry Pendent Sprinklers (formerly Model M) shall be Viking SIN VK172 (Plain Barrel), SIN VK176 (Adjustable Standard), or SIN VK180 (Adjustable Recessed).

6. Extended Coverage:
   a. Extended coverage quick response pendent sprinklers: Extra-large orifice and an 11.2 nominal K Factor, UL and FM listed for extended coverage application. Quick Response Extended Coverage Light Hazard (ECLH) Extra-Large Orifice Sprinklers (formerly Model M) shall be Viking SIN VK608.
7. Provide proper wrenches to service specified sprinkler heads.

2.9 WATERFLOW DETECTORS

A. Flow Switches: Vane type, UL listed, FM approved water flow detectors in the sprinkler systems where shown on the Drawings or as indicated in these Specifications. Detectors shall be designed for mounting in the horizontal or vertical piping, but shall not be mounted in a fitting or within 12 inches of any fitting that changes direction of water flow, and shall have sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler head. Switches shall be activated by a vane extending into the waterway of the piping. Detectors shall provide a ½ inch conduit entrance.
   1. Required whole sizes shall be 1 $^{5}/_{16}$ inches for piping 2 inches to 3 inches and 2 $^{1}/_{16}$ inches for piping 4 through 8-inch size.
   2. Flow Switch: UL/FM listed, rated for 450 PSI and surges up to 18 FPS, alarm activation at 10 GPM, sets of single pole double throw Form C synchronized sets of contacts rated at 15 A, 125 VAC and 2A, 24 VDC; corrosion-resistant using factory-installed, non-corrosive insert.
      a. Switch Enclosure: Tamper resistant, meeting NFPA 4 rating, and equipped with instantly recycling adjustable retard with 0-90 second range.
      b. Equivalent to “Model VSR-FE-2“ or “VSR-FEX” by Potter Electric Signal Manufacturing or “Model WFD” by System Sensor.

B. Pressure Switches: UL/FM listed, rated for 250 PSI and detect 10 PSI pressure increase or decrease from normal line pressure, adjustable from 10 to 175 PSI, 2 sets of single pole double throw Form C synchronized sets of contacts rated at 15 A, 125 VAC and 2A, 24 VDC; corrosion-resistant using factory-installed, non-corrosive insert, bleed valve assembly; equivalent to “Model PS40-2A-BVL” by Potter Electric Signal Manufacturing.

C. All electrical wiring shall be provided under another Division of the Specifications.

D. Coordinate all requirements with Division 26.

2.10 DRAINS AND TEST PIPES

A. Fire Sprinkler Zone Valve Assembly:
   1. UL Listed Provide drains at locations indicated or required for complete drainage of systems. Provide other drains, valves or plugs as indicated or required. Pipe drains to approved locations.
   2. Provide test pipes as indicated or required and piped to discharge at approved locations.

B. Assembly shall be UL Listed and FM approved, include all required accessories such as flow switch, sight glasses, restrictive orifices test valve and drain angle valves, flow and valve tamper switch meeting the requirements of the applicable NFPA 13 for inspector test stations and fire sprinkler floor zone isolation and drain down, and relief valve where required Model 1000 (non-looped/gridded system) and Model 1011 (looped/gridded system) by AGF or approved equivalent.

2.11 PIPE SLEEVES, ANCHORS, SUPPORTS AND SWAG BRACING

A. The Contractor shall furnish and install all sleeves required for the lines and mains as needed for sprinkler piping.

B. All piping shall be securely supported from the building structure by means of Underwriters approved iron hangers, supports and pipe inserts and installed in accordance with Underwriters approved methods.

C. All horizontal piping shall be supported by means of approved wrought iron clevis type hangers with proper size suspension rods and locknuts, spaced as required by the Underwriters.

D. Supports for vertical piping shall be heavy black iron extension clamps with bolts, each end resting on the building structure or hung from the slab in an approved manner.

E. Provide all auxiliary steel required for pipe supports.

F. Piping shall be hung from structural slab by means of malleable iron concrete inserts set informs before concrete is poured. Drilled type concrete inserts may be provided. Power driven studs will not be accepted unless accepted by projects structural engineer.

G. Piping shall not be hung from ductwork, or the work of other trades.

H. No pipes or other apparatus shall be installed so as to interfere in any way with the full swing of doors, building access doors, and access doors in ductwork. The arrangement, positions, and connections of pipes, drains, valves, etc., shown on the Drawings shall be taken as a close approximation and while they shall be followed as closely as possible, the right is reserved by the Project Representative to change the locations to accommodate any conditions which may arise during the progress of the work without additional compensation to this Contractor for such changes, provided that the changes are requested prior to the installation of this Contractor's work.

I. Piping typically shall be installed concealed in or above building construction; i.e.; hung ceilings, and shall be so arranged that relocation of lighting fixtures, or plumbing and mechanical systems, will not cause any interference.

J. All threaded pipe throughout the job shall be reamed smooth before being installed. Pipe shall not be split, bent, flattened or otherwise injured either before or during the installation. The Architect reserves the right to reject any and all work not in accordance with the review Shop Drawings.

K. Provide in accordance with referenced standards. Do not mix piping material and hanger material of dissimilar metals. All beam clamps shall be fitted with steel retainer straps. Hanger rods of less than 3/8-inch diameter are not permitted. All horizontal piping shall be supported by means of UL approved clevis type hangers with proper size suspension rods and locknuts, spaced as required by the Underwriters.

2.12 PIPE HANGERS

A. Provide in accordance with referenced standards. Do not mix piping material and hanger material of dissimilar metals. All beam clamps shall be fitted with steel retainer straps. Hanger rods of less than ⅜ inch diameter are not permitted. All horizontal piping shall be supported by means of UL Listed and FM approved band type hangers with proper size suspension rods and surge restrainers as required, spaced as required by the Underwriters.

2.13 SPARE SPRINKLER HEADS

A. In addition to the heads actually required, furnish a stock of extra sprinklers of amounts as recommended by the National Fire Protection Associations Standards, including a minimum of six (6) heads of each type and temperature rating used and two (2) suitable wrenches for each type sprinkler head, contained in steel boxes, suitable for use as a service kit on the project.

2.14 IDENTIFICATION SIGNS

A. Metal identification signs, nominally 2 inch x 6 inch or 3 inch x 5 inch, red background with white lettering; equivalent to Potter-Roemer “Series 6300.”
   1. Include appropriate warning and/or identification information such as “Inspectors Test,” “Drain,” “Main Drain,” “Fire Sprinkler Valve – Do Not Close,” “Sprinkler Fire Alarm – Call Fire Department,” hydraulic design information indicating design flow and residual pressure, etc.
   2. Label control valves, fire riser, etc., with appropriate brief descriptions of operating functions.
   3. Provide signage to locate main or section valves in accordance with applicable standards.

B. Provide required signs, securely fastened to control valves, fire department connection, sprinkler control valve, etc., by stainless steel wire or chains indicating the purpose and location of each valve.

2.15 MISCELLANEOUS

A. Water Service Pressure Gauge:
   1. Dial: White aluminum, 4½ inch diameter, rated to 1,000 PSI with black markings and numerals, ranges provided to be read at mid-range, slotted and adjustable pointer.
   2. Case: Aluminum with phenolic black turret and plastic lens with ¼ inch N.P.T. connections located at bottom, lower back or center back as required.
   3. Operation: ANSI B40.1 Grade A accuracy to 1 percent with brushed bushed rotary movement.
   4. Manufacturer: Equivalent to “Series PG-1” by Weiss.

B. Pressure Gauge Accessories
   1. Gauge Cock: ¼ N.P.T. brass ball valve with lever handle, equivalent to “LC -14 or LCU-14” by Weiss.
   2. Pressure Snubber: Brass housing, PSI rating 15,000 PSI at 70 degrees F, with corrosion resistant porous metal dampening element with porosity selected to meet type of service, and inlet meeting connection size of gauge.
   3. Water and Light Oil (30-225 Saybolt Seconds Universal Viscosity); equivalent to “No.PSN-B-25-E, ¼ inch N.P.T.”, or “No.PSN-B-50-E, ½ inch N.P.T.” by Weiss.

C. Escutcheon Plates: Escutcheon Plates shall be pressed stainless steel, chrome plated with concealed hinges and springs to hold position on pipe. Install on pipes passing through floors, ceiling and walls in finished areas. Wall plates exposed to weather shall be stainless steel. Escutcheon wall plates exposed to weather shall be stainless steel.

D. Sprinkler guards: UL listed, Heavy duty welded wire, red baked enamel finish.

2.16 SOFFITS

A. Level Cover support system: Modular piping cover system for installation of metal piping system in existing construction, ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials UL Listed, “DecoShield M” manufactured by DecoShield® Systems, Deerfield Beach, Florida.

B. Cover Units: L-shaped and U-shaped cross-section units of flame retardant resin material, paintable finish.

C. Surface burning characteristics when tested in accordance With ASTM E84:

1. Flame spread: 20
2. Smoke developed: 250

D. Provide coupling fittings for joining units end-to-end and prefabricated inside and outside corner fittings and end caps.

E. Provide sidewall sprinkler head housing accommodating NFPA 13 4-inch drop assembly requirements.

F. Provide mounting clips to secure covers to wall-ceiling.

G. Pipe Hangers for Copper and Steel Piping: Design and dimensions compatible with cover system; UL Listed.

H. Paint: Acrylic latex; color to match adjoining surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All piping, valves, and other materials shall be installed according to the Local Authority rules and an inspection certificate furnished.

B. Sprinkler piping shall be installed and coordinated with the ductwork and other mechanical and electrical services in the ceiling cavities by the Contractor to provide the clearances for lighting fixtures as indicated on the Drawings. If any departures from the Drawings are necessary to comply with any NFPA requirements, or the authority having jurisdiction, such revisions and/or departures shall be detailed and submitted for approval. All such revisions shall be made and the sprinkler systems installed in accordance therewith, without additional cost to the Owner. Departures shall not be made without prior written approval by the Project Representative. The Drawings are schematic and do not indicate inferred details. This installation shall also meet the approval of the Local Fire Department.

C. The sprinkler heads in public areas, and in typical floor elevator lobbies shall be located as indicated on the Architectural reflected ceiling plans and coordinated with the lighting fixtures. Sprinkler head alignment is required in all areas. Sprinklers shall be provided with a temporary plastic cover when installed in plaster or drywall ceilings.

D. No pipes or other apparatus shall be installed so as to interfere in any way with the full swing of doors, building access doors, and access doors in ductwork. The arrangement, positions, and connections of pipes, drains, valves, etc., shown on the Drawings shall be taken as a close approximation and while they shall be followed as closely as possible.

E. The right is reserved by the Project Representative to change the locations to accommodate a change of conditions, which may arise during the progress of the work without additional compensation to this Contractor for such changes, provided that the changes are requested prior to the installation of this Contractor’s work.

F. Piping typically shall be installed concealed in or above building construction; i.e.; hung ceilings, and shall be so arranged that relocation of lighting fixtures, or plumbing and mechanical systems, will not cause any interference.

G. All components of the fire protection system shall be in installed in accordance with the manufacturer’s installation recommendations.

H. All sprinkler heads shall be installed in conformance with the UL listing and FM approvals criteria. Spacing of sprinkler heads shall be in conformance with the UL listing and FM approvals criteria for the applicable occupancy type.

I. The fire protection subcontractor shall coordinate the installation of pipes, hangers, valves, and all other items of the fire protection system with the work of all other trades so that all components will be installed to avoid conflicts, and provide for proper servicing and maintenance of mechanical and electrical equipment in ceiling plenums.

J. Sprinkler heads shall be installed on a true axis line of ½ inch plus or minus. At the completion of the installation, if any heads are found to exceed this tolerance, heads shall be removed and reinstalled by this Contractor, at no additional cost to the Project Representative.

K. The Project Representative reserves the right to reject any and all work not in accordance with the approved shop drawings

L. Components improperly installed shall be removed and/or relocated as directed by the Project Representative at no additional cost to the Owner. Refer to Section 23 0501 subsection titled “Contractor’s Coordination Drawings” for additional requirements.

M. All sprinkler piping shall be installed concealed in hung ceilings, including drywall ceilings and soffits unless noted otherwise and shall be arranged so that relocation of lighting fixtures shall not cause any interference.

N. Run all pipe straight and true. Springing or forcing piping into place will not be permitted. Install piping in such a manner as to prevent strain on the equipment.

O. Conceal piping in ceiling cavity where ceiling are provided. Exposed piping shall be installed as nearly as possible parallel to or at right angles to the column lines of the building.

P. All piping shall be carefully graded so as to eliminate traps and pockets. Where water traps cannot be avoided, provide drains in conformance with NFPA 13.

Q. Make all joints smooth and unobstructed inside. Ream all cut pipe ends to remove burrs. Remove all obstructions prior to fabrication.

R. Install a union or flanges at equipment connections and elsewhere as indicated.

S. Make welded joints on pipe runs with continuous welds, without backing rings, and with pipe ends beveled before fabrication. Gas cuts shall be true and free from burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no metal shall project within the pipe.

T. All threaded pipe throughout the job shall be reamed smooth before being installed. Use full pipe lengths; random lengths joined by couplings will not be accepted.

U. Pipe shall not be split, bent, flattened or otherwise damaged either before or during the installation.

V. All welded elbows shall be long radius type.

W. The Fire Protection Subcontractor utilizing a grooved piping system shall provide a letter of certification to the Project Representative stating that a project site training session of at least two (2) hours duration was conducted for this Project by the grooved fitting manufacturer for the Subcontractor’s supervisory and installing personnel.

X. All piping that penetrates fire rated construction shall be firestopped.

Y. All piping shall be of the sizes required by applicable codes, but not less than the sizes indicated on the Drawings.

Z. Install sprinkler piping and heads at minimum 24-inch distance from variable air volume box or DDC control.

3.2 FIRE SPRINKLER CONTROL ASSEMBLY

A. Fire Sprinkler Zone Valve Assembly:
1. UL Listed Provide drains at locations indicated or required for complete drainage of systems. Provide other drains, valves or plugs as indicated or required. Pipe drains to approved locations.
2. Provide test pipes as indicated or required and piped to discharge at approved locations.
3. Install control valves, supply valves, in clearly accessible locations within five feet of the floor.
4. Inspector's test valves shall be installed downstream of each water-flow device. Inspector's test outlets shall be piped to drain outside of the building or into the sewer drain. Valves shall be within six feet of the floor or finished grade. When the discharge outlet cannot be seen from the valve or when inspector's test connections are piped into the sewer system, a sight glass shall be provided. Direct interconnections shall not be made between sewers and sprinkler drains.

3.3 TAMPER SWITCHES

A. Provide an integral tamper switch and control valve on branch lines serving sprinkler protection in elevator spaces and elevator machine rooms.

B. Tamper switches:
1. Provide valve tamper switch on each isolation valve indicated below:
a. Valves at bases of standpipes.
b. Valves at fire system valves.
c. Sprinkler-zone valves.
d. Post indicator valves.
2. Coordinate requirements with Division 26
3. All electrical wiring shall be provided under Division 26.
4. Provide installation in conformance with manufacturer's installation instructions, including mounting, adjustments to actuating lever and notching of valve stem.
5. The valve tamper switch must activate within ⅕ length of travel of valve closure or opening. Two separate and distinct signals shall be initiated, one indicating movement of the valve from its normal position and the other indicating restoration of the valve to its normal position. The off-normal signal shall be initiated during the first two revolutions of the hand wheel or during one-fifth of the travel distance of the valve control apparatus from its normal position. The off-normal signal shall not be restored at any valve position except normal.

3.4 VALVES

A. Fire Department Connections:
1. Install fire department connection eighteen inches to twenty-four inches above paving or grade with twelve inch clearance around all sides.

B. Provide full line size check valves with automatic ball drip on the boss located on the bottom and inlet side of each check valve serving fire department connections.

C. Install check valve (other than FDC check valve as above) and water flow indicators with eighteen inch clearance from obstructions so that they can be removed and serviced.

D. Pressure gauges shall be provided at each side of the main check valve and at each control valve for each floor (where applicable).

E. Provide indicating type isolation valves on fire sprinkler supply piping supplying elevator spaces and elevator machine rooms.

3.5 PIPING ACCESSORIES AND EQUIPMENT INSTALLATION

A. Underground Piping: All bolts, nuts, washers and rodding used for the installation of underground piping, valves and fittings from the riser flange back to, and including, all parts of the water main tap shall be stainless steel conforming to ASTM A194 Grade 8M or ASTM A320 Grade B8M. All of the above materials shall be thoroughly coated with bituminous mastic. After coating, all valves and ferrous fittings shall be wrapped in 8 mil polyethylene film and securely taped in place with underground tape.

3.6 SLEEVES AND ESCUTCHEONS

A. Sleeves: Provide sleeves for all pipes passing through slabs, concrete walls, and lath and plaster ceilings (except drop nipples for heads) and partitions. Sleeves shall extend three inches above floors and be flush with walls, ceilings, and partitions. In concrete construction, sleeves shall be set in forms prior to pour.

B. Clearance between sleeves and pipes shall be one-inch for pipes through 3½- inches, two-inch for pipe sizes 4-inches and greater, and three-inch for seismic joints.

C. Packing: For sleeves set in fire walls and floors, caulk space between pipe and sleeve with flexible fire-resistive packing compound to achieve rating at least equal to that of the wall or floor penetrated. Annular space between sleeves and piping shall be sealed with UL through-penetration systems #49 (concrete) or #147 (gypsum/stud). Sleeves in floors on grade or exterior walls below grade shall be packed with oakum between pipe and sleeve flush with top of sleeve for floors and with outer surface for walls. Sleeves at seismic joints shall not be packed unless associated with a fire rated wall, partition, floor or floor ceiling assembly.

D. Sleeve Material:
1. In concrete slabs and walls: Schedule 40 black steel pipe.
2. Sleeves through waterproof membranes: Sleeves set in walls and slabs may be either cast iron or steel and shall be provided with a flashing clamp device and corrosion-resistant clamping holes.

E. Escutcheons: Furnish and install escutcheons on all exposed pipes passing through walls, floors, ceilings, (except for sprinkler heads) and partitions.

3.7 DRAINS AND TEST PIPES

A. Provide drains at locations indicated or requiring for complete drainage of systems. Provide other drains, valves or plugs as indicated or required to meet NFPA 13 recommendations. Pipe drains to approved locations, where required.

B. Provide test pipes as indicated or required locations and piped to discharge at approved locations.

C. Provide all required accessories such funnels air gap fitting, pipe alignment brackets and supports.

3.8 EARTHQUAKE PROTECTION

A. Provide seismic protection for sprinkler and standpipe piping in strict accordance with FM GLOBAL Data Sheet 2-8 “Earthquake Protection for Water-Based Fire Protection Systems.”

3.9 WATER SERVICES

A. Install fire line water services in accordance with the Rules and Regulations of the local Fire and Water Departments and obtain all necessary and required approvals, prior to starting any work. The Project Representative shall pay all water service fees.

3.10 HANGERS AND SUPPORTS

A. All pipes throughout the building shall be thoroughly and substantially supported with UL listed FM approved hangers and support devices and installed in accordance with Underwriter’s approved methods.

B. Furnish and install any special hangers or supports that may be required due to any peculiarities of construction. The design, selection spacing, and application of horizontal pipe hangers, supports, restraints, anchors, and guides shall be in accordance with the applicable standards.

C. All vertical pipes 8-inch in diameter and smaller shall be supported at least every other floor with Grinnell Figure 261 or approved equal riser clamps.

D. Hanger rods, inserts, etc., shall be sized and installed as recommended by the manufacturer for the service intended. Hanger rods shall be cadmium plated or galvanized.

E. All horizontal piping shall be supported by means of approved wrought iron clevis type hangers with proper size suspension rods and locknuts, spaced as required by the Underwriters.

F. Retainer straps shall be used with all beam clamps.

G. Supports for vertical piping shall be heavy black iron extension clamps with bolts, each end resting on the building structure or hung from the slab in an approved manner.

H. Provide all auxiliary steel required for pipe supports.

I. Submit pipe hanger, insert and support details for concrete floor construction to the Project Representative for review and approval. Piping shall be hung from structural slab by means of malleable iron concrete inserts set in place before concrete is poured. Drilled type concrete inserts may be provided as approved by structural engineer. Power driven studs shall not be accepted unless accepted by the Project Representative.

J. Piping shall not be hung from ductwork, or the work of other trades.

3.11 TESTING

A. General:
1. All inspections, examinations, and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Fire Protection Subcontractor, as necessary to obtain complete and final acceptance of the system as installed. The certificates of inspection shall be in quadruplicate and shall be delivered to the Architect for distribution.

Note: All hydrostatic tests shall be performed as required by the reference standards cited hereinbefore and the Authority Having Jurisdiction, except the testing period shall be not less than eight (8) hours.

2. Provide acceptance test consisting of hydrostatic tests of the fire protection piping system in accordance with NFPA Pamphlet No. 13 and No. 14, but at not less than 200 pounds pressure for two (2) hours, or at 50 pounds per square inch in excess of the maximum static pressure when the maximum static pressure is in excess of 150 pounds per square inch.
3. Provide a hydrostatic pre-test, same as acceptance hydrostatic tests indicated in the foregoing paragraph, for both above ground and underground piping, prior to calling for fire marshal acceptance test. Written confirmation of passed 100 percent pre-test shall be given to the inspector of record prior to calling for final acceptance test. All cost associated with delays caused by failure to complete 100 percent operational pre-test shall be borne by the contractor. A Contractor Material and Test Certificate shall be filled out on completion of pre-test.
4. Maintenance testing shall be performed in accordance with this code and Administrative Rules published by the chief. Where certified inspection, testing, or qualification of fire protection equipment is required by nationally recognized standards, laws, ordinances, or administrative rules, the chief shall require that the person, firm, or corporation performing such work have a certificate from the fire department.

B. Fire sprinkler systems: Test in accordance with applicable current NFPA 13 and 25 Standards.

C. Fire standpipe systems: Test in accordance with applicable current NFPA 14.

D. Thread Test: A test shall be made of the thread on the hose valves and fire department connections using a coupling from the Local Fire Department hose. The test shall be made in the presence of the Owner or the Project Representative.

E. Fire alarm devices and tamper switches: Test all alarm devices for proper operation and connection to central alarm system and BMS.
1.

3.12 PERIODIC INSPECTION

A. After completion of the automatic sprinkler system and at the beginning of the warranty period the Automatic Sprinkler Subcontractor shall perform, without charge to the Owner, one (1) inspection of the sprinkler system during the warranty period. Inspection shall be as per the applicable NFPA No. 25, “Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems”, plus the following maintenance to be performed during the course of the inspection:
1. Operation of all control valves.
2. Lubrication of operating stems of all interior valves.
3. Operation of water gong, electric alarms, supervisory panels, air compressors, alarm trip switches, flow switches, etc.
4. Cleaning of alarm valves.

5. Lubrication of Fire Department hose connection inlet and fire hose valve threads.
6. The Standard Form of the National Fire Sprinkler Association, Inc., “Report of Inspection” (Sheets 1 and 2), shall be filled out in triplicate after each inspection and the copies sent to the Project Representative.

END OF SECTION 21 1319

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