

PROJECT MANUAL

FOR THE
TENANT IMPROVEMENT OF
OXNARD UNION HIGH SCHOOL DISTRICT
DISTRICT OFFICE

1800 N SOLAR DRIVE
OXNARD, CALIFORNIA

Bid Set
02-24-2020

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PROJECT MANUAL

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SECTION 011100

SUMMARY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The scope of work of this contract shall consist of the Interior Tenant Improvement of the 1st and 2nd floors of 1800 N Solar Drive, Oxnard, CA for the District Office of the Oxnard Union High School District. The project will include some demolition, some ceiling work, replacement of doors, construction of new partitions, offices and conference room. The project also includes the modification of the mechanical and electrical and fire protection systems to match the new partition plan. New floor, ceiling and wall finishes shall be installed and applied to complete the tenant improvement.
1. Project Location: 1800 N. Solar Drive, 1st and 2nd Floors, Oxnard, CA
 2. Client: Oxnard Union High School District
- B. All work shall be in conformance with the construction documents prepared by P K Architecture, 5126 Clareton Drive, Suite 110, Agoura Hills, CA 91301.

1.2 CODE COMPLIANCE

- A. All work performed, and products furnished, shall comply with the regulations of the following codes:
1. California Building Code based on the International Building Code, latest edition as adopted by the City of the Project's Jurisdiction.
 2. California Plumbing Code, latest edition.
 3. California Mechanical Code, latest edition.
 4. California Electrical Code, latest edition.
 5. California Architectural Barrier Laws, Title 24, Part 2, California Code of Regulations and ADA standards for accessible design.
 6. Energy Building Regulations, Title 24, California Code of Regulations.
 7. California Green Building Standards Code
 8. California Fire Code
- B. Except as noted above, or otherwise specified, the latest official date of publication, adoption, issue or revision of the code shall apply.

END OF SECTION

SECTION 013300

SUBMITTALS – SHOP DRAWINGS, PRODUCT DATA & SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Qualifying data on alternatives and substitutions.
2. Shop and erection drawings on all fabricated products and assemblies.
3. Catalog cuts, technical performance and composition data on all products and systems.
4. Qualifying mill test or field test data on basic materials.
5. Certificates of Compliance and Certificates of Inspection.
6. Samples, prototypes, color and finish submittals.

B. Related Work Specified Elsewhere

1. Specific Submittal Requirements – Respective Technical Sections of the Specifications.

C. General: Contractor shall make all submittals specified or required by the Contract Documents.

1.02 SHOP DRAWINGS

A. Original drawings, prepared by Contractor, subcontractor, supplier or distributor, which illustrate some portion of the Work; showing fabrication, layout, setting or erection details.

B. Prepared by a qualified detailer, under responsibility of the entity furnishing the work represented thereby.

C. Identify details by reference to sheet and detail numbers shown on Contract Drawings.

1.03 PRODUCT DATA.

A. Manufacturer's Standard Schematic Drawings:

1. Modify drawings to delete information which is not applicable to project.
2. Supplement standard information to provide additional information applicable to project.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:

1. Clearly mark each copy to identify pertinent materials, products or models.
2. Show dimensions and clearances required.
3. Show performance characteristics and capacities.

4. Show wiring or piping diagrams and controls.

1.04 SAMPLES.

- A. Physical examples to illustrate materials, equipment or work quality, and to establish standards by which completed work is judged.
- B. Office Samples: Submit six samples of sufficient size to clearly illustrate:
 1. Functional characteristics of product or material, with integrally related parts and attachment devices.
 2. Full range of color, texture and pattern.
- C. Field Samples:
 1. Erect at project site at location acceptable to the Architect.
 2. Construct each field sample complete, including work of all trades required in finished work.
- D. After review, samples will be retained and used at site to compare against work completed for compliance. Remove field sample at conclusion of work when acceptable to the Architect.

1.05 REQUESTS FOR SUBSTITUTIONS AND ALTERNATIVES.

- A. The Contract Documents comprise the minimum standards for execution of the work. Submit requests for substitution and alternatives to products, systems and methods of construction specified to the Architect. No substitutions are permitted without written approval of the Architect.
- B. Submit 5 copies of request including the following:
 1. Complete data substantiating compliance of proposed substitution with intent of Contract Documents.
 2. For Products:
 - a. Product identification, including manufactures name and address.
 - b. Manufacturer's literature:
 - (1) Product description
 - (2) Performance and test data
 - (3) Reference standards
 - c. Samples
 - d. Name and address of similar projects on which product was used, and date of installation.
 3. For construction methods:
 - a. Detailed description of proposed method.
 - b. Drawings illustration methods.
 4. Itemized comparison of proposed substitution with product or method specified.
 5. Data relating to changes in construction schedule.
 6. Requirements of maintenance and service and source of replacement materials.

- C. In making request for substitution, Contractor represents:
 - 1. Contractor has investigated proposed product or method and determined that it is equal or superior in all respects to that specified.
 - 2. Contractor will provide the same guarantee for substitution as for product or method specified.
 - 3. Contractor will coordinate installation of accepted substitution into work, making changes as may be required for work to be complete in all respects.

- D. Substitutions will not be considered if:
 - 1. They are indicated or implied on shop drawings or project data submittals without formal requests submitted in accord with this section.
 - 2. Acceptance will require substantial re-design of project or revision of Contract Documents.

1.06 CONTRACTOR RESPONSIBILITIES

- A. Review Shop Drawings, Product Data and Samples prior to submission.

- B. Verify:
 - 1. Field measurements
 - 2. Field construction criteria
 - 3. Catalog numbers and similar data.
 - 4. Quantities required for each item.

- C. Coordinate each submittal with requirements of work and of Contract Documents.

- D. Contractor's responsibility for errors and omissions in submittals is not relieved by Architects review of submittals.

- E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Architect gives written acceptance of specific deviations.

- F. Notify Architect in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

- G. Begin no work that requires submittals until return of submittals with Architect's stamp and initials or signature indicating review.

- H. After Architect's review, distribute copies.

1.07 SUBMISSION REQUIREMENTS

- A. Schedule submissions sufficiently before the dates which reviewed submittals will be needed for fabrication or construction. Submittals to be checked by Consulting engineer shall be submitted to the Architect.

- B. Submit (5) five copies of all submittal samples. Submit (1) one copy of shop drawings and literature that can be submitted as a pdf .

C. Submittals shall include:

1. Date and revision dates.
2. Project title.
3. Names of Contractor, Sub-contractor, Supplier and Manufacturer.
4. Identification of product or material.
5. Relation to adjacent structure or materials.
6. Field dimensions clearly identified as such.
7. Applicable specification section(s).
8. Identification of deviation from Contract Documents.
9. Contractor's stamp, certifying their review of submittal, and compliance with Contract Documents.

1.08 RESUBMISSION REQUIREMENTS

A. Shop Drawings:

1. Revise initial drawings as required and resubmit as specified for initial submittal.
2. Indicate on drawings any changes which have been made including those requested by Architect.
3. Identify all revisions.
4. Product Data and Samples: Submit new data and samples as required for initial submittal.

1.09 ARCHITECT'S DUTIES

- A. Architect and Consulting Engineers shall review and return submittals to Contractor within 10 working days.
- B. Review for:
1. Design concept of project.
 2. Information given in Contract Documents.
 3. Design Adherence.
- C. Review of separate item does not constitute review of an assembly in which item functions.
- D. Affix stamp and initials or signature certifying the review of submittals.
- E. Return submittals to Contractor for distribution.

END OF SECTION

SECTION 016600

MATERIAL AND EQUIPMENT – HANDLING AND STORAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Items Included:

1. General materials and equipment requirements.
2. Transportation and delivery to project site.
3. Product storage and protection.
4. General product installation procedures.

B. Related Work Specified Elsewhere:

1. Specific requirements for specific products – the respective section of the Specification for the Product.

1.2 GENERAL PRODUCT CRITERIA

A. All products, materials and equipment incorporated into the work shall:

1. Conform to specified specifications and standards.
2. Comply with size, dimensions, make, type, capacity and quality specified.

B. Manufactured and Fabricated Products:

1. Design, fabricate and assemble in accord with the best engineering and shop practices.
2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
3. Two or more items of the same kind shall be identical, by the same manufacturer.

C. Do not use products, materials or equipment for any purpose other than that for which it is designed or specified

1.3 TRANSPORTATION AND DELIVERY

A. Arrange deliveries of products on accord with construction schedules and in ample time to facilitate inspection prior to installation.

B. Coordinate deliveries to avoid conflict with work and conditions at the site, and in consideration of:

1. Work of subcontractors
2. Limitations of storage space

3. Availability of equipment and personnel for handling products.
- C. Deliver products in undamaged condition in manufacturer's original containers or packaging, with identifying labels intact and legible.
- D. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of the parts and to facilitate assembly.
- E. Immediately on delivery, inspect shipment to assure:
 1. Product complies with requirements of Contract Documents and approved submittals.
 2. Quantities are correct
 3. Containers and packages are intact, and labels are legible.
 4. Products are properly protected and undamaged.

1.4 PRODUCT HANDLING

- A. Provide equipment and personnel necessary to handle products, by methods to prevent soiling or damage to products or packaging.
- B. Provide additional protection during handling as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.
- C. Handle products by methods to prevent bending or overstressing. Lift heavy components only at designated lifting points.

1.5 STORAGE

- A. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.
- B. Store products subject to damage by the elements in substantial weather tight enclosures.
 1. Maintain temperatures within the ranges required by manufacturer's instructions and/or the specifications.
 2. Provide humidity control for sensitive products, as required by manufacturer's instructions and/or specifications.
 3. Store unpacked products on shelves, in bins or in neat piles, accessible for inspection.
- C. Exterior Storage:
 1. Provide substantial platforms, blocking or skids to support fabricated products above ground and to prevent soiling or staining.
 2. Cover products subject to discoloration or deterioration from exposure to the elements with impervious sheet coverings. Provide adequate ventilation to avoid condensation.
 3. Store loose granular materials on solid surfaces such as paved areas, or provide plywood or sheet materials to prevent mixing with foreign matter.

- a. Provide surface drainage to prevent flow or ponding of rainwater.
 - b. Prevent mixing refuse or chemically injurious materials or liquids/with site soils.
- D. Arrange storage in a manner to provide easy access for inspection, and access to all parts of the project.
- 1. The state of storage facility is adequate to provide required protection.
 - 2. Required environmental conditions are maintained on a continuing basis.
 - 3. Surfaces of products exposed to the elements are not adversely affected.

1.6 INSTALLATION – MANUFACTURER’S INSTRUCTIONS

- A. When Contract Documents require that installation of work shall comply with manufacturer’s printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including copies to Architect. Maintain one set of complete instructions at the jobsite during installation and until completion.
- B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
- C. Should job conditions or specified requirements conflict with manufacturer’s instructions, consult with Architect for further instructions. Do not proceed with the work without clear instructions.
- D. In complying with manufacturer’s instructions, do not omit any preparatory step or any installation procedure unless specifically modified or exempted by Contract Documents.

1.7 PROTECTION AFTER INSTALLATION

- A. Provide protection of installed products to prevent damage from subsequent operations. Remove such protection only when no longer needed, prior to completion of work.
- B. Control traffic to prevent damage to equipment and surfaces.
- C. Provide coverings to protect finishes from damage.
 - 1. Cover projections, wall corners, jambs, sills and soffits of openings in areas for traffic and for passage of projects in subsequent work.
 - 2. Protect finish floors and stairs from dirt and damage.
 - 3. In areas subject to foot traffic, secure heavy paper, sheet goods or other material in place.
 - 4. For movement of heavy materials, lay planking or similar materials in place.
 - 5. For storage of products in finished surfaces, lay tight wood sheathing in place.
 - 6. Cover walls and floor elevator cars and surface of elevator car doors used by construction personnel.

END OF SECTION

SECTION 017400

CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Execute cleaning, during progress of the work, and at completion of the work.

B. Related Work Specified Elsewhere:

1. Cleaning for specific products or work; the respective specification section for that work.

1.2 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with local codes, ordinances, regulations and laws.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 – EXECUTION

3.1 DURING CONSTRUCTION.

- A. Execute cleaning to ensure that building, grounds, and adjacent properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to prevent blowing dust.
- C. At reasonable intervals during progress of work, remove waste materials, debris and rubbish from site and dispose of legally away from site.
- D. Provide on-site metal containers for collection of waste materials, debris, and rubbish.

- E. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for occupancy.
- F. Handle waste materials and debris in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly painted surfaces.

3.2 FINAL CLEANING

- A. Employ experienced professional cleaners for final cleaning.
- B. In preparation for occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- C. Remove grease, dust, dirt stains, labels, fingerprints, and other foreign materials, from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.
- D. Wash and shine glazing and mirrors.
- E. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- F. Broom clean paved surfaces; rake clean other surfaces of grounds.
- G. Replace air conditioning or ventilation system filters if units were operated during construction.
- H. Clean ducts, blowers and coils, if air handling units were operated without filters during construction.
- I. Maintain cleaning until project is occupied.

END OF SECTION

SECTION 017700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 GENERAL

- A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the work.

1.2 RELATED REQUIREMENTS

- A. Fiscal provisions, legal submittals and additional administrative requirements: Conditions of the Contract.
- B. Cleaning: section 01710
- C. Record Documents: Section 01720.
- D. Closeout submittals required of trades: The respective sections of the Specifications.

1.3 SUBSTANTIAL COMPLETION - PUNCHLIST

- A. Substantial completion is the stage in the progress of the project or designated portion thereof when the project is sufficiently complete in accordance with the Contract Documents so the Owner can occupy and utilize the project for its intended purpose.
- B. When contractor considers the Work is substantially complete, Contractor shall submit to Architect:
 - 1. A written notice that the Work, or designated portion thereof, is substantially complete.
 - 2. A list of items to be completed or corrected.
- C. Within ten (10) working days after receipt of notice, Architect will make a "Punchlist" inspection to determine the status of the work.
- D. After "Punchlist" inspection, Architect will promptly notify the Contractor in writing of the items remaining to obtain substantial completion.
 - 1. Contractor shall promptly and with due diligence remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Architect.
 - 2. Architect will inspect the work.
- E. When the Architect concurs that the Work is substantially complete, Architect will:

1. Prepare a Certificate of Substantial Completion accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

1.4 FINAL INSPECTION

- A. When Contractor considers the Work is complete, Contractor shall submit written certification that:
 1. Contract Documents have been reviewed.
 2. Work has been inspected for compliance with Contract Documents.
 3. Work has been completed in accordance with the Contract Documents.
 4. Equipment and systems have been tested in the presence of the Owner's representatives and are operational.
 5. Work is completed and ready for final inspection.
- B. Architect and Owner will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Architect consider the Work is incomplete or defective:
 1. Architect will promptly notify the Contractor in writing, listing the incomplete or defective work.
 2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification by Architect that the work is complete.
 3. Architect will re-inspect the work.
- D. When the architect finds that the Work is acceptable under the Contract Documents, Architect will request the Contractor to make closeout submittals.
- E. Refer also to General Conditions for other completion requirements.

END OF SECTION

SECTION 017836

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Compile and submit specified warranties and bonds.
2. Compile and submit specified service and maintenance contracts.
3. Standard guarantees to be submitted by all subcontractors.

B. Related Work Specified Elsewhere:

1. Submittals – Section 01300
2. Operating and Maintenance Data – Section 01730
3. Provisions of warranties and bonds of respective sections of specific products.

1.2 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds and services and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Submit two (2) each original signed copies of all documents.

C. Content of warranties, bonds and service and maintenance contracts:

1. Basis on which all such documents apply and all provisions applicable to validity.
2. Date of beginning of warranty, bond or service and maintenance contract.
3. Duration of warranty, bond or service and maintenance contract.
4. Any interim inspections required and schedule pertaining thereto.
5. Proper procedure in case of failure.
6. Instances that might affect the validity of warranty or bond.
7. Notification requirements applicable.
8. Name and signature of responsible principal issuing the document and address and telephone number.

1.3 TIME OF SUBMITTALS.

A. Make submittal within thirty days after Date of Substantial Completion.

B. For items of work, where acceptance is delayed beyond the Data of Substantial Completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.

GUARANTEE/WARRANTY FOR: _____
(Description of Work)

DATE OF ACCEPTANCE: _____

_____ of _____
(Print Name of Subcontractor and Company)

hereby warrants that all work, materials and equipment associated with the above described scope of work that we have installed in the Oxnard Union High School District- District office Tenant Improvement, in the City of Oxnard, California, are new, unless otherwise specified, and that all work completed is of good quality free from faults and defects and in conformance with the Contract Documents.

If within a period of one (1) year from the date of acceptance of the subject project or designated equipment, by the Owner, or after the Date of Substantial Completion of the work or designated portion thereof, or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, we agree to correct it promptly, along with any adjacent work displaced by doing so or damaged by such defect, after receipt of a written notice from the Owner to do so. This obligation shall survive termination of the Contract.

If we fail to commence compliance with the above paragraph promptly after receipt of written notice from the Owner to do so, or fail to pursue such compliance with diligence, we do hereby authorize the Owner to proceed to have the defects repaired and made good at our sole expense and will pay the cost and charges therefore on demand.

Signed: _____ Date: _____

Printed Name: _____ Company Name: _____

Local Representative to be contacted for Service:

Name: _____

Address: _____

Tel. Number: _____

END OF SECTION

SECTION 054000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Exterior metal stud framing system.
2. Bracing, fasteners and related accessories.
3. Backing for cabinets, toilet grab bars and accessories, ladders and handrails.

B. Related Sections include the following:

1. Structural steel
2. Metal fabrication
3. Interior non-bearing metal framing

1.2 QUALITY ASSURANCE

A. Applicable Code: California Building Code latest edition as adopted by Project's jurisdiction.

B. AISI's 2004's "North American Specification for the Design of Cold-Formed Steel Structural Members" combines Allowable Stress Design (ASD) and Load and Resistance Factor Design (LRFD) methods in one edition and incorporates provisions for screw connections that earlier editions did not. Verify with authorities having jurisdiction if compliance with an earlier edition is required. If so, retain LRFD option and the subparagraph referencing CCFSS Technical Bulletin and insert the date of the edition of AISI specification being referenced. For edition dates, see "Reference Standards" in Evaluations.

C. AISI Specifications: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.

1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

D. Applicable Standards:

1. ASTM specifications as referred to herein by number.
2. AWS as referred to herein by number.

C. All studs shall be marked with the manufacturer's name and gauge size of material.

1.3 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

- A. AISI Specifications: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.
 - 1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."
- B. Applicable Standards:
 - 1. ASTM specifications as referred to herein by number.
 - 2. AWS as referred to herein by number.
- C. All studs shall be marked with the manufacturer's name and gauge size of material.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Studs shall be formed from steel conforming to ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated with a minimum yield of 33,000 psi. Stud sizes and gauges as shown on the drawings. Studs shall be required dead and live loads as indicated in the drawings and code-required lateral loads.
- B. All track, bridging and closures and other accessories shall be formed from steel conforming to ASTM A 1003/A 1003M, with a minimum yield of 33,000 psi.

- C. Bridging, 16 gauge, $\frac{3}{4}$ " deep, cold rolled channels.
- D. All studs, joists, accessories and components shall be formed from steel having a G-60 galvanized coating, conforming to ASTM A1003/A 1003M.
- E. Welding Electrodes: Conform to AWS D1.1, Table 4.1.1.

PART 3 - EXECUTION

3.1 METAL STUD INSTALLATION

- A. Install tracks securely anchored to the structure as detailed. Shim off of structural steel as detailed to achieve vertical alignment within industry tolerances, Butt weld or splice together track butt joints; anchor to common structural member.
- B. Space studs at 16" on center or as otherwise indicated. Studs shall be fabricated full length with no splices permitted. Studs shall be cut accurately to length to seat squarely and to bear on webs of sill and head tracks.
- C. Unless detailed otherwise, all connections of studs at joints between stud and track and at supports and bracing shall be electric arc fusion welds. Welding process, procedures and quality shall conform to AWS Code D1.3. Clean slag from all welds and touch up all welds with a self-curing inorganic zinc-rich primer. Reference product: "A#5686" by Rust-Oleum Corp.; "Tnemec-Zinc 90E-75" by Tnemec Co.
- D. At corners provide not less than 3 studs, located so as to provide surfaces for attachment of all interior and exterior facings.
- E. For framing around door and window openings, install two studs at each jamb, continuous from floor to structure. Weld or tie studs adjacent to frames securely to jamb anchors in frames. Stiffen jack studs over and below opening with bridging located approximately 6" above or below frame and extending approximately 36" beyond jamb on each side. Securely attach jack studs to structure.
- F. Install bridging to provide resistance to bending and rotation where plaster is not on each side. Install at 5 ft. on center.
- G. Provide bracing and bridging as detailed, or as required.
- H. Connections of bridging, bracing, supports and similar conditions shall provide rigid joints capable of withstanding deflections. Augment by doubling studs and the use of gussets or braces as required for rigidity.
- I. Provide for rigidly connecting all blocking, special braces, framing for attachments and support of electrical outlets and plumbing fixtures, and other such equipment requiring support by the metal framing.

- J. Any stud attachment to structural members with fireproofing require the connection to be patched around and totally encased with fireproofing to match the structural members fire protection.

END OF SECTION

SECTION 064100

ARCHITECTURAL CASEWORK

PART - 1 GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Architectural casework, including counters, upper and lower cabinets.

B. Related Work Specified Elsewhere:

1. Sealants and caulking.
2. Stone countertops

1.02 QUALITY ASSURANCE.

A. Applicable Code: California Building Code latest edition.

B. Applicable Standards:

1. Woodwork Institute of California (WIC) Manual of Millwork. All casework delivered to the job shall bear a WIC Certified Compliance Label.

C. SUBMITTALS.

1. Shop Drawings: Submit shop drawings for all casework, identifying location in building, and showing all materials and species, connections, fabrications details, installation details and hardware. Show casework in plan, elevation and section and in scale as required to fully detail work. Front page of shop drawings shall bear the WIC Certified Compliance Label.

D. PRODUCT DELIVERY AND STORAGE.

1. Deliver casework to job only after installation of all plaster, tile and other "wet" work, and when is no danger of damage due to excessive moisture conditions.
2. Store all casework indoors protected from all wet conditions. Maintain temperature at 60 deg. F minimum after delivery of all casework. Protect casework adequately against moisture, dust, paint and other damaging elements prior to and during installation.

PART 2 – PRODUCTS

CASEWORK

- A. Casework shall be wood casework conforming to WIC Manual of Millwork, Section 14, Economy Grade, suitable for base for stone countertops. Casework shall be of the sizes and configurations shown on the drawings.
- B. Refer to Section 09600 for stone countertop requirements.

PART 3 – EXECUTION

3.01 CASEWORK INSTALLATION.

All work shall be assembled at the mill insofar as is practical, in sections and lengths as required to be accessible to locations in the building. Deliver casework to the job ready to set in place.

- B. Install casework plumb and level in accordance with WIC Manual of Millwork Installation Requirements. Shim as necessary using concealed shims.
- C. Anchor wall units securely to wall to obtain loading requirements required by code. Indicate methods on shop drawings.
- D. Accurately scribe and closely fit all face plates, filler strips, and trim strips to irregularities of adjacent surfaces. Caulk as required to provide for complete fit against adjoining surfaces.

END OF SECTION

SECTION 072100
BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Glass fiber building thermal insulation
 - 2. Cavity wall insulation.
 - 3. Concealed building insulation.
 - 4. Exposed building insulation.
 - 5. Rigid Insulation

- B. Related Sections include the following:
 - 1. Roof Framing
 - 2. Gypsum Wallboard

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.

- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

- B. All materials shall be delivered to the job site in their original unopened packages bearing manufacturer's label.

PART 2 - PRODUCTS

2.1 INSULATING MATERIALS

- A. Exterior Walls and Roof: Insulation shall be un-faced fiber glass material in roll or Batt form or as specified in the drawings, complying with ASTM C665, Type III, Class A for concealed application. Material thickness shall be as required for the R-Value shown on drawings. Insulation shall have a maximum flame spread rating of 25, and a maximum smoke density of 450 when tested according to UBC Standard 8-1. Add Type II or FSKF scrim-reinforced foil over un-faced fiberglass batts at open manufacturing and warehouse areas or where otherwise visible.
- B. 4 Layer Multi- cavity layer foil or single layer Type II or FSKF Scrim Reinforced Foil where called out on the plans.
- C. For Rigid Insulation, (exterior furring wall application where required insulation thickness is less than 2 ½"): use Polyiso Foam and Fiberglass Rigid Boards by Celotex or Dow Chemical in thickness and R-value specified on the plans which equals R-6.5 per inch of thickness.
- D. Interior Walls and Ceilings: Use R-11 fiberglass un-faced batts between studs and joists.
- E. Use sound batts or blankets as called for in the plans or where the cavity is less than 3 ½".

PART 3 - EXECUTION

3.1 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.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.
- F. At roof installation: Insert flanged blankets between framing members, vapor barrier facing inward. Where framing spacing permits, flanges shall be stapled to sides of framing members at

each end of batt or rolled along length of flanges at 8 inches o.c. using 9/16-inch staples in a power stapler. Where framing space does not permit stapling of flanges, use 18 gauge wires, stretched between framing as required for proper installation and to permanently prevent insulation from sagging or settling. Avoid gaps or bulges. Fit insulation around penetrations by cutting, not piercing. Insulation shall fit all framing spaces to form a complete insulated blanket, neatly trimmed and snug, with vapor barrier completely sealed.

- G. Where multi layer or single layer is installed, the ends of the foil must be cut back from the edge of trusses at least 2” for air to flow and not be trapped.
- H. Batt insulation to be installed on non furred masonry or concrete walls shall be pinned in place with an appropriate number of pins to prevent sagging or displacement.

END OF SECTION

SECTION 078400

FIRESAFING

PART 1 – GENERAL

1.01 DESCRIPTION.

- A. Work Included:
 - 1. Fire safing insulation.
- B. Related Work Specified Elsewhere:
 - 1. Building insulation.
 - 2. Fireproofing of structural steel.

1.02 QUALITY ASSURANCE

- A. Applicable Code: California Building Code latest edition.
- B. Applicable Standards:
 - 1. American Society for Testing and Materials (ASTM) Specifications as referred to herein by number.

1.03 SUBMITTALS

- A. Submit manufacturer’s product data and specifications for all products proposed for use.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. In order to designate quality required, specifications are based upon HILTI; “Thermafiber Life-Safety Insulation Systems” as manufactured by USG Interiors, Inc or 3M Firesafing assemblies. Other products equal to those specified are acceptable upon written approval by the Architect. Approval is contingent upon acceptance by California State Fire Marshal. Provide written approval by CSFM of materials and construction systems proposed for use.
- B. Safing: Preformed mineral fiber safing insulation conforming to ASTM C665, Type, I, equal to “Thermafiber” Safing Insulation.
- C. Safing clips: Galvanized steel.

PART 3 – EXECUTION

3.01 SAFING INSTALLATION.

- A. Install 4” thick safing in safe-off area between curtain wall insulation and floor slab. Install on safing clips mechanically attached to underside of slab. Space safing clips as required, 24” o.c. maximum with 3 clips per 4 ft. butt. Leave no voids. (Required 1 HR rating at roof and floors).
- B. Cut safing wider, ½” min., than opening to insure compression fit.
- C. Where shown on details or required by approved rating detail, install safing material in slab or wall openings around ducts, piping, cables or other utilities.
- D. Install Firesafing based on HILTI System No. CEJ 246 P (HI/BP 120-01) Perimeter Barrier System -ASTM 2307 between floors, at voids between the curtain wall system and the edge of floor slab.

3.02 INSTALLATION APPROVAL.

- A. All installation details shall conform to manufacturer’s approved details for rating required. Conform to all State Fire Marshal requirements.

END OF SECTION

SECTION 079200

SEALANTS AND CAULKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Caulking specified in this Section includes, but is not necessarily limited to the following major items requiring caulking.
 - 1. Sheet metal work
 - 2. Door frames
 - 3. Aluminum window framing
 - 4. Glass and glazing
 - 5. Joints in concrete, masonry and precast concrete
 - 6. Through penetrations and sealing of rated assemblies
 - 7. EIFS exterior system joints

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
- C. Provide rated exterior wall sealants for 4 hour walls as shown on the drawings.

1.3 QUALITY ASSURANCE

- A. Applicable Code: California Building Code latest edition.
- B. Applicable Standards: Unless noted otherwise, latest edition applies.
 - 1. ASTM Specifications as noted herein by number.
 - 2. Federal Specifications as referred to herein by number.
 - 3. Underwriters laboratory (UL) Through penetration firestop systems as referenced by number.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.

- B. Submit independent laboratory certification that sealants provided conform to all specifications listed and to all testing criteria.
Submit items under each of the various sections under which those materials are used.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Sealant shall be able to be easily applied by caulking gun, putty knife or trowel. Sealant shall not sag or flow when applied in vertical or overhead installations and shall cure under normal temperature conditions to a flexible, firm rubber. Sealants shall be non-staining.
- B. Exterior Joints in Horizontal Wearing and Traffic Surfaces: Two-part self leveling urethane sealant conforming to Fed. Spec. TT-S-00227E, Type I, Class A and ASTM C-920. Reference products:
 1. Sikaflex – 2c, SL.
- C. Tilt-up Concrete Panel Joints: One part non-sag polyurethane sealant conforming to Fed. Spec. TT-S-001543, Type A, non-sag, and ASTM C-920, Type S, Grade NS, Class 25. Must be compatible with Tex-Cote Finish. Reference Product:
 1. Elasto-Thane 230
- D. All other Exterior Joints: Includes perimeters of exterior openings (and interior of exterior openings), expansion and control joints and sheet metal joints and sheet metal to façade joints. Use two part, non-sag polyurethane sealant conforming to Fed. Spec. TT-S-227E, Type II, Class A and ASTM C-920, Type M, Grade NS. Must be compatible to Tex-Cote Finish. Reference product:
 1. Pecora Dynatrol II
 2. Sika-Flex 1-A

3. Elasto-Thane 230

E. Exterior Storefront and Glazing: One part construction grade silicone conforming to TT-S-00230C, Type II, Class A and ASTM C920, Type S, Grade NS. Must be compatible with Tex-Cote finish. Reference product:

1. Dow 795
2. G.E. Ultraglaze 4000
3. Tremco Spectrem 1
4. Sika-Flex 1-A

Use one part, non-sag polyurethane sealant, conforming to Fed. Spec. TT-S-230C, Class A, Type II and ASTM C-920, Type S, Grade NS for fasteners of storefront can and at end dams. Reference product:

1. Pecora Dynatrol I

F. Warehouse Floor Slab Joints: Two part, self-leveling epoxy resin. Reference product:

1. Sikadur 51 SL

G. All Interior Work: One part, construction grade silicone sealant conforming to TT-S-001543A, Class A, and ASTM C-920. Reference products:

1. Pecora 863
2. Dow 999
3. G.E. Construction 1200

H. Fire Resistant: For sealing all penetrations through, and perimeters of, all rated assemblies, use products specially formulated as a fire resistant sealant. Sealant shall be UL listed and approved for use by California State Fire Marshal. Sealant shall be rated according to ASTM E814, for the hourly rating required by surrounding assembly. Use products as referenced in the approved UL details for each through-penetration fire stop system. Reference products:

1. Dow Corning Fire Stop 2000.
2. G.E. RTU 7403.
3. 3M Fire Barrier Caulk CP 25.

When size of the opening preclude use of above specified sealant, use two-part silicone foam penetration type sealant. Foam sealant shall conform with all listings and ratings as required for one part fire resistant sealant. Use damming materials as recommended by manufacturer. Reference products:

1. Dow Corning Fire Stop 2001
2. G.E. RTU 851.

I. Colors as selected by Architect. Colors selected will be required to match or contrast with adjacent material as required.

H. Primer: Provide primers supplied by manufacturer of sealants that have been tested in combination with the sealant for staining and durability.

- K. Filler and Backing: Use non-absorbent, closed cell polyurethane foam, polyethylene foam or butyl, free from oil or other staining elements. Filler and backing materials shall be of compressive nature. Refer to Section 07270 for mineral fiber backing material for rated assemblies.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
- B. Concrete: Cure and dry fresh concrete before primer is applied. Wash away and surface dry alkaline seepage from fresh concrete.
- C. Metal: Remove corrosion by sandblast, wire brush, grinder or chemical corrosion remover. Remove coatings from coated metal surfaces.
- D. Primer: Use primer in accordance with manufacturer's recommendations.
- E. Joint Filler: Provide filler or backing by tightly packing the back of joints over 2 inch in depth with specified material.

3.3 APPLICATION

- A. Apply sealant in accordance with manufacturer's instructions. Apply sealants Internationally smooth and free of wrinkles and tooled sufficiently convex to result in a flush joint when cured.
- B. Firmly press sealant into joint to insure complete wetting of bondage surface.

- C. Caulk around entire perimeter of each opening.
- D. Seal all penetrations of fire-rated assemblies with fire resistant sealant. Conform to approved UL details.
- E. Seal all exterior joints if they constitute a potential source of leakage or weather incursion.
- F. Sealant shall not be used when it becomes too gelled to be discharged in a continuous flow from a gun or when poured. Modification of caulking compound by addition of liquids, solvents or powders is not permitted.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 081400

WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core doors with wood-veneer faces.
- B. Related Sections include the following:
 - 1. Metal Frames
 - 2. Finish Hardware

1.2 QUALITY ASSURANCE

- A. Applicable Code: California Building Code latest edition as adopted by Project's jurisdiction.
- B. Retain one standard below. NWWDA I.S.1-A is less restrictive than AWI or WIC; WIC applies only in California, Nevada, and Oregon. See Evaluations. Review standard selected and coordinate its requirements with options selected.
- C. Applicable Standards: AWI Quality Standards of Architectural Woodwork Institute.
- D. Indicate AWI Quality Standard Grade on all submittals.

1.3 SUBMITTALS

- A. Submit complete manufacturer's product data and specifications for products proposed for use.
- B. Submit sample sections of doors showing stile, rail, veneer and core construction. Mark each sample with manufacturer's name and product designation.
- C. Submit samples for face veneer, minimum 12" x 12" showing full range of stain shades for stain selection. Samples shall have sealer and topcoat applied to ½ of each sample face.
- D. Door supplier shall coordinate information furnished by frame and hardware suppliers, and prepare a complete schedule showing door sizes, opening number, mortising and dimensions prior to fabrication.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

- B. Store doors flat off floor at job prior to installation, in a clean, dry, well ventilated room.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Doors with wood veneer finish: Provide solid core wood doors conforming to the following:
 1. Flush style conform to AWI Quality Standards Section 1300.
 2. Solid core Architectural grade of 5 -Ply Construction
 3. Model: AWI Type PC-5.
 4. Grade: AWI Premium, for transparent finish.
 5. Face: AWI Premium grade veneer, see drawings for cut and wood species.
 6. Core: Mat-formed particle board conforming to latest edition of CS 236, Type I, Density C, Class 1.
 7. Style Edges: Matching hardwood stile edges bonded to core, 1 1/8" minimum after trim.
 8. Crossband: Minimum 1/16" kiln dried poplar.
 9. Rail Edges: Mill option softwood bonded to core, 1 1/8" min. after trim.
 10. Adhesive, Type I.
- B. Provide Underwriter's Laboratories label when required with appropriate fire resistance rating for class of opening indicated. Construction details and hardware application shall be as approved by labeling authorities. Where rating requires, provide doors with mineral core.
- C. Prepare doors at factory to have glazed openings.

2.2 FACTORY FINISHING

- A. Pre-finish all hardwood veneer doors at factory.
- B. Comply with recommendations of AWI Quality Standards Section 1500 for factory finishing of doors using manufacturer's standard finishing system, unless specified otherwise in the drawings. Finish shall comply with the following as minimum.
 1. First Coat: Filler/Stain in color as selected by Architect.
 2. Second Coat: Clear Sealer; Oven dried and sanded.
 3. Third and Fourth Coat: Clear topcoat; oven dried.
 4. Edges: Top and Bottom edges shall be sealed.

2.3 FACTORY FITTING AND MACHINING

- A. Furnish doors that are factory pre-fit to net size required and machined for all hardware requiring routing and mortising.
- B. Pre-fit doors to scheduled frame opening size, tolerance as follows:
 1. Top = 1/8 inch
 2. Width = 1/8 inch

3. Bottom = as detailed or as required by floor condition.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Drill pilot holes for all screws and screw home all screws. Hammer driving is not acceptable. Neatly and accurately drill for and attach surface mounted hardware.
- B. Doors are to operate freely but not loosely, without sticking or binding, without hinge bound conditions and with hardware properly adjusted and functioning.

END OF SECTION

SECTION 085113

INTERIOR ALUMINUM DOOR AND WINDOW FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pre-finished aluminum door frames for interior use.
2. Pre-finished aluminum window frames for interior use.
3. Pre-finished aluminum framing system for interior use.
4. Pre-finished aluminum doors for interior use.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED documentation and requirements
2. Division 08 Section "Glazing" for glass view panels in interior aluminum doors.
3. Division 08 Sections "Flush Wood Doors", "Clad Wood Doors", and "Stile and Rail Wood Doors" for wood doors used in interior aluminum frames.
4. Division 08 Sections "Door Hardware" and "Access Control Hardware" for door hardware used on interior aluminum doors and frames.
5. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on interior aluminum frames.
6. Division 28 Section "Access Control" for access control devices installed at interior aluminum frame openings and provided as part of a security access system

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. AAMA 603.8 - Performance Requirements and Test Procedures for Pigmented Organic on Extruded Aluminum.
2. AAMA 607.1 - Guide Specification and Inspection Methods for Clear Anodized Finishes for Architectural Aluminum.
3. AAMA 608.1 - Guide Specification and Inspections Methods for Electrolytically Deposited Color Anodic Finished for Architectural Aluminum.
4. AAMA 609 & 610-02 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum.

5. ASTM B221 - Standard Specification for Aluminum and Aluminum-alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
6. NAAMM - "Metal Finishes Manual for Architectural and Metal Products".
7. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
8. NFPA 252 - Standard Method of Fire Tests of Door Assemblies.
9. ANSI A117.1 - Accessible and Usable Buildings and Facilities 10. ICC/IBC - International Building Code.

1.2 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- C. Templates: Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the interior aluminum door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- D. Shop Drawings: Include the following:
 1. Frame details for each frame type, including dimensioned profiles.
 2. Locations of reinforcement and preparations for hardware.
 3. Details of each different wall opening condition. Include requirements for steel framing at partitions for fit and securing of frames, partition widths and tolerances, direction of framing members, clips and attachments.
 4. Details of anchorages, joints, field splices, and connections.
 5. Details of accessories.
 6. Details of moldings, removable stops, and glazing.
 7. Elevations of each door design.
 8. Details of doors, including vertical and horizontal edge details.
 9. Details of preparations for power, signal, and control systems.
- E. Samples for verification: Provide, at the request of architect, prepared Samples as indicated below:
 1. Framing Member: 12 inches long
 2. Corner Fabrication: 12-by-12-inch-long, full size window corner, including full-size sections of extrusions with factory-applied finish.
 3. Aluminum chips in full range of manufacturer's standard finishes for architect's color selection.

F. Interior Aluminum Door and Frame Schedule: Use same designations indicated on Drawings. Coordinate with Door Hardware schedule and glazing.

G. Informational Submittals:

1. LEED Documentation: Submit manufacturer's environmental documentation and applicable sustainability program credits for MR-4 and that are specified herein.
2. Certificates of Compliance: Submit any product test report or information necessary to indicate compliance with this specification section.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain aluminum frames and doors through one source from a single qualified manufacturer.
- B. Manufacturer Qualifications: A firm experienced in the manufacturing of interior aluminum framing systems and doors with a minimum five (5) years successful in-service performance providing product similar to those indicated, including pre-engineering and pre-fabricating all components of aluminum framing systems and doors.
- C. Installer Qualifications: An experienced installer with a minimum five (5) years experience who has completed aluminum framing systems and door installations similar in material, design, and extent to those indicated and whose work has resulted in construction with a record of successful in-service performance.
- D. Aesthetic Effects: 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. Fire Rated Assemblies: In locations where fire-rated openings are scheduled or required by regulatory agencies, provide fire-rated aluminum frames that have been tested and certified for specified exposure by an agency acceptable to governing authorities.
 1. Provide labels permanently fastened on each frame that is within size limits established by NFPA and the testing authority.
 - a. Provide 20-minute labels.
 - b. Provide 90-minute labels.
 - c. Provide labels for openings as scheduled on the drawings.
- F. Pre-Installation Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing interior aluminum frames and doors and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver interior aluminum frames and doors individually protective wrapped within cartons and marked for the corresponding scheduled opening. Do not bulk pack frames.
- B. Inspect frames upon delivery for damage.
 - 1. Repair minor damage to pre-finished products as recommended by Manufacturer.
 - 2. Replace frames that cannot be satisfactorily repaired.
- C. Store Interior aluminum frames and doors at Project site under cover and as near as possible to final installation location. Do not use covering material that will cause discoloration of aluminum finish.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of interior aluminum frame openings by field measurements before fabrication and indicate measurements on Shop Drawings submittals.
- B. Do not begin installation of aluminum frames and doors until area of work has been completely enclosed and interior is protected from the elements.
- C. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy standards. If necessary, provide artificial heating, cooling, and ventilation to maintain required environmental conditions.

1.6 WARRANTY

- A. Provide manufacturer's written warranty against defects in materials and workmanship upon final completion and acceptance of Work in this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

Western Integrated Materials, Inc.
3310 E. 59TH St., Long Beach, CA 90805
Telephone: 562-634-2823
Fax: 562-634-8449
Web Site: www.western-integrated.com

- B. Substitutions: Material from alternate interior aluminum framing system and door fabricators will not be accepted without prior written and sample approval in accordance with requirements specified in Division 01 and at the discretion of Architect and their designated openings consultant.

2.2 MATERIALS

- A. Extruded Aluminum: Controlled ASTM B221 alloy billets of 6063-T5, to assure compliance with tight dimensional tolerances and maintain color uniformity.
- B. Recycled Content of Aluminum Products: Post consumer recycled content plus pre consumer recycled content not less than 50 percent.
- C. Extruded Aluminum Frames - Provide interior aluminum framing components complying with dimensions, profiles, finish, and relationships to adjoining work of components as indicated on Drawings. Provide frames that are fitted for partition types and throat openings meeting the throat opening and required clearances per frame manufacturer's recommendations. Reinforce for specified hinges, strikes, closers, and other hardware as required.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify wall thickness does not exceed standard tolerance of $\pm 1/16''$.
- C. General Contractor to verify the accuracy of dimensions given to frame and door manufacturer for pre-cut openings.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install and set interior aluminum frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions
 - 1. At fire-protection-rated openings, install frames according to NFPA 80,
- B. Install frame components in the longest possible lengths with no component less than 48 inches.
 - 1. Fasten to suspended ceiling grid at 48 inches on center maximum, using #6 sheet metal screws or other fasteners approved by frame manufacturer.
 - 2. Use concealed installation clips to produce tightly fitted and aligned splices and connections.

3. Secure clips to extruded main-frame components and not to snap-in or trim members.
4. Do not use screws or other fasteners exposed to view when installation is complete

3.2 ADJUSTING AND CLEANING

- A. Final adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition.
- B. Clean exposed frames promptly after installation, using cleaning methods recommended by frame manufacturer and according to AAMA 609 & 610.
- C. Touch up marred areas so that touch-up is not visible from a distance of 48 inches. Remove and replace frames that cannot be satisfactorily adjusted.

3.3 PROTECTION

- A. Provide protection required to assure that frames and doors will be without damage or deterioration upon substantial completion of the project.

END OF SECTION

SECTION 087100

DOOR HARDWARE

Part 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Door Hardware, including electric hardware.
 - 2. Storefront and entrance door hardware.
 - 3. Power supplies for electric hardware.
 - 4. Cylinders for doors fabricated with locking hardware.

- B. Related Sections:
 - 1. Section 06200 - Finish Carpentry: Finish Hardware Installation.
 - 2. Section 07900 - Joint Sealers – exterior thresholds.
 - 3. Section 08100 - Metal Doors and Frames.
 - 4. Section 08200 - Wood and Plastic Doors.
 - 5. Section 08300 - Special Doors.
 - 6. Section 08400 - Entrances and Storefronts.
 - 7. Section 16722 - Fire/Life-Safety System.

- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.
 - 1. Windows.
 - 2. Cabinets, including open wall shelving and locks.
 - 3. Signs.
 - 4. Toilet accessories, including grab bars.
 - 5. Installation.
 - 6. Rough hardware.
 - 7. Access doors and panels, except cylinders where detailed.

1.2 REFERENCES:

- A. Use date of standard in effect as of Bid date.
- B. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
- C. ANSI A117.1 – Specifications for making buildings and facilities usable by physically handicapped people.
- D. ADA – Americans with Disabilities Act of 1990
- E. BHMA – Builders Hardware Manufacturers Association
- F. DHI – Door and Hardware Institute
- G. NFPA – National Fire Protection Association
 - 1. NFPA 80 – Fire Doors and Windows
 - 2. NFPA 101 – Life Safety Code
 - 3. NFPA 105 – Smoke and Draft Control Door Assemblies
 - 4. NFPA 252 – Fire Tests of Door Assemblies

1.3 SUBMITTALS & SUBSTITUTIONS

- A. SUBMITTALS: Provide quantity of submittals as described in Submittal Section 013300. Organize vertically formatted schedule into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
- B. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.
- C. No substitutions are allowed for Door Hardware Section
- D. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, wiring/riser diagrams, manufacturers’ installation, adjustment and maintenance information, and supplier’s final inspection report.

1.4 QUALITY ASSURANCE:

- A. Qualifications:
 - 1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.
 - (1) Responsible for detailing, scheduling and ordering of finish hardware.
- B. Hardware: New, free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.
- C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C / UBC Standard 7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.
 - 1. Note: scheduled resilient seals may exceed selected door manufacturer’s requirements.
 - 2. See 2.6.E for added information regarding resilient and intumescent seals.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Delivery: coordinate delivery to appropriate locations (shop or field).
 - 1. Permanent keys and removable cores: secured delivery direct to Owner’s representative.
- B. Acceptance at Site: Items individually packaged in manufacturers’ original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

- C. Storage: Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc...

1.6 PROJECT CONDITIONS:

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical as the same operation and quality as type specified, subject to Architect's approval.

1.7 SEQUENCING AND COORDINATION:

- A. Conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
- B. Furnish manufacturer templates to door and frame fabricators.
- C. Use hardware consultant to check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.
 - 1. Confirm that door manufacturers furnish necessary UBC-7-2 compliant seal packages.

1.8 WARRANTY:

- A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' warranties:
 - 1. Closers: Ten years mechanical.
 - 2. Exit Devices: Five years.
 - 3. Hinges: Life of Building.
 - 4. Manual Surface Door Closer Bodies Twenty Five years.
 - 5. Locks Latches Ten years
 - 6. Cylindrical Heavy Duty Locks Latches Seven years

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Listed manufacturers as listed below. All hardware shall be Heavy Duty rated, Grade 1 products only. No substitutions allowed.

ITEM:	MANUFACTURER:
Hinges	McKinney ASSA ABLOY
Door Closers	Rockwood Products ASSA ABLOY
Key System	Corbin Russwin (RU)
Cylindrical Locksets	Corbin Russwin (RU) CL3300 Series
Mortise Lockset	Corbin Russwin (RU) ML2000 Series
Multi-Point Lockset	Corbin Russwin (RU) FE6600 Series

Push Rail Exit Devices	Corbin Russwin (RU) ED4000/ED5000S Series
Auto Flush Bolts Surface Bolts	Rockwood Products ASSA ABLOY
Push & Pull Plates	Rockwood Products ASSA ABLOY
Kickplates	Rockwood Products ASSA ABLOY
Stops	Rockwood Products ASSA ABLOY
Overhead Stops	Rockwood Products ASSA ABLOY
Thresholds	Pemko Products ASSA ABLOY
Seals & Bottoms	Pemko Products ASSA ABLOY

- B. Provide hardware items required to complete the work in accordance with these specifications and manufacturers' instructions.
1. Include items inadvertently omitted from this specification that are shown in the door schedule. Submit items from the same list of manufacturers as listed above. Note these items in submittal for review.
 2. Where scheduled item is now obsolete, bid and furnish manufacturers updated item at no additional cost to the project.

2.2 HANGING MEANS:

- A. Conventional Hinges: Hinge open widths minimum, but, of sufficient throw to permit maximum door swing. Steel or stainless steel pins and concealed bearings.
1. Three hinges per leaf to 7 foot, 6 inch height. Add one for each additional 30 inches in height, or any fraction thereof.
 2. Extra heavy weight hinges on doors over 3 foot, 5 inches in width.
 3. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins.
 4. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
 5. Provide shims and shimming instructions for proper door adjustment.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

- A. Mortise Locksets and Latchsets: as scheduled.
1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
 2. Latchbolts: $\frac{3}{4}$ inch throw stainless steel anti-friction type.
 3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
 - a. Spindles: security design independent break-away. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
 4. Thumbturns: accessible design not requiring pinching or twisting motions to operate.
 5. Deadbolts: stainless steel 1-inch throw.
 6. Electric operation: Manufacturer-installed continuous duty solenoid.
 7. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.

8. Certifications:
 - a. ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
 - b. ANSI/ASTM F476-84 Grade 31 UL Listed.

2.4 EXIT DEVICES/PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through touch pad design. No exposed touch bar fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. ¾" throw deadlocking latchbolts.
4. No exposed screws to show through glass doors.
5. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
6. Releasable with 32 lb. maximum pressure under 250 lb. load to the door.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: Breakaway type, forged brass or bronze escutcheon min .130" thickness, match lockset lever design.
3. Rod and latch guards with surface vertical rod devices.
4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware".

2.5 CLOSERS

- ### A. General: One manufacturer for closer units throughout the Work, including surface closers, high security closers, overhead concealed closers, floor closers, low-energy door operators and electromagnetic hold-open closers.

B. Surface Closers:

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.
4. Thru-bolts and wood doors unless doors are provided with closer blocking. Non-sized and adjustable. Place closers inside building, stairs and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Opening pressure: Exterior doors 8.5 lb., interior doors 5 lb., labeled fire doors 15 lb.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.

10. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to -30 degrees F, furnish data on request.
11. Non-flaming fluid will not fuel door or floor covering fires.

C. Floor Closers: See 2.2: HANGING MEANS.

2.6 OTHER HARDWARE

- A. Automatic Flush Bolts: Low operating force design.
- B. Overhead Stops: Stainless steel (100 & 410 series). Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- C. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.
- D. Door Stops: Provide stops to protect walls, casework or other hardware.
 1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.
- E. Seals: Finished to match adjacent frame color. Resilient seal material: polypropylene, nylon brush, or solid high-grade neoprene. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability.
 1. Proposed substitutions: submit for approval.
 2. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.
 3. Non-corroding fasteners at in-swinging exterior doors.
 4. Fire-rated Doors, Resilient Seals: UL10C / UBC Standard 7-2 compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
 5. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C / UBC Standard 7-2. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required. Adhesive-applied intumescent strips are not acceptable, use concealed-in-door-edge type or kerfed-in-frame type.
- F. Thresholds: As scheduled and per details.
- G. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

2.7 FINISH:

- A. Generally BHMA 625 Polished.

1. Areas using BHMA 625 to have push-plates, pulls and protection plates of BHMA 629, Polished Stainless Steel, unless otherwise noted.
- B. Door closers: factory powder coated to match other hardware, unless otherwise noted.
- C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

2.8 KEYING REQUIREMENTS:

- A. Key System: Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers. Initiate and conduct meeting(s) with Owner to determine system keyway(s) and structure, furnish Owner's written approval of the system.
 1. New factory registered master key system.
 2. Non-I.C. construction keying: inserted type partial key. At substantial completion, remove inserts in Owner's presence; demonstrate consequent non-operability of construction key. Give all removed inserts and all construction keys to Owner.
 3. Furnish 10 construction keys.
 4. Furnish 2 construction control keys.
 5. Furnish 1 extractor tool.
 6. Re-key entire project at no extra expense to Owner if missing construction keys.
- B. Key Cylinders: utility patented, 7-pin solid brass construction.
- C. Locks and cylinders: keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer. Provide removable cores.
- D. Permanent keys: secured shipment direct from point of origination to Owner.
- E. Billing List: Secured shipment direct from point of origination to Owner upon completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

- A. Factory trained, certified, and carries a factory-issued card certifying that person as a "Certified Installer". Alternative: can demonstrate suitably equivalent competence and experience.

3.2 PREPARATION:

- A. Ensure that walls and frames are square and plumb before hardware installation.

- B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
 - 1. Notify Architect of any code conflicts before ordering material.
 - 2. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

3.3 INSTALLATION

- A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.
 - 1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
 - 2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
- B. Locate floor stops not more than 4 inches from the wall.
- C. Drill pilot holes for fasteners in wood doors and/or frames.
- D. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4 ADJUSTING

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
 - 1. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner's satisfaction.
- B. Inspection: Use hardware supplier. Include suppliers with closeout documents.
- C. Follow-up inspection: Installer to provide letter of agreement to Owner that approximately 6 months after substantial completion, installer will visit Project with representatives of the manufacturers of the locking devices and door closers to accomplish following:
 - 1. Re-adjust hardware.
 - 2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.
 - 3. Identify items that have deteriorated or failed.
 - 4. Submit written report identifying problems and likely future problems.

3.5 DEMONSTRATION:

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- A. Demonstrate electrical and electronic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING:

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.
- B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

END OF SECTION 08710

SECTION 088000

GLASS AND GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Glazed curtain walls.
 - 4. Glazed entrances.
 - 5. Storefront framing.
- B. Related Sections include the following:
 - 1. Division 8 Section "Aluminum Storefront Framing"
 - 2. Division 7 Section "Sealants and Caulking."

1.2 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.
- B. Thermal Movements: Provide glazing that allows for thermal movements resulting from the maximum change in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1.3 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated in the drawings.
- B. Samples: Provide for each glass products, in the form of 12-inch-square Samples for glass with each piece clearly labeled with name of project, name of manufacturer and grade or quality and thickness and energy performance data.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Glass: Obtain glass from one primary-glass manufacturer.
- B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.6 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS MATERIAL AND MANUFACTURER

- A. Vision Glass: Front Entry Vision Glass shall be Solarban 90 (2) clear + clear insulating glass unit; Field Vision Glass shall be Solarcool (2) Bronze Glass + Solarban 60 (3) coated insulating glass unit, or Architect's approved equal. Refer also to drawings for product and color selection. Glass shall be 1" thick with ¼" tinted exterior glass, then ½" air space then ¼" clear glass with low E coating. Glass shall have the following properties or as specified in the drawings Mechanical Title 24.
- B. Spandrel Glass: Where indicated on drawings, use spandrel glass consisting of exterior vision glass as specified above consistent with the glass adjacent to it with an opacifier film applied to the back surface.
- C. Tempering: Glass shall be tempered where shown on the drawings and where required by the Building Code and the Consumer Products Safety Commission, and local ordinance.
- D. Gaskets, Block and Spacers shall be Neoprene.
- E. Caulking shall comply with Sealants and Caulking Section.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications. Glass shall not become load bearing.
- B. Finish edges of glass in manner best suited for particular applications involved. Conform to manufacturer's requirements.

END OF SECTION

SECTION 092100
GYPSUM WALLBOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Gypsum drywall construction.
2. Joint and corner reinforcing.
3. Drywall accessories, including access panels.
4. Installation of access doors.

B. Related Work Specified Elsewhere:

1. Metal framing and furring.
2. Painting.
3. Furnishing access doors by trades requiring same.

1.2 QUALITY ASSURANCE

A. Applicable Code California Building Code latest edition as adopted by Project's jurisdiction.

B. Standards: Unless noted otherwise, latest edition, issue or revision applies.

1. Conform to Gypsum Association Recommended Specifications for Application and Finishing of Gypsum Board and Levels of Gypsum Board Finish.
2. American Society for Testing and Materials (ASTM) Specifications as referred to herein by number.

1.3 SUBMITTALS

A. Submit manufacturer's printed data and specifications for all materials proposed for use.

1.4 PRODUCT DELIVER, STORAGE AND HANDLING.

A. All materials shall be delivered in the original packages, containers, or bundles, bearing the brand name and name of manufacturer.

B. All materials shall be kept dry and shall be stored in enclosed areas under roof and fully protected by weather. Do not use gypsum board that has been damaged by water.

C. Gypsum board shall be neatly stacked flat avoiding undue sagging or damage to edges, ends and surfaces.

PART 2 – PRODUCTS**2.1 MATERIALS.**

- A. Water-resistant Gypsum Wallboard: Conform to ASTM C-630 with moisture resistant core and chemically treated paper; use 5/8 inch thick, tapered edge. For use at walls in toilet rooms and janitors room. Do not use for ceilings. Fire rated type “x” green board when specified to be fire walls.
- B. Fire Retardant Gypsum Wallboard: Gypsum board shall be 5/8-inch, tapered edge, mill fabricated, Type “X”, fire retardant, conforming to ASTM C-36 Use square edge panels for base layer of two layer application. For all uses except where shown to be water resistant.
- C. Gypsum Sheathing Board: Conform to ASTM C79 with treated core for fire rating. Use 5/8” thick with square edge. Provide with water-repellant paper.
- D. Fasteners: 1-1/4” Type “S” drywall screws.
- E. Corner Beads, Casing Beads and Edge Trim: Standard wallboard accessories, manufactured or galvanized steel with perforated flanges. Use Fast Mask drywall edge trim where drywall abuts window mullions or other hard finished surfaces.
- F. Joint Treatment Materials: Joint tape, adhesive, or compounds, as manufactured and recommended by the wallboard manufacturer, conforming to ASTM C-475.
- G. Access Doors: Specially designed for use in drywall construction and shall be fabricated from 16 gauge min. cold-rolled steel. Provide with concealed hinge and flush lock. Access doors shall have factory prime painted, except in toilet rooms provide satin stainless steel finish. Where construction requires, provide with fire rating.

PART 3 – EXECUTION**3.1 WALLBOARD APPLICATION.**

- A. Cut or saw all openings; do not score or punch. Sand cut edges and ends where necessary to obtain neat joining when wallboard is erected. Stagger joints in the board with abutting ends occurring over supports. To minimize end joints, use wallboard sheets of maximum practical lengths. Arrange joints on opposite sides of partition to occur on different studs.
- B. Fasteners: Space fasteners at 12” o.c. in the field and 8” o.c. staggered along abutting edges. While fasteners are being driven, hold the wallboard in firm contact with the underlying support. Proceed from the central portion of the wallboard toward ends and edges. Drive home with heads slightly below wallboard surface in a dimple formed by the fasteners head. Take care to avoid breaking the paper face. Fasteners shall be placed not closer than 3/8” from ends or edges of wallboard.

3.2 JOINT TREATMENT.

- A. Field Joints: Apply tape properly either by applying compound to joint and pressing in tape, or by mechanical tool designed for the process. Apply the second coat, extending the compound to least 3” beyond the joint centerline. Draw down to a smooth even plane. After drying, sand as needed to eliminate any high spots or excessive compound. Apply third coat, feathering joint treatment compound edges approximately six inches from center of joint. After drying, sand joints to leave a smooth even surface. Do not raise nap of paper when sanding.
- B. Fasteners: Cover fastener heads with three successive coats, each applied at a different direction. Apply as specified for field joints.
- C. Inside Angles: Treat inside corners and angles as for field joints, except fold the tape in the middle to provide a clean sharp corner, fully embedded.
- D. Outside Angles: Use metal corner beads and accessories standard with the wallboard manufacturer set in and finished with adhesive as for joints.
- E. Intersections with Other Materials: Where gypsum board abuts masonry and other materials, trim edge with metal trim.

3.3 GYPSUM BOARD FINISH.

- A. Gypsum Board shall be finished to the following levels according to Gypsum Association Recommended Specifications:
 - 1. Level 1: Concealed areas above ceilings; shafts; areas not visible in the finish work. Note: Where fire rating is required, conform to details of construction as required by approved fire-rated assemblies.
 - Level 3: Tile Substrate.
 - Level 5: All areas exposed to view in the finish work and to be painted.

3.4 ACCESS DOORS

- A. Install access panels in gypsum board walls and ceilings. Coordinate location with installation requiring the access panels. Bring to the attention of the Architect any discrepancies, lack of adequate clearance, interferences with cabinetwork, lighting fixtures, etc., for final decision by the Architect.
- B. Check access panels at the end of the job for proper opening and closing, and, if damaged, repair or replace as necessary.

3.5 MECHANICAL, PLUMBING AND ELECTRICAL WORK.

- A. Coordinate with mechanical, plumbing and electrical trades in the location and installation of their work. Provide bridging, bracing and backing to support their work installed in or on drywall construction. Do not close both faces of walls until their installations have been inspected and approved.

END OF SECTION

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SECTION 093013

CERAMIC TILE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Ceramic floor tile.
2. Ceramic wall tile.

B. Related Work Specified Elsewhere:

1. Gypsum drywall backing.
2. Concrete finishes.
3. Prefabricated shower stalls

1.2 QUALITY ASSURANCE

A. Applicable Codes: California Building Code, latest edition.

B. Standards: Unless noted otherwise, latest edition or revision applies.

1. American Society for Testing and Materials (ASTM) as referred to herein by number.
2. American National Standards Institute (ANSI) Specifications as referred to herein by number.
3. Tile Council of America (TCA) "Handbook for Ceramic Tile Installation."

C. Provide a Master Grade Certificate bearing the certification mark of Tile Council with each carton of tile.

1.3 SUBMITTALS

A. Submit manufacturer's printed data and specifications for all material proposed for use.

B. Submit samples of tile showing full range of manufacturer's colors, textures and finishes. Samples shall be marked with manufacturer's name and color designation.

1.4 PRODUCT DELIVERY, STORAGE & HANDLING.

- A. Deliver all products to jobsite in manufacturer's unopened cartons and containers with manufacturer's label and product designation intact.
- B. Store all tile cartons in a dry place.

PART 2 – PRODUCTS

2.1 MATERIALS.

- A. General: All ceramic tile shall meet or exceed the requirements of ANSI 137.1.
- B. Wall and Floor Tile: Refer to finish schedule for product designation, size, color and pattern designations and locations.
- C. Trim Tiles: Shall be of the type appropriate for the specified installation method. Trim size, color and shade shall match field tile. All exterior corners, jambs and closings to other surfacing materials shall use the proper trim units to complete a finished installation such as cove or bullnose units.
- D. Grout: Factory manufactured, non-shrinking, uniformly colored, latex Portland cement grout, conforming to ANSI A118.6.
- E. Latex – Portland Cement Mortar: Conform to ANSI 118.4.
- F. Sealer: For grout at all toilet and shower floors: Standard manufacturer sealer for tile grout equal to Hydroment "Grout Seal" as manufactured by Bostik (800)523-6530.
- G. Threshold: Solid marble in color as selected. Provide in shape as detailed; use single piece with no joints at each threshold.
- H. Provide extra amount of tile materials.

PART 3 – EXECUTION

3.1 INSPECTION.

- A. Inspect concrete slab to insure that no flooring materials or adhesives remain. Verify that curing compound were not used or have been completely removed.
- B. Inspect stud walls to insure proper installation, suitable for tile.

3.2 INSTALLATION - GENERAL

- A. General: Layout tile so field of pattern is exactly centered so that maximum size border tile may be used. Do cutting along outer edges. Cut and drill without

marring tile; smooth edges with fine stone. Fit carefully around pipes, outlets and similar items so cover plates or trim will cover cut holes.

- B. Wall Tile: Install wall tile over gypsum wallboard in accordance with ANSI A108.5 according to TCI Installation Method W243.
- C. Floor Tile: Thin Set Over Concrete Slabs: Install in accordance with ANSI 108.5 according to TCI Installation Method F113.
- D. Grout: Conform to ANSI 108.10. Grout tile flush with face of tile making a neatly finished surface even with top edge of the tile. Force grout into joints and compact at least three-quarters of joint depth or until it meets bond coat.
- E. Caulk around penetrations through tile using caulking compound compatible with grout color.
- F. Threshold: Place threshold in accordance with TCA Installation Method TR611, using specified mortar as bond coat. Provide 100% coverage of bonding material between threshold and floor.

3.3 CLEANING.

- A. Remove surplus mortar and clean tile. Use neutral cleaners as recommended by the tile manufacturer.
- B. After final cleaning allow tile to stand for a minimum of three days for curing of the grout. During this period, the traffic way shall be closed and no traffic allowed on the floor during this time.
- C. Seal all grout at toilet room floors. Conform to sealer manufacturer's recommendations.

END OF SECTION

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SECTION 095100

ACOUSTICAL CEILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes

1. Acoustical ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Related Sections

1. Section 09 51 00 - Acoustical Ceilings
2. Section 09 51 13 - Acoustical Fabric-Faced Panel Ceilings
3. Section 09 53 00 - Acoustical Ceiling Suspension Assemblies
4. Section 09 20 00 - Plaster and Gypsum Board
5. Section 01 81 13 - Sustainable Design Requirements
6. Section 01 81 19 - Indoor Air Quality Requirements
7. Section 02 42 00 - Removal and Salvage of Construction Materials
8. Divisions 23 - HVAC Air Distribution
9. Division 26 - Electrical

C. Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.

2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition,

color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
9. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material
 - A. Armstrong Fire Guard Products
10. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
11. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
12. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
13. ASTM E 1264 Classification for Acoustical Ceiling Products

B. International Building Code

C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

D. NFPA 70 National Electrical Code

E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

G. International Code Council-Evaluation Services Report - Seismic Engineer Report

1. ESR 1308 - Armstrong Suspension Systems

H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report

1. 0244 - Armstrong Single Span Suspension System

I. California Department of Public Health CDPH/EHLB Emission Standard Method Version 1.1 2010

J. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings

K. International Well Building Standard

L. Mindful Materials

M. Living Building Challenge

N. U.S. Department of Agriculture BioPreferred program (USDA BioPreferred).

1.4 SYSTEM DESCRIPTION

Continuous/Wall-to-Wall

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.

D. Acoustical Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

a. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 SUSTAINABLE MATERIALS

Transparency: Manufacturers will be given preference when they provide documentation to support sustainable requirements for the following: Material ingredient transparency, Removal of Red List

Ingredients per LBCV3, Life Cycle impact information, Low-Emitting Materials, and Clean Air performance.

1. Health Product Declaration. The end use product has a published, complete Health Product Declaration with disclosure at a minimum of 1000ppm of known hazards in compliance with the Health Product Declaration open Standard.
2. Declare Label. The end use product has a published Declare label by the International Living Future Institute with disclosure of 100 ppm with a designation of Red List Free or Compliant (less than 1% proprietary ingredients).
3. Low Emitting products with VOC emissions data. Preference will also be given to manufacturers that can provide emissions data showing their products meet CDHP Standard Method v1.1 (Section 01350).
4. Life cycle analysis. Products that have communicated lifecycle data through Environmental Product Declarations (EPDs) will be preferred.
5. End of Life Programs/Recycling: Where applicable, manufacturers that provide the option for recycling of their products into new products at end-of-life through take-back programs will be preferred.
6. Products meeting LEED V4 requirements including:

Storage & Collection of Recyclables

Construction and Demolition Waste Management Planning

Building Life-Cycle Impact Reduction

Building Product Disclosure and Optimization Environmental Product Declarations

Building Product Disclosure and Optimization Sourcing of Raw Materials

Building Product Disclosure and Optimization Material Ingredients

Construction and Demolition Waste Management

1.7 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

2. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

3. Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory

B. Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.8 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 a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.9 PROJECT CONDITIONS

A. Space Enclosure:

Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

HumiGuard Max Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Ceilings with HumiGuard Max performance can be installed in conditions up to 120°F (49°C) and maximum humidity exposure including outdoor applications, and other standing water applications, so long as they are installed with either SS Prelude Plus, AL Prelude Plus, or Prelude Plus Fire Guard XL suspension systems. Products with HumiGuard Max performance can be installed in exterior applications, where standing water is present, or where moisture will come in direct

contact with the ceiling. Only Ceramaguard with AL Prelude Plus suspension system can be installed over swimming pools.

1.10 ALTERNATE CONSTRUCTION WASTE DISPOSAL

A. Ceiling material being reclaimed must be kept dry and free from debris.

B. Contact the Armstrong Recycle Center a consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant will provide assistance to facilitate the recycling of the ceiling.

C. Recycling may qualify for LEED Credits:

a. LEED 2009 - Category 4: Material and Resources (MR)

i. Credit MRc2: Construction Waste Management

b. LEEDv4 - MRp2 - Construction Waste Management Planning Qualifies as a material stream (non-structural) targeted for diversion. Ceilings will be source-separated and diverted through the Armstrong Ceiling Recycling Program.

c. LEEDv4-MRc5 -

i. Option 1: Divert ceilings to qualify for one of the 3 material streams (50%)

ii. Option 2: Divert ceilings to qualify for one of the 4 material streams (75%)

1.11 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping

2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Acoustical panels: Ten (10) years from date of substantial completion

2. Suspension: Ten (10) years from date of substantial completion

3. Ceiling System: Thirty (30) years from date of substantial completion

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.12 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. Armstrong World Industries, Inc.

B. Suspension Systems:

1. Armstrong World Industries, Inc.

C: Perimeter Systems

1. Armstrong World Industries, Inc.

2.2.1 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type AP

1. Surface Texture: Fine

2. Composition: Mineral Fiber

3. Color: White

4. Size: 24 in x 24 in

5. Edge Profile: Armstrong Dune Tegular or approved equivalent.

6. Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.50

7. Ceiling Attenuation Class (CAC) : ASTM C 1414; Classified with UL label on product carton 35

8. Sabin:N/A

9. Articulation Class (AC):
10. Flame Spread: ASTM E 1264; Class A (UL)
11. Light Reflectance (LR) White Panel: ASTM E 1477; 0.83
12. Dimensional Stability: HumiGuard Plus
13. Recycle Content: Post-Consumer - 1% Pre-Consumer - 40%
14. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
15. Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD)
16. Acceptable Product: DUNE Second Look, 2711 No added formaldehyde as manufactured by Armstrong World Industries

2.3.1 METAL SUSPENSION SYSTEMS

A. Components:

Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

- a. Structural Classification: ASTM C 635 Heavy Duty duty
- b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
- c. Sustainability: Environmental Product Declaration (EPD), Health Product Declaration (HPD)
- d. Acceptable Product: 24" x 24" Armstrong Silhouette XL 9/16 Bolt Slot Grid with 1/4" reveal grid as manufactured by Armstrong World Industries or approved equivalent.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three times design load, but not less than 12 gauge.

D. Edge Moldings and Trim:

1. 7800 - 12' Wall Molding

E. Accessories:

1. 5594 - Compression Strut
2. 6091 - Safety Cable
3. 7126 - Spreader Hold Down
4. 7127 - Snap-in Access Tool
5. 7129 - Torsion Spring Hook Access Tool

6. 7130 - Torsion Spring Suction Access Tool

7. 7425 - Stabilizer Bar

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

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. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions.

B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight.

D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. 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. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

C. Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant will provide assistance to facilitate the recycle of the ceiling.

SECTION 096500

RESILIENT FLOOR TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Solid vinyl floor tile.
- 2. Rubber floor tile.
- 3. Vinyl composition tile (VCT).
- 4. Resilient wall base and accessories.

- B. Related Sections include the following:

- 1. Division 9 Section "Resilient Athletic Flooring" for resilient floor tile for use in athletic-activity or support areas.
- 2. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base, reducer strips, and other accessories installed with resilient floor tile.
- 3. Division 9 Section "Linoleum Floor Coverings" for linoleum floor tile.
- 4. Division 9 Section "Static-Control Resilient Floor Coverings" for resilient floor tile designed to control electrostatic discharge (ESD).

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
 - 1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
- D. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 - 2. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products listed in other Part 2 articles.

- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

- A. Colors and Patterns: As indicated in the drawings.

2.3 SOLID VINYL FLOOR TILE

- A. Solid Vinyl Floor Tile: ASTM F 1700.
 - 1. Armstrong World Industries, Inc.; as indicated in the drawings
- B. Class: As indicated by product designations.
- C. Type: as indicated in the drawings.
- D. Thickness: Per manufacturer's
- E. Size: as indicated in the drawings
- F. Fire-Test-Response Characteristics:
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.4 RUBBER FLOOR TILE

- A. Rubber Floor Tile: ASTM F 1344.
 - 1. As indicated in the drawings
- B. Fire-Test-Response Characteristics:
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.5 VINYL COMPOSITION TILE

- A. Vinyl Composition Tile (VCT): ASTM F 1066.
 - 1. As indicated in the drawings
- B. Class: As indicated by product designations.
- C. Wearing Surface: As indicated by product designations.
- D. Thickness: As indicated by product designations.
- E. Size: As indicated on the drawings.

F. Fire-Test-Response Characteristics:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.6 RESILIENT WALL BASE

- A. Wall Base: ASTM F 1861. As indicated in the drawings.

2.7 RESILIENT STAIR ACCESSORIES

- A. Treads: FS RR-T-650. As indicated in the drawings.
- B. Stringers: Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- C. Fire-Test-Response Characteristics:
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.8 RESILIENT MOLDING ACCESSORY

- A. Description: As indicated in the drawings.

2.9 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
- C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. 24 hours or per manufacturer's recommendation, whichever is more stringent.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated.
- 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 in pattern of colors and sizes indicated.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.
- G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION

SECTION 096800

CARPET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Woven carpet.
 - 2. Carpet cushion.
 - 3. Carpet Tile
- B. Related Sections include the following:
 - 1. Adhesives

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet: 12-inch square Sample.
 - 2. Exposed Edge Stripping and Accessory: 12-inch long Samples.
 - 3. Carpet Cushion: 6-inch square Sample.
- C. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.
- D. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. **Fire-Test-Response Characteristics:** Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. **Product Options:** Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Substitutions."
- D. **Mockups:** Before installing carpet, install mockups for each type of carpet installation required to demonstrate aesthetic effects and qualities of materials and execution. Install 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 and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Remove mockups when directed.
 - 7. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **General:** Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. **General:** Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."
- B. **Environmental Limitations:** Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Special Carpet Cushion Warranty: Written warranty, signed by carpet cushion manufacturer agreeing to replace carpet cushion that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse. Failure includes, but is not limited to, permanent indentation or compression.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET

- A. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Product: Use carpet as specified in the drawings finish plan. Provide carpet cushion on stairs.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the following:
 - 1. Carpet manufacturer.
 - 2. Carpet cushion manufacturer.

- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by the following:
 - 1. Carpet manufacturer.
 - 2. Carpet cushion manufacturer.
- C. Tackless Carpet Stripping: Water-resistant plywood in strips as required to match cushion thickness and that comply with CRI 104, Section 11.3.
- D. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- E. Metal Edge Transition Strips: Extruded Aluminum Schluter with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the following:
 - a. Carpet manufacturer.
 - b. Carpet cushion manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. For wood subfloors, verify the following:
 - 1. Underlayment over subfloor complies with requirements specified in Division 6 Section "Rough Carpentry."
 - 2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the following:
 - 1. Carpet manufacturer.
 - 2. Carpet cushion manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Direct-Glue-Down Installation: Comply with CRI 104, Section 8, "Direct Glue-Down Installation."
- B. Double-Glue-Down Installation: Comply with CRI 104, Section 9, "Double Glue-Down Installation."
- C. Carpet with Attached-Cushion Installation: Comply with CRI 104, Section 10, "Attached Cushion."
- D. Carpet with Preapplied Adhesive Installation: Comply with CRI 104, Section 10.4, "Pre-Applied Adhesive Systems (Peel and Stick)."
- E. Hook-and-Loop Installation: Comply with CRI 104, Section 10.5, "Hook and Loop Technology."
- F. Stretch-in Installation: Comply with CRI 104, Section 11, "Stretch-in Installation."
- G. Stair Installation: Comply with CRI 104, Section 12, "Carpet on Stairs."
- H. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - 1. Bevel adjoining border edges at seams with hand shears.
 - 2. Level adjoining border edges.
- I. Do not bridge building expansion joints with carpet.

- J. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- K. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- L. 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.
- M. Install pattern parallel to walls and borders.
- N. Install carpet cushion seams at 90-degree angle with carpet seams.
- O. If transitions between Carpet finishes and or other type of floor finish happens at doors, provide the transition directly below the door where it cannot be seen when door is in the closed position. Provide Schluter or thresholds between tile carpet and tile transitions.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION

SECTION 099000

PAINING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Painting and staining of all surfaces including as indicated in the drawings, but not limited to, the following:
 - a. Interior walls and hard lid ceiling surfaces as indicated in the drawings.
 - b. Interior exposed concrete plaster and masonry surfaces.
 - c. Interior ferrous metals.
 - d. Interior gypsum wallboard.
 - e. Interior wood trim, when indicated.
 - f. Exposed piping, conduits, and ductwork, when indicated.
 - g. Exposed mechanical equipment, when indicated.
 - h. Exposed electrical equipment, when indicated.

B. Related Work Specified Elsewhere:

1. Shop prime coats.
2. Factory finishes.
3. Painting work specified as work of other sections.

C. Materials not to be Painted:

1. Following surfaces are not to receive painter's finishes:
 - a. Work having complete factory finish other than prime coat.
 - b. Stainless steel and plated finishes (not zinc or cadium).
 - c. Finish hardware, except prime-coated items.
 - d. Walking surfaces, except when indicated.
 - e. Work specified not to be painted under other sections.

1.02 QUALITY ASSURANCE.

- A. Applicable Code: California Building Code, latest edition. California Green Standards Code, latest edition.
- B. Environmental Regulations: Conform to all applicable environmental regulations of all governing jurisdictions.

1.03 SUBMITTALS

- A. List of paint materials: Prior to submittal of color and gloss samples, submit for approval complete list of paint materials proposed for use, identifying each material by manufacturer's name, product name and number, including primers, thinners, and coloring agents. Submit manufacturer's catalog data fully describing each material as to contents, recommended usage, and preparation and application methods. Identify surfaces to receive various paint materials. Make no deviations from approved list. If applicable, provide a chart for comparison of manufacturer's numbers as herein specified to types of paint proposed for use.
- B. Color and Gloss Samples: Obtain color and gloss selections and instructions from Architect. Using materials from approved list, prepare and submit 8-1/2"x11" samples of each complete paint finish.

1.04 DELIVERY AND STORAGE.

- A. Delivery of Materials: Deliver to site in original, unopened containers with manufacturer's labels intact, describing contents with manufacturer's name, product name and number.
- B. Storage: Store all material off ground and in area providing protection from damage and from weather. Empty containers, and remove oily rags from building at end of each day's work. Take every precaution to prevent fire.
- C. Extra Paint: Provide Owner with 2 gallons of each type and color and gloss combination of paint used. Unless requested differently by Owner. Provide in manufacturer's sealed containers.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials of standard manufacture of types as specified herein in paint schedule. Provide materials by one of the following manufacturers: Dunn-Edwards, Sherwin Williams, and PPG. Equal products by other manufacturers are acceptable upon approval by the Architect first.
- B. Paint Systems: Unless otherwise specified or approved, use paint products of one manufacturer. In any case, primers and intermediate and finish coats in each paint system must be products of same manufacturer, including thinners and coloring agents.
- C. Factory Mixing: To maximum extent practicable, factory mix each paint material to color, gloss and consistency for application.
- D. At completion of job, provide 5 gallons of extra paint for field colors and 2 gallons for accent colors of all type and color.

PART 3 – EXECUTION

3.01 CONDITIONS OF SURFACES.

- A. Examination of Surfaces: Examine surface to be finished under this Section and verify that work of other trades has been left or installed in satisfactory conditions to receive paint, stain or specified finishes. Before starting work notify Architect in writing of any surfaces unsatisfactory for proper paint finish. Application of first coat of any finishing process constitutes acceptance of surface.

3.02 PREPARATION.

- A. Properly prepare surfaces to receive finishes indicated, scheduled and specified.
- B. Shop coated Metal: Thoroughly degrease and clean all foreign matter. Clean and spot paint field connections, welds, soldered joints, burned or abraded portions with same material used in shop coats.
- C. Uncoated Ferrous Metal: Thoroughly degrease and clean dirt, rust, mill scale and foreign matter, using rotary brushes, solvent or sandblasting as necessary. Remove pits and welding slag, and clean to bright metal before priming. Apply primer within three (3) hours after preparation.
- D. Gypsum Wallboard Surfaces: Fill cracks, holes and other imperfections with proper patching compound, finish to match adjoining surface, and allow to thoroughly dry. Remove glaze on surfaces by sanding. After first or primer sealer coat is applied, touch up visible suction spots before next coat is applied; work shall not proceed until suction spots are sealed.
- E. Galvanized Metal and Zinc Alloy: Thoroughly degrease and clean off foreign matter. Apply phosphoric metal etch or vinyl-type pre-wash if type recommended by primer manufacturer, allow to dry and immediately apply primer paint.
- F. Wood: Carefully putty nail holes, cracks and other defects. Use non-staining putty to match wood. Remove all marks with a thorough final sanding of all exposed surfaces using 150 grit or finer sandpaper. Thoroughly dust and clean prior to applying sealer.
- G. Clean concrete surfaces of dirt, encrustations, efflorescence, and other matter. Repair all cracks, holes, pits, and smooth off to match adjacent surface.
- H. Fixtures, Equipment and Hardware Cooperate with other trades and coordinate removal of fixtures, equipment, and hardware items as required for painting work.
- I. Surfaces Not Mentioned: Prepare in accordance with paint manufacturer's recommendations and as approved.

3.03 WORK QUALITY

- A. Application: Unless otherwise specified, apply materials in accordance with manufacturer's instructions by brush, rollers or spray. Apply each coat at proper consistency, free of brush or roller marks, sags, runs, or any other evidence of poor work quality. Avoid lapping paint on glass, hardware, and other surfaces not to be painted; apply masking as required.
- B. Protection: Protect floors, fixtures, equipment and like surfaces with impervious protective covers or drop cloths. Exercise care to prevent paint from being splattered

onto surfaces not to be painted. Paint or repaint surfaces from which such paint cannot be satisfactorily removed, as required to produce acceptable finish.

- C. **Contrasting Color:** Where painting is executed in contrasting colors, cut to meet true lines. Holidays and restrikes on painted surfaces are sufficient cause for necessitating recoating entire surface involved.
- D. **Barricades:** Maintain barricades and wet paint signs for duration of need.

3.04 COATS AND COLORS

- A. Numbers of coats specified to be applied are minimum. First coat may be omitted on surfaces already painted; spot or undercoat with specified first coat as necessary to achieve results. Insure acceptable paint finishes of even, uniform color, free from cloudy or mottled appearance in surfaces and evident thinness of coating.
- B. **Mechanical and Electrical Items:** (Exposed on walls only in the finish work.)
 1. Exposed pipe line, fire sprinkler lines, ducts, plenums, conduits, hangers and like items, paint with one prime coat and two coats of flat wall paint.
 2. Electrical panels, cabinets, and like items, paint bare surface with one prime coat and then same as for exposed pipes.
 3. Plumbing fixtures: Except where concealed in cabinets or counters, paint unfinished underside of cast iron plumbing fixtures with enamel, finish matching color of wall finish against which same occurs, unless otherwise specified.
 4. Exposed mechanical equipment as specified for metal surfaces.

3.05 CLEANING AND TOUCH-UP WORK

- A. Make detailed inspection of paint finishes after painting work is completed, carefully remove spattering of paint material from adjoining work of others, particularly plumbing fixtures, trim, tile, and finish metal surfaces, and make good any damage thereto. Repair any abraded, stained or otherwise disfigured painting work and leave entire painting work in new conditions.

3.06 PAINTING SCHEDULE.

- A. Paint and finish surfaces as indicated by the following schedule of finishes for materials or surfaces indicated on drawings and specified herein. To designate type and quality of paint, Dunn-Edwards product numbers and designations are used. Specialty products are also indicated by special product designations.
- B. **Exterior Surfaces:**
 1. **Concrete Flat finish**

First Coat	ESPR00
Second Coat	EVSH10
Third Coat (as needed)	EVSH10
 2. **Concrete – Accent Colors: Semi Gloss finish**

First Coat	ESPR00
Second Coat	EVSH50
Third Coat (as needed)	EVSH50

3. Metal – Ferrous: Semi Gloss finish

First Coat	BRPR00 (omit if shop primed, touch-up as needed.)
Second Coat	EVSH50
Third Coat	EVSH50

4. Metal (Roll-Up Door and hollow metal doors):

First Coat	BRPR00 (omit if shop primed, touch-up as needed.)
Second Coat	EVSH50
Third Coat	EVSH50

5. Metal Ferrous

First Coat	Carboguard 890VOC (omit if shop primed, touch-up as needed.)
Second Coat	Carbothane 134VOC
Third Coat	Carbothane 134VOC

6. Metal Galvanized:

First Coat	ULGM00
Second Coat	EVSH50
Third Coat	EVSH50

7. Wood (Stain)

First Coat	SSHL10
Second Coat	SSHL10

8. Precision Concrete Masonry Block

First Coat	SBPR00
Second Coat	EDLX10-0
Third Coat (as needed)	EDLX10-0

9. Textured Masonry Block

First Coat	Okon W-1 or W-2
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C Interior Surfaces:

1. Concrete: Low Sheen finish Semi Gloss finish

First Coat	ESPR00	ESPR00
Second Coat	SPMA20	EVSH50
Third Coat	SPMA20	EVSH50

- | | | |
|---|---|-------------------|
| 2. Gypsum Wallboard: | Low Sheen finish | Semi Gloss finish |
| First Coat | VNSL00 | VNSL00 |
| Second Coat | SPMA20 | EVSH50 |
| Third Coat | SPMA20 | EVSH50 |
| 3. Gypsum Wallboard: Flat Finish | | |
| First Coat | VNSL00 | |
| Second Coat | SPMA10 | |
| Third Coat | SPMA10 | |
| 4. Metal: Ferrous | | |
| First Coat | ENPR00 (Omit if shop primed, touch-up as needed.) | |
| Second Coat | EVSH50 | |
| Third Coat | EVSH50 | |
| 5. Wood: (Unless specified otherwise in cabinet and door details) | | |
| Pretreatment | Old Masters Wood Sealer | |
| First Coat | Old Masters Wood Stain | |
| Second Coat | Old Masters WB Polyurethane | |
| Third Coat | Old Masters WB Polyurethane | |
| 6. Concrete Floors (where shown) | | |
| First Coat | Epoxy spot filler as needed | |
| Second Coat | Micro-Seal Densifier by Rainguard | |

END OF SECTION

SECTION 220000**PLUMBING****PART 1 - GENERAL** Division 1 requirements apply to this section

1.1 CONDITIONS

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Division 0 and Division 1 apply to the work under this Section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this Section.
- C. Substitutions: Request for substitutions must be made before bid. See Division 1.
- D. Inspection of conditions: Examine related work and surfaces before starting work of this Section. Report to Architect, in writing, conditions which will prevent proper provision of this work. Beginning work of this Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor. Contractor shall perform any required removal, repair, or replacement of this work caused by unsuitable conditions at no additional cost to Owner.

1.2 SCOPE

- A. Work Included: The work under this Section shall consist of all labor, materials, equipment, facilities, transportation and services necessary for and reasonably incidental to the furnishing, installation, completion and testing of all plumbing work as indicated on the Drawings and as specified herein. The work in general shall include, but not be limited to, the following principal items:
 - 1. Domestic water system.
 - 2. Plumbing fixtures.
 - 3. Condensate and indirect drain.
 - 4. Permits and Fees.
 - 5. Installation of fixtures and equipment specified elsewhere.

1.3 RELATED WORK

- A. Electrical wiring (line and low voltage) and conduit - Division 16.
- B. Cutting and patching of building structure and partitions.
- C. Cast-in-place concrete.
- D. Painting, unless specified herein.
- E. Trenching, Backfilling and Compacting.
- F. Comfort Heating & Cooling System.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

- B. Codes and Regulations:
1. In addition to complying with specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction.
 2. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern.
- 1.5 PERMITS, CONNECTION CHARGES AND FEES: Obtain and pay for all permits, sewer connection charge fees and miscellaneous fees, required for execution of this work. Up front sewer, gas and water fee to be paid by Owner.
- 1.6 CODES AND ORDINANCES: All work shall be executed and inspected in accordance with all City, County, State, and Federal Codes, Title 24 laws, ordinances, rules and regulations applicable service charges, fees, permits, royalties, taxes, and other similar costs in connection therewith. If to the knowledge of the Contractor, the drawings or specifications are at variance with the above-mentioned laws, rules, and regulations, he/she shall promptly notify the Architect in writing and any necessary changes can be provided for in his/her contract. If the Contractor performs any work knowing it to be contrary to such laws, rules or regulations, and without notice as required above, he/she shall bear all costs arising therefrom. Permits not required on public work projects.
- 1.7 REFERENCES: References to standard code specifications shall mean editions in effect at date of bidding.
- 1.8 WORKMANSHIP, MATERIALS AND EQUIPMENT: All work shall be performed in a workmanlike manner and shall present a neat and mechanical appearance when completed. All materials shall be of type, quality and of minimum rating prescribed herein or indicated by manufacturer's name, type, model or catalog number. All materials furnished and installed under this contract shall be of first quality. All materials shall be a product of domestic manufacturers.
- 1.9 CUTTING AND PATCHING: Contractor shall perform all cutting and patching required for the introduction and placement of his/her work. He/She shall employ people to perform all patching work that are skilled in the particular trade involved. Cutting and patching required as a result of the omissions of an opening in construction shall be done by the Contractor at his/her own expense.
- 1.10 PROTECTION OF WORK: All work shall be protected at all times from danger by freezing, breakage, dirt, foreign materials, etc., and shall replace all work so damaged. The Contractor shall use every precaution to protect the work of others, and he/she will be held responsible for all damage to other work caused by his/her work or through the neglect of his/her workers.
- 1.11 COORDINATION
- A. All work shall be coordinated with that of other trades to avoid construction delays. If, in the opinion of the Architect, any piping, equipment, etc., has been improperly placed or installed due to lack of coordination, such piping and equipment shall be relocated as directed by the Architect at the Contractor's expense.
 - B. As far as possible the work under this Contract shall be indicated on the Design Drawings in such positions as to suit and accommodate the work of the other trades. Therefore, the Contractor is hereby made directly responsible for the correct placing of his/her work and the proper location and connection of his/her work in relation to the work of the various trades.
 - C. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub-base and support.
 - D. Pipe Sleeves and Inserts: Furnish and install all pipe sleeves and pipe support inserts before concrete is poured.

1.12 DESIGN CHANGES CAUSED BY PRODUCT SUBSTITUTION

- A. Contractor shall pay costs of design and installation (includes other trades) for changes resulting from substitution of alternate products. Additionally, they shall reimburse the specifying Engineer for their additional time.
- B. Acceptance of alternate products by Architect does not change this requirement.
- C. Contractor shall reimburse Engineer for costs required to review substituted or non-approved alternate products.

1.13 EXCAVATING AND BACKFILLING: Perform all excavation and backfilling as required. Contractor shall establish all lines and elevations prior to opening trenches and shall be responsible for correctness thereof.

1.14 CLEAN-UP: Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by his/her employees or work. After completion of work and prior to final acceptance, thoroughly clean all parts of the work, remove all debris and surplus equipment and leave installation in perfect condition, ready for use.

1.15 SUBMITTALS AND SHOP DRAWINGS

- A. Submittals:
 - 1. No product will be accepted on job-site without prior approval.
 - 2. Reference catalog cuts and brochures of products to proper paragraph in Specifications. Furnish numerical index by Specification paragraph number listing product name, catalog number and reference to page number of submittal brochure.
 - 3. Cross reference individual catalog numbers of substitute products to numbers of specified materials.
 - 4. Submittals shall be complete and bound in booklet form or a single electronic file; otherwise the submittals will be rejected.
 - 5. Submittal shall include, but not be limited to the following:
 - a. Plumbing fixtures and equipment, cuts, including trim and fittings, and roughing dimensions.
 - b. Water heating equipment and storage tank.
 - c. Drains and waste receptors.
 - d. Schedule of pipe, fittings, valves, with manufacturer and catalog number.
 - e. Specialties, valves, gauges and thermometers of all types.
 - f. Foundations, supports, hangers, inserts.
 - g. Wiring diagrams, control panel boards, and controls for electrically operated equipment furnished by plumbing trades.
 - h. All special products furnished by plumbing trades.
- B. Shop Drawings:
 - 1. Prepare shop drawings at a scale suitable to clearly delineate the subject. Sheet sizes shall be 8-1/2" x 11" minimum or multiples of 8-1/2" x 11".
 - 2. Drawing legend shall contain project title, drawing title, drawing number and number of drawings to set.
 - 3. Scale shop drawings shall be furnished prior to installation of equipment for:
 - a. Areas noted on plan as required shop drawings.
 - b. Approved deviations from plans.
 - c. Draw equipment areas/rooms layouts to a minimum scale of 1/4" = 1'- 0", including equipment, piping, accessories, showing clearances for operating and servicing.

C. Conflicts in Shop Drawings or Submittals:

Contractor agrees that shop drawing submittals processed by the Architect do not become contract documents and are not change orders, that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the contractor's convenience in organizing his work and to permit the Architect to monitor the contractor's progress and understanding of the design. The process of review of the contractor's submittals is not the purpose of testing the Architect's perception. If deviations, discrepancies or conflicts between shop drawings submittals and contract documents are discovered either prior to or after the shop drawings submittals are processed by the Architect, the contractor agrees that the contract documents shall control and shall be followed.

1.16 INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS

- A. As used in the drawings and specifications, certain non-technical works shall be understood to have specific meanings as follows:
1. "Furnish" . . . Purchase and deliver to the project site complete with every necessary appurtenance and support.
 2. "Install" . . . Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
 3. "Provide" . . . "Furnish" and "Install".
- B. Except where modified by a specific notation to the contrary it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- C. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Exceptions are that notes on the drawings which refer to an individual element of work take precedence over the specifications where they conflict with same.
- D. No exclusions from, or limitation, in the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.
- E. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance, nor do they delineate every item required for the intended installation. The work shall be installed in accordance with the diagrammatic intent expressed on the Plumbing Drawings, and in conformity with the dimensions indicated on Architectural and Structural Working Drawings and on equipment Shop Drawings.
- F. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

1.17 OPERATING AND MAINTENANCE DATA

- A. Upon completion of the installation provide two (2) complete sets of operating and maintenance instructions for the systems specified in this section to the Owner's Representative.
- B. The Contractor shall incorporate, among others in the set of operating and maintenance instructions to the Owner's representative, the following directions:
1. Schedule of major components of each system with manufacturer's catalog data, nameplate data, and parts list.
 2. Preventive maintenance schedule for each major component of each system.
 3. Pressure test reports.

4. Directory: Names, addresses and telephone numbers of General Contractor, its subcontractor's and related equipment suppliers, including name of person to contact in each case.
5. Provide a separate listing of all components from each manufacturer and from each supplier.
6. Specific Manufacturer's Warranties. List each piece of equipment covered, with day and date warranty begins, date of expiration and name, address and telephone number of person to contact regarding problems during warranty period.
7. Listing of extra stock parts furnished as part of the Contract.

1.18 MANUFACTURER'S WARRANTY: Standard warranty of manufacturer shall apply for replacement of parts after expiration of other warranty periods stated in specifications if they are for shorter time than standard manufacturer's warranty. Manufacturer shall furnish and replace parts to Owner. Furnish Architect printed manufacturer's warranties complete with material included and expiration dates upon project completion. In no event, shall any labor or material warranty be less than one year from project acceptance.

1.19 GUARANTEES

- A. All materials furnished shall be guaranteed, in writing, on a form approved by the Owner, for a period of one (1) year after date of acceptance of the project by the Owner. Should any trouble develop during this period due to defective materials or workmanship, the Contractor shall furnish all new materials and labor to correct the trouble without any cost to the Owner.
- B. Any defective materials or inferior workmanship noticed at time of installation shall be corrected immediately to the entire satisfaction of the Owner.
- C. The Contractor shall guarantee that his/her installation of all materials and equipment will meet the performance requirements of these specifications, and that all equipment will deliver the specified or required capacities.
- D. The Contractor shall be responsible for all damage to any part of the premises caused by leaks or breaks in pipe lines, fixtures or equipment provided under this Section of the Specifications, for a period of one (1) year after date of acceptance by the Owner.

PART 2 - PRODUCTS

2.1 SANITARY SOIL WASTE AND VENT SYSTEM

- A. Soil, waste and vent piping to 5' outside the building may be one of the following:
 1. Hubless cast iron soil pipe and fittings, CISPI - 301, ASTM A888, with stainless steel clamp and shield couplings, CISPI - 301
 2. Hubless cast iron soil pipe, CISPI- 301, ASTM A888 with hub and spigot cast iron fittings CISPI - 301, ASTM A74 with the A.B. & I. "Best" cast iron coupling and rubber gaskets, ASTM C564.
 3. Hubless cast iron soil pipe, CISPI-301, ASTM A 888 with M.G. mechanical joint couplings.
 4. Schedule 40 ABS or PVC DWV pipe and drainage pattern fittings. Solvent cement joints. Below slab only.
- B. Soil piping from 5' outside the building may be one of the following:
 1. Certainteed Corp. "fluid tight" p.v.c. gravity sewer pipe and fittings or approved equivalent.
 2. Extra heavy bell and spigot vitrified clay pipe and fittings with compression joints.

3. Same as specified to 5' outside building.

C. Cleanouts:

1. Acceptable Manufacturers: J.R. Smith as specified, or equivalent by Josam, Wade or Zurn.
2. Accessories: Where installed in construction with waterproof membrane, provide cleanouts with flashing clamp device with corrosion-resistant clamping bolts.
3. Floors:
 - a. Finished (tile or resilient covering): J.R. Smith #4048 with Nikaloy square top and tapered thread bronze plug. Set tops square with floor tile or resilient covering pattern.
 - b. Unfinished: J.R. Smith #4248 with cast iron round tractor type cover and tapered thread bronze plug.
4. Walls: Tapped tee or C.I. ferrule, with tapered thread bronze plug. J.R. Smith #4472 chrome plated for tiled walls, prime coated for painted walls.

D. Floor Drains:

1. Acceptable Manufacturers: J.R. Smith as specified, or equivalent by Josam, Wade or Zurn.
2. All floor drains shall be piped with trap primers.
3. Accessories:
 - a. Where installed in conjunction with waterproof membranes, provide with flashing clamp device with corrosion-resistant clamping bolts.
 - b. Provide with trap primer tailpiece where required. J.R. Smith #2695Y-2.

2.2 STORM DRAIN SYSTEM

A. Pipe and Fittings: Same as specified for soil, waste and vent system.

2.3 DOMESTIC HOT AND COLD WATER SYSTEMS

A. Pipe and Fittings: Type "L" hard-drawn copper tube, ASTM B88, with wrought copper solder joint fittings, ANSI B16.22. Cast bronze solder joint fittings, ANSI B16.18, may be used only for sizes for which wrought copper fittings are not manufactured. Leadless solder joints.

B. Lead Free Valves:

1. Provide systems with valves where indicated on Drawings and as specified. All valves shall be easily accessible. Valves for similar service shall be of same manufacturer.
2. Provide systems with valves so located and arranged as to give complete regulating control over all systems. Valves shall be installed on both sides of all equipment, on risers and on all branch mains.
3. Acceptable Manufacturers: Hammond, Milwaukee, Stockham, Nibco Manufacturer's name and figure number specified are for type, construction and quality required.
 - a. Ball Valve (2" and smaller): Hammond #8501, 150 lb., threaded.
 - b. Ball Valve (2½" and larger): Nibco #F-510, 150 lb., flanged.
 - c. Check Valve (2" and smaller): Hammond #IB904, 125 lb., threaded.
 - d. Check Valve (2½" and larger): Hammond #IR1124, IBBM, 125 lb., flanged.

C. Lead Free Unions and Flanges:

1. Unions (2" and smaller): Cast bronze ground joint pattern, brass to iron seat, ASTM B62 and ANSI B16.18.
2. Flanges (2½" and larger): 150 lb., cast bronze, solder joint, ASTM B62 and ANSI B16.24.
 - a. Flange gaskets shall be 1/16" thick and suitable for water. Garlock or approved equivalent.

- b. Bolting Materials: Carbon steel heavy hex bolts and nuts, ASTM A307 type B.

D. Specialties:

1. Water Hammer Arrestors:
 - a. Acceptable Manufacturers: Precision Plumbing Products, J.R. Smith
 - b. Locate as shown on Drawings and size in accord with Plumbing and Drainage Institute Standard No. WH-201.
2. Hose Bibbs: As specified on the drawings.
3. Trap Primer Assemblies:
 - a. Trap primers for drains shall be as indicated and specified.
 - b. Trap Primer Piping: Same as specified for domestic water (annealed copper may be used).
 - c. Equipment: Precision Plumbing Products

E. Vibration Isolation:

1. Provide FDA approved flexible connections between plumbing equipment and distribution piping.
2. Isolate pipe risers from the building using neoprene pads.

2.4 CONDENSATE AND RELIEF DISCHARGES: Type "L" or "M" hard-drawn copper tube, ASTM B88, with wrought copper solder joint fittings, ANSI B16.22. Solder: Same as specified for water system.

2.5 INSTALLATION OF FIXTURES AND EQUIPMENT SPECIFIED ELSEWHERE

A. Work Included:

1. Rough-in and connect plumbing services required for laboratory and/or restrooms equipment as indicated on the drawings.
2. Furnish and install straight or angle stops on all domestic hot and cold water lines at hose bibbs, and elsewhere as indicated or required.
3. Furnish and install gas shut-off cocks and gas manifolds as indicated or required.
4. Furnish and install water hammer arrestors in hot and cold water lines to all equipment or apparatus equipped with quick closing valves.
5. Install gas emergency shut-off valves furnished by others.

B. Products:

1. Materials and Methods:
 - a. Water Supply Stops: Brass-Craft straightway and angle type, as required.
 - b. Fixture Traps: Cast brass, adjustable P-trap, code approved.
 - c. Refer to the various sections included under Division No. 15 for material requirements for each particular system.
 - d. All exposed uninsulated piping, valves, etc., furnished by this Contractor for kitchen equipment shall be chrome plated.

C. Fixtures:

1. As specified on the drawings.

2.6 INDIRECT WASTE: Type DWV copper drainage tube, ASTM B306 with cast brass or wrought copper drainage fittings, ASTM and ANSI B16.4, leadless solder.

2.7 FIXTURES AND TRIM

A. Basic Requirements:

1. Smoothly grout joints between fixture and floor or wall with silicone grout.
2. Provide brass plated brass work sleeves over exposed piping used in conjunction with fixtures, unless specified otherwise.
3. Provide all supplies and wastes with escutcheons.

4. Fixture P-traps:
 - a. Concealed: Hubless cast iron or non-adjustable cast brass.
 - b. Exposed: Cast brass or copper tubing, adjustable, brass finish where concealed or covered to conform to handicap requirements, chrome plated where exposed.
5. Angle and Straight Stops and Risers: Brass-Craft or approved equivalent.
6. Trap Arms:
 - a. Schedule 40 galvanized steel pipe.
7. All water closets shall use a maximum of 1.28 gallons per flush.
8. All urinals shall use a maximum of 0.125 gallon per flush.
9. All lavatories shall use a maximum of 0.4 gallons per minute or comply with Cal Green code requirements.

2.8 PIPE INSULATION

- A. Pipe Insulation: Owens-Corning Fiberglas #25 ASJ/SSL, Halstead closed cell or approved equivalent. See Sheet P-1 for thickness requirement.
- B. Valve and Fitting Covers for Fiberglass Insulation: Manville "Zeston 2000".
- C. Installation shall be per manufacturer's instructions.
- D. Handicap Trap and Hot Water Trap Insulation: Trap Wrap by Brocar-Products Inc. or Handi Lav-Guard Insulation Kits by Truebro, Inc.
- E. Metal Jacketing: Provide metal jacketing for all insulated piping exposed to weather.
 1. Piping: Apply aluminum metal jacket 0.016 in. with moisture barrier around pipe and slip edge into preformed Z lock position to shed water. Butt next jacket section leaving approximately 3/8" gap. Place preformed 2" butt strap with sealant over the seam and secure with 1/2" aluminum band and wing seal.
 2. Fittings: Apply prefabricated metal fittings identical in composition to pipe jacketing.

2.9 PIPE HANGERS AND SUPPORTS

- A. General:
 1. A hanger assembly shall consist of an upper attachment secured to structure, a hanger rod and a pipe hanger.
 - a. The upper attachment shall be as follows:
 - 1) Concrete: Concrete insert, or expansion shield.
 - 2) Steel Framing: Beam clamp.
 - 3) Wood Framing: Angle clip with one leg bolted thru wood member with a plate washer on each side. Bolt shall be same size as required rod size. Lag bolts will not be allowed.
 2. Pipes at the same elevation may be supported by acceptable trapeze hangers.
 3. Explosive type fasteners or studs will not be permitted.
 4. Hangers and supports shall fit outside of all pipe insulation and insulation inserts unless specified otherwise.
 5. Refer to Drawings for fabrication of special supports.
 6. All water piping shall be isolated from structure.
- B. Hanger spacing for horizontal suspended piping shall be as follows, unless specified or shown on the Drawings otherwise.
 1. Cast iron soil pipe shall be supported at not more than 5 ft. intervals with support not more than 18" from hub.
 2. Steel Pipe 1" and Smaller: Not to exceed 6 ft. - 0 in.
 3. Steel Pipe 1-1/4" and Larger: Not to exceed 10 ft. - 0 in.
 4. Copper Tubing 1 1/2" and Smaller: Not to exceed 6 ft. - 0 in.
 5. Copper Tubing 2" and Larger: Not to exceed 10 ft. - 0 in.

6. In all cases, space pipe supports to provide adequate support for the pipes, the medium in the pipes, insulation, valves and fittings to prevent any sagging or separation of joints.
- C. Hanger Rods: Solid mild steel, sized as specified below. Maximum length of all thread rod shall not exceed 6".

<u>Pipe Size</u>	<u>Rod Diameter</u>
1/2" thru 3"	3/8"
4" thru 6"	1/2"

- D. Vertical piping shall be supported, not hung, at each floor with malleable iron or steel bolted pipe clamps. Clamps for water pipes shall rest on neoprene and cork pads.
- E. Hangers shall be clevis, or split ring type. Acceptable manufacturers: B-Line, Tolco, Michigan Hanger, or approved equivalent.
- F. Provide pipe to structure or hanger isolation as follows:
1. Hangers: Water piping shall be isolated from hangers with two (2) layers of 1/4" felt.
 2. Through Structural Members:
 - a. All waste piping shall be isolated from all points of contact with the structure of the building with two (2) thicknesses of 1/4" heavy plumbers' felt. There shall be no points of contact between any waste line and the structure of the building including studs, gypboard, plates, headers, or any other part of the building.
 - b. All water piping shall be isolated the same as the waste piping except piping 1" and smaller. 1" and smaller water piping shall be isolated using Acousto-Plumb isolators as manufactured by Speciality Products Co. This includes stub-outs at fixtures.

2.10 PIPE FLASHING

- A. Provide a flashing assembly at every pipe passing through a roof.
- B. Lead flashing and counterflashing:
 1. For Vent Piping: Stoneman #S-1000-4, 4 lb. lead, 6" skirt.
 2. For Other Than Vent Piping: Stoneman Versa-Flash, 4 lb. lead, 6" skirt.

2.11 ACCESS PANELS

- A. Provide metal access panels and frames for all valves, trap primers, or similar items requiring adjustment or servicing located in concealed spaces.
- B. Access Panels: Face-of-wall and ceiling type: Steel with primecoat finish in painted walls and ceilings: polished chrome-plated bronze in tile walls.
- C. Access panel sizes shall be 12" x 12" for valves 2" and smaller and individual trap primers, 18" x 18" for valves 2-1/2" and larger and trap primers with distribution boxes.
- D. Provide panels with cylinder locks, keyed alike.
- E. Panels in fire rated walls shall have same rating as walls.
- F. Acceptable Manufacturers: Josam, Milcor, Elmdor, or Zurn.

2.12 DIELECTRIC ISOLATORS

- A. Isolate incompatible piping materials.

- B. For piping 2" diameter and smaller, use unions or companion flanges equivalent to EPCO.
- C. For piping 2-1/2" diameter and larger, use flange dielectric isolation sets equivalent to F.H. Mahoney type E, 150 lb. class.

2.13 TOOLS

- A. Furnish all special tools necessary for the care and operation of any equipment.
- B. Identify tools for the specific equipment.

2.14 PIPE SLEEVES

- A. Provide pipe sleeves for all piping passing through concrete walls and floors.
- B. Sleeves shall be Crete-Sleeves by Sperzel Co. or approved equivalent.

PART 3 - EXECUTION

3.1 EXCAVATION, BACKFILL, AND DEWATERING

- A. General: Perform all excavating, trenching, backfilling, compacting and dewatering required for the installation of the work of this Division 15.
- B. Excavate, backfill, and compact in accordance with Trenching, Backfill and Compacting Section of Specifications.
- C. Dewatering:
 1. Lay pipe in dry trenches and keep trenches completely dry until piping system has been tested, cleaned, insulated, inspected and accepted by the Owner and completely backfilled before dewatering function ceases.
 2. Furnish and operate pumps, well points, siphons or other equipment as may be required to provide complete dewatering of trenches and disposal of excess water.

3.2 PIPING INSTALLATION

- A. Layout of Work:
 1. Perform all dimensional layout of the work and establish all lines and grades as set forth on the Drawing.
 2. Be responsible for conformity of the finished work with Drawings and Specifications.
 3. Layout rough-in for contract equipment as well as Owner furnished equipment and appliances in accordance with rough-in diagrams provided by the Manufacturer.
- B. Installation:
 1. Inspect all piping prior to installation; pipe found unsatisfactory on inspection or damaged by handling shall be promptly removed from the job site.
 2. All piping systems shall be graded and valved to provide complete drainage and control of all systems.
 3. Install horizontal sanitary and storm drainage piping to uniform grades conforming to the applicable code for this installation or as indicated on Drawings.
 4. All piping shall run parallel to building construction and shall be neat and workmanlike. Do not cut or drill structural members except as approved by the Structural Engineer, or specifically noted on the Drawings.

5. Conceal all piping in finished portions of the building unless noted otherwise on the Drawings.
6. Coupled shot sections of pipe, bushings, close nipples, long screws, and crosses are prohibited.
7. Install all piping in such a manner as to prevent any undue noise from the flow of water under normal conditions.
8. Install piping to permit free expansion and contractions, except where the Drawings specifically indicate an anchor or guide. Do not connect stiffening structural members to bends or elbows. Water piping shall be secured to structure at fixture locations.
9. Use offsets necessary to prevent undue strain on piping. The springing of piping into place is prohibited.
10. Select and install pipe supports and hangers in such a manner as to impose only negligible restraint on the free movement of piping and not deform piping. No anchors shall be employed.
11. Locate pipe supports as close as possible to valves or other heavy piping specialties.
12. Carefully locate supports and hangers so that they do not hinder free movement of adjoining piping or occupy open space in a pipe rack.
13. Buried Piping:
 - a. Carefully handle and lower pipe in such a manner as to avoid damage to the pipe.
 - b. Excavate a socket hole under the joint so that pipe will be supported on its body. Provide socket holes large enough (but not excessive) to allow adequate space for workers to "make" the joints.
14. All exposed polished or enamel connection from fixtures shall be put on with special care showing no tool marks or threads at fittings.
15. Sway bracing shall be installed per Governing Jurisdictional.

3.3 PIPE JOINTS

- A. Threaded Steel Pipe:
 1. Cut square and remove all burrs. Ream for full flow.
 2. Cut threads with clean dies. Apply thread compound to male threads only.
 3. After jointing, not more than three full threads shall remain exposed.
- B. Copper Tubing:
 1. Cut square and remove all burrs. Ream for full flow.
 2. Clean outside ends of tubing and male fittings and sockets of female fittings to bright finish. Clean with emery cloth.
 3. Properly apply solder flux to surfaces being jointed. Application and type of flux shall be as recommended by the specific solder manufacturer.
 4. Remove internal parts of solder-end valves prior to soldering.
 5. Refer to specific piping system for type of solder.
- C. Cast Iron Soil Pipe and Joints: Install in accord with coupling manufacturer's instructions. Refer to specific piping system for type of coupling.

3.4 PROTECTIVE COATING FOR UNDERGROUND PIPING

- A. General: Protect underground pipe as specified. Protect fittings similar to piping.
- B. Cast Iron Pipe: Asphaltum varnish or similar coating standard of pipe manufacturer.
- C. Copper Tubing and Pipe: No coating required.

3.5 CLEANING AND DEGREASING OF PIPING

- A. Clean all piping systems to remove all dirt, grease, scale, foreign substances, etc.
- B. Use air and/or inert gas blown through the lines of gas system, to prove the piping clean. All other piping systems shall be thoroughly flushed out with water unless specified otherwise.
- C. Prior to commencing work, submit for approval a complete procedure for flushing of piping systems. Include flushing source, system flushing inlet pressure, and size of inlet and outlet flushing connections with their locations for each system.

3.6 PLUMBING AND FIXTURE INSTALLATION

- A. Each fixture shall be installed at the height and location shown on drawings. Fixture supplies, trap and trap arm shall be set square with wall, in line with fixture outlets, and properly aligned to prevent any undue strain on fixtures. Fixtures shall be set level. Joint between fixture and wall or floor shall be grouted smoothly with G.E. silicone grout. All fixtures shall have their water supplies protected against possible back siphonage. The discharge outlets of supply faucets for sinks and lavatories shall clear the top of the overflow rim by at least 1".
- B. Backing and Support: Fixture or supporting arms shall be securely attached to a backing plate in accordance with the manufacturer's instructions. Backing plates shall be 1/4" thick x 6" wide and shall be connected to a minimum of 3 studs. Plates shall be drilled and tapped in each case to receive the fixture mounting bolts. Fixture bolts shall be brass with chrome plated heads when exposed.
 - 1. For Wood Stud Construction: Recess backing plate flush with studs. Attach backing plate to each stud that it crosses with two 3/8" steel bolts (on 4" centers) extended through stud and secured rear side with nuts provided with 1/8" x 2" steel backup washers.
 - 2. For Metal Stud Construction: Attach backing plate to each stud that it crosses by 3/16" fillet weld on top and bottom edges of the plate and across the full width of stud flange.

3.7 EQUIPMENT AND APPLIANCE INSTALLATION

- A. Install equipment and appliances, both Owner furnished and in contract where shown, as indicated, and in accordance with manufacturer's recommendations for the specific service.
- B. Provide anchor bolts, setting Drawings and templates for setting equipment.
- C. Assure correct alignment of equipment or appliance after setting.
- D. Where grouting is necessary, use non-shrink type.

3.8 TESTING OF PIPING

- A. Testing and inspection of all piping systems and associated equipment for leaks shall be accomplished after installation and cleaning and prior to placing into service.
- B. A rigid visual inspection of each specific piping system shall be made prior to conducting tightness tests, to ascertain that all appurtenances and equipment are provided, properly connected and supported, and in all respects ready for testing.
- C. Equipment such as hot water, flexible hose, safety valves and similar test pressure. Equipment shall either be disconnected from the piping or be isolated by valves or blanks during testing.
- D. Indicated pressure gauges mounted locally may be tested with the lines, provided the test pressure

does not exceed the scale range.

- E. The application of pressure to a system shall be under control at all times, so that in no case shall the test pressure be exceeded by more than 6%.
- F. Gauges used for testing shall be tested for accuracy as directed or approved by the Owner, and then installed as close as possible to the low point of the piping system.
- G. Do not apply test pressure until the piping system and its contents approach the same temperature.
- H. While piping is under test, exercise care that excessive pressure does not occur due to increase in ambient temperature.
- I. Piping test pressure shall be as specified with the particular system. If test pressures are not specified, they shall be 150% of design pressure for the specific system being tested.
- J. Conduct hydrostatic tests with water at a temperature below 100 degrees F.
 - 1. Fill the system slowly with water and vent at highest points to expel the air before pressurizing.
 - 2. Carefully examine all joints for leaks or defects.
 - 3. Provide connections as required to accomplish the above.
- K. Keep accurate test records of each line or system tested. Each test shall include:
 - 1. Identification of piping system and test number.
 - 2. Testing medium.
 - 3. Test pressure.
 - 4. Date of test acceptance.
- L. Tests: Allow to stand 4 hours or longer as directed to provide tight without leaks. Perform tests in presence of the Owner or his/her representative.
 - 1. Soil, waste, and vent system and storm drain system. Test with water to a static head of 10 ft.
 - 2. Domestic Water System: Test with water at 1-1/2 times system pressure.
 - 3. Gas System: Test with air at 40 psi.
- M. At the completion of the work, completely adjust all valves and equipment for their proper use and seating.

3.9 STERILIZING OF PIPING AND FIXTURES

- A. Water lines and fixtures shall be flushed thoroughly prior to chlorination to remove dirt, etc. Screens on faucets to be removed during injection and replaced after completion of disinfection.
 - 1. Injection shall start only when all fixtures are connected up and ready for operation.
 - 2. A service cock on riser, either 3/4" to at least 1-1/4", shall be provided by the Plumbing Contractor and located at the water service entrance. The disinfecting agent shall be injected into and through the system from these cocks or risers only.
 - 3. Chlorine (either gas or liquid) must be used as disinfecting agent. Calcium or sodium hypochlorite (liquid or powdered), or as approved in Federal and AMWWA procedures, may be used.
 - 4. The disinfecting agent shall be injected by a proportioning pump or device through the service cock or riser slowly and continuously at an even rate.
 - 5. All outlets must be fully opened at least twice during injection, and the residual checked with orthotolidine solution.
 - 6. When the chlorine residual concentration indicated is not less than 50 quarts per million at all outlets, then all fixtures and water supply valves must be closed and secured.
 - 7. Then the residual shall be retained for a period of not less than 24 hours.
 - 8. After the retention, the residual upon checking at most outlets shall not be less than 10

parts per million. If less, then the disinfection must be repeated as described above.

- B. If satisfactory, all piping and fixtures must be flushed until residual chlorine or orthotolidine tests shall not be greater than the incoming water supply.
- C. All work and Certification of Performance must be done by approved applicators or qualified personnel with chemical and laboratory experience.

3.10 DEMOLITION

- A. The Contractor shall visit the site and familiarize him/herself with all existing conditions affecting his/her work. Special attention should be given to possible Asbestos products, removal is by others, and this Contractor shall take all necessary safety precautions.
- B. Protection:
 - 1. Perform demolition in such a manner as to eliminate hazards to persons and property and to minimize interference with use of neighboring utilities and structures or interruption of use of such utilities and free passage to and from the structures.
 - 2. Provide safeguards, including warning signs and the like that are required for the protection of Owner's and Contractor's employees and others, during demolitions and removal operations.
 - 3. Care shall be taken to prevent spread of flying particles and dust.
- C. Contractor shall examine all the items which are designated to be reused, and refurbish them and store them for reuse.
- D. Contractor shall contact Owner to see which items (equipment, fixtures, etc.) Owner wishes to keep. Owner will direct Contractor as to where items shall be stored.
- E. All removed equipment, piping, etc., which are not to be reused or kept by the Owner shall be removed from the site and shall become the property of the Contractor.
- F. On completion of the demolition work and after removal of all debris, the site shall be left in clean condition satisfactory to the Owner. Cleaning shall include offsite disposal of items, materials, debris, and rubbish resulting from demolition operations.

END OF SECTION

SECTION 230000**HEATING, VENTILATION AND AIR CONDITIONING****PART 1– GENERAL****1.1 RELATED DOCUMENTS**

- A. Division 1 requirements apply to this section.

1.2 SUMMARY

- A. Section includes: Heating, ventilating, and air conditioning required for this work is indicated on the Drawings and includes, but not necessarily limited to:
1. Rooftop exhaust fans.
 2. Vibration isolation.
 3. Ducts, dampers, grilles, registers, and diffusers.
 4. Other items required for a complete and operating system of heating, ventilating, and air conditioning.
 5. Equipment operating and maintenance manuals.
- B. Related work described elsewhere:
1. HVAC equipment drains.
 2. Line voltage, service wiring and all conduit.
 3. Independent test and balance: Provided by General Contractor. Mechanical Contractor shall review requirements of this section and cooperate fully with Test & Balance agency.

1.3 QUALITY ASSURANCE

- A. Qualifications of manufacturers: Use products by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.
- B. Qualifications of workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Codes and standards: In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in "Duct Manual and Sheet Metal Construction for Ventilating and Air Conditioning Systems", latest edition, published by the Sheet Metal and Air Conditioning Contractors National Association (SMACNA). All air conditioning equipment shall be ARI tested and CEC approved and all gas fired equipment shall bear AGA and UL labels.

1.4 SUBMITTALS

- A. Shop drawings: Furnish 1/4" scale minimum detailed ductwork layout shop drawings and catalog plates of all special equipment as required for approval. Shop drawings or catalog plates shall show sizes, sections and dimensions of equipment, methods of connection or attaching to work of other trades, and copies of all shall be furnished to other trades. Make all erection drawings necessary for the installation of the work.
1. The ductwork layout shop drawings shall be done by an HVAC detailer or similarly trained individual. The drawings shall be the result of review of: the complete set of construction documents, coordination with other trades to determine utility routing and updating of drawings based on field conditions.

2. The drawings shall include ductwork sizes, transition, offsets, fittings, top and bottom duct elevations, routing of other trades such as piping and conduit, other fixture locations such as lighting and plumbing, dimensioned penetrations and openings. Obtain a clean, architectural background (floor plan or reflected ceiling plan) for use as base sheets. Copies of mechanical plans are not acceptable.
3. Submit one set for approval, within 4 weeks of award of contract, or 4 weeks prior to needing approval to order ductwork fabrication and equipment ordering (to allow time for resubmittals).

B. Material List:

1. Before entering into any Contract for purchase of materials, and before any work is started, Contractor shall submit for approval and receive approval of six (6) identical copies of a complete list, including catalogs and descriptive matter, of the following materials and equipment they proposed to furnish and install. Materials list shall be complete and contained in the bound loose leaf notebooks. Items not contained in the submittal shall conform to design specifications. Partial or supplemental SUBMITTALS will not be accepted.
 - a. Rooftop exhaust fans.
 - b. Fans, motors, drives, and bases.
 - c. Grilles, registers, diffusers.
 - d. Insulation.
 - e. Vibration isolation equipment.
 - f. Miscellaneous ductwork appurtenances, i.e., flex connections, dampers, etc.
 - g. Flexible duct.
 - h. Equipment supports.

- C. Wiring diagrams: Wiring diagrams of work required for the installation of the ventilating and air conditioning equipment shall be submitted for approval. Only approved diagrams shall be used for installation purposes.

1.5 CONFLICTS IN SHOP DRAWINGS OR SUBMITTALS:

- A. Contractor agrees that shop drawing submittals processed by the Architect do not become contract documents and are not change orders. The purpose of shop drawing review is to establish a reporting procedure and is intended for the contractor's convenience in organizing his work and to permit the Architect to monitor the contractor's progress and understanding of the design. The process of review of the contractor's submittals is not the purpose of testing the Architect's or Engineers perception. If deviations, discrepancies or conflicts between shop drawings submittals and contract documents are discovered either prior to or after the shop drawing submittals are processed by the Architect, the contractor agrees that the contract documents shall control and shall be followed.

1.6 CODES, ORDINANCES AND CONDITIONS

- A. All work shall conform to, and be installed in accordance with, the requirements of all laws, rules and regulations of the State, City, and County. Requirements of this Section are minimum requirements and shall govern, except that the building laws and/or the Drawings shall govern when their requirements are greater or more stringent, without added cost to the Owner.
- B. Where the work as shown on the Drawings or described in the Specifications is in conflict with any of the laws, ordinances or regulations applicable to this project, the Contractor shall notify the Architect and obtain directions before installing any of the work involved with the conflict.
- C. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.

1.7 PLAN CHECK PERMITS AND RELATED FEES:

- A. Contractor shall obtain all required permits and arrange all required inspections for the execution of the work under this Section. Permits not required on public works project.

1.8 PRODUCT HANDLING

- A. Comply with pertinent provisions of Division 1.
- B. Protection: Use means necessary to protect materials of this Section before, during and after installation, and to protect work and materials of other trades.
- C. Replacements: In the event of damage, immediately make repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.9 WARRANTY

- A. In addition to equipment manufacturer's warranties, the Contractor shall warrant the entire heating, ventilating and air conditioning system for a period of one year from the date of start of substantial completion. If during this period any material or apparatus proves defective, or any part of the system fails to function properly, this Contractor shall make good the defects without expense to the Owner.
- B. Furnish Owner all manufacturers' written warranties of material and equipment as a condition of final payment.

1.10 DUTIES OF THE SYSTEM

- A. It is intended that the system will provide ventilating, heating and cooling with automatic control for the areas indicated on the Design Drawings. Equipment shall be installed to produce and automatically maintain design conditions without drafts or objectionable noises.
- B. Before acceptance, quietness of operation and satisfactory to Owner shall be obtained for all apparatus equipment.
- C. Provide all required vibration isolation equipment to ensure that no objectionable vibration is transmitted to the structure.

1.11 DESIGN DRAWINGS: General drawings: Structural, Architectural, Electrical, and all Mechanical Drawings form a part of work to be done under this Specification. Contractor shall examine all drawings in order to fully inform themselves as to the scope and detail of work required of them and to check for interferences, etc.

1.12 COORDINATION WITH OTHER TRADES

- A. The Contractor shall order their work in such a manner that progress will harmonize with all trades and so that all work may proceed as expeditiously as possible.
- B. Contractor shall coordinate with the Architectural, Plumbing and Electrical Sections of the Specification to make sure each and every item has been covered. No extras will be allowed for any controversies arising between trades.
- C. As far as possible the work under this Contract shall be indicated on the Design Drawings in such

positions as to suit and accommodate the work of the other trades. Therefore, the Contractor is hereby made directly responsible for the correct placing of his work and the proper location and connection of his work in relation to the work of the various trades.

- 1.13 CLEAN-UP: Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by his employees or work. After completion of work and prior to final acceptance, thoroughly clean all parts of the work, remove all debris and surplus equipment and leave installation in perfect condition, ready for use.
- 1.14 DESIGN CHANGES CAUSED BY PRODUCT SUBSTITUTION
- A. Contractor shall pay costs of design and installation for changes resulting from substitution of alternate products.
- B. Acceptance of alternate products by Architect does not change this requirement.

PART 2- PRODUCTS

- 2.1 AIR CONDITIONING EQUIPMENT: As specified on the drawings.
- 2.2 SHEET METAL
- A. Description: The sheet metal shall include housings, ductwork, plenums, dampers, equipment connections, fire dampers, etc.
- B. Materials: Sheet metal shall be fabricated of galvanized steel sheets of lock forming quality (LFQ) and shall have a galvanized coating of 1-1/4 oz. total for both sides of 1 sq. ft. of a sheet. Supports, access doors not part of ducts, bar or angle reinforcing, damper rods and items made of uncoated mild steel shall be painted with two coats of primer.
- C. Construction: Sheet metal ductwork may be of either rectangular construction (steel or aluminum) or round construction (only spiral seam steel). Gages as per local code requirements; fabrication shall be in accordance with the Sheet Metal and Air Conditioning National Association (SMACNA) low velocity and Duct Construction Standard, or per CMC Tables.
- D. Elbows and tees: Shall have a center line radius of 1-1/2 times duct width, measured in plane of turn. All square elbows shall be equipped with turning vanes of double thick metal of air foil design. Vanes shall be straight, and securely fastened to the sides. Square elbows with radius heel will not be permitted.
- E. Flexible connections: Neoprene coated fiberglass sleeve to provide a minimum 3" clearance between metal parts of all fan and unit connections. Verify approval of materials with local authorities.
- F. Extractors: Adjustable volume type with extended flexible shaft, connected to grille face or to side of duct permitting adjustment from exterior of duct.
- G. Operated dampers or splitters: Fabricated of 16 gauge steel, and as recommended by SMACNA Manual, equipped with Vent-Lock #637 self-locking regulator on all ducts unless noted otherwise. Provide where required for air balancing, including O.S.A. intakes. Single leaf damper approved up to 36" x 12" maximum duct size, over these sizes multi-blade opposed type damper shall be used.

2.3 DIFFUSERS, REGISTERS AND GRILLES

- A. All diffusers, registers and grilles shall be furnished with finish as per Architect.
- B. The manufacturer shall verify that all supply and return selections shall not produce an ambient noise level in excess of NC-35. Only the self-noise of the outlet shall be considered.
- C. Shop drawings are required for each type register or diffuser and manufactured plenums, with reference to schedule number.
- D. Diffusers, registers and grilles shall be furnished with neoprene gaskets, and concealed fasteners unless indicated otherwise. No tek screws allowed for fastening.
- E. Description: As scheduled on Drawings. Contractor shall confirm ceiling and mounting types prior to ordering of devices.
- F. Manufacturers: Price or Krueger.

2.4 THERMAL DUCTWORK INSULATION (Wrapped)

- A. Material: Glass fiber blanket. Material, Schuller/Mansville "Microlite". Supply duct insulation to be provided with foil face vapor barrier. Insulation shall conform to Section 604, 1997 Uniform Mechanical Code. See drawings for thickness and density. R = 4.2 minimum.
- B. Manufacturers: Schuller/Mansville, CertainTeed or Owens-Corning Fiberglass Corp.

2.5 ACOUSTICAL AND THERMAL LINED DUCTS

- A. Material: Schuller/Mansville "Permacote Linacoustic" Flexible glass fiber, blanket type duct liner. Lining must be approved by local codes and shall meet or exceed NFPA Standards. NRC rating shall be at least 0.80 at frequencies above 1000. See Drawings for thickness and density. R = 6.3 minimum.
- B. Minimum of 10 lineal feet of supply and return at AC units shall be lined unless shown on Drawings.
- C. Manufacturers: Schuller/Mansville, CertainTeed or Owens-Corning Fiberglass Corp.

2.6 FLEXIBLE AIR DUCT AND CONNECTORS

- A. Flexible duct shall be factory fabricated assembly consisting of a zinc-coated spring steel helix, inner liner, wrapped with a nominal 1" thick fiberglass insulation and sheathed in a vapor barrier jacket. The composite assembly, including insulation and vapor barrier, shall meet the Class I requirements of flame spread of 25 or less, smoke developed of 50 or less, as set forth in NFPA Bulletin No. 90A and be labeled by UL as an air duct.
- B. Flexible duct shall be Casco type SF-181 or Owens-Corning Fiberglass Corp. "Fiberglass" UL Class I rated air duct. Maximum length shall be five feet.

2.7 VIBRATION AND NOISE CONTROL

- A. All mechanical equipment and piping shall be isolated from the structures by means of resilient vibration and noise isolators supplied by a single manufacturer to the mechanical contractor.
- B. Types: Provide as specified on the Drawings.

- C. Earthquake restraints: All base mounted equipment shall be equipped with seismic snubbers. Snubbers shall be capable of withstanding force as per CBC.
 - D. Flexible pipe connections: Flexible pipe connectors should be used for piping connected to vibration isolated equipment.
- 2.8 INDIRECT DRAIN PIPING: Cooling coil drain pans and equipment auxiliary drain pans shall be piped to nearest approved receptacle using type "M" copper tubing and wrought copper sweat fittings.
- 2.9 PIPING INSULATION: Insulate indirect drain lines from air conditioning units were routed inside building.
- 2.10 EXHAUST FANS
- A. ROOF EXHAUST FANS: Fan shall be low silhouette belt-driven type. Housing shall be heavy gage steel or aluminum with steel or aluminum top hinged and latched for easy access to parts requiring inspection and service. Motor and drive shall be out of the air stream. Provide factory mounted disconnect switch accessible under hinged top. Provide bird screen and factory fabricated curb. Finish shall be factory applied baked enamel or approved equal. All moving parts shall have integral vibration isolation mounting.
- 2.11 MACHINERY GUARDS: Cover all moving parts of machinery such as shaft couplings, belt drives, exposed fan intakes, etc., with removable metal guards. Provide access in guard for tachometer readings. Comply with applicable safety regulations.
- 2.12 AUTOMATIC CONTROL DEVICES
- C. Thermostats: Provide as shown on the Drawings.
 - D. Refer to Drawings for thermostat and switch locations.
- 2.13 SINGLE SOURCE
- A. For ease of maintenance and parts replacement, to the maximum extent practicable use equipment of a single manufacturer.
 - B. The Architect may reject any materials list which contains equipment from various manufacturers if suitable materials can be secured from fewer manufacturers, and the Architect may require source of materials to be unified to the maximum extent practicable.
- 2.14 OTHER MATERIALS: Materials not specifically described but required for a complete and proper installation of the work of this Section shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect.

PART 3- EXECUTION

- 3.1 EXAMINATION: Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
- 3.2 INSTALLATION, GENERAL
- A. Install equipment in locations shown on the reviewed and approved shop drawings, except where specifically otherwise approved on the project by the Architect.

- B. Avoid interference with structure, and with work of other trades, preserving adequate headroom and clearing doors and passageways to the approval of the Architect.
- C. Check each item in the system and defects, verifying that parts are properly furnished and installed, that all items function properly, and that required adjustments have been made.

3.3 INSTALLATION OF DUCTWORK

- A. Fabricate and install ductwork in accordance with the reviewed and approved shop drawings and the referenced standards.
- B. Sheet metal ductwork:
 1. Cross-break or kink flat surfaces to prevent vibration.
 2. Sizes shall be as noted on Drawings, to provide quiet draft-free ventilation.
 3. Slope: No more than 1 to 7 on any side except where connections dictate. A maximum of 1 to 4 may be used, subject to approval.
 4. Throat: Area of the branch duct takeoff shall be in direct proportion to the volume of air to each branch.
 5. Holes: Holes in duct for damper rods and other necessary devices shall be drilled and shall be airtight. No pipes, conduits or other member may pass through any duct unless otherwise shown on the Drawings.
 6. Noise: Entire system shall prove quiet to a degree satisfactory to the Owner. Any adjustment required to produce quietness shall be made by the Contractor before work can be deemed to be finished and accepted.
 7. Isolation: Where incompatible materials come in contact, they shall be isolated from each other with rubber, neoprene, lead or material best suited for the materials to be isolated.
 8. Supports: Secure ducts against displacement and vibration. Anchor to structural parts of the buildings at intervals not greater than 10 feet. Suspend with 18 gauge straps and as recommended in the SMACNA Manual.
 9. All supply and return air ducts insulated on all sides with externally applied flexible fiberglass blanket insulation, applied with butted joints, securely and neatly seal with aluminum heat sensitive tape, or lined with flexible blanket type insulation with plastic coating to air stream. Externally applied insulation at ducts used for cooling shall be covered with a vapor barrier, maximum permeance of 0.05.
- C. All ductwork:
 1. Wherever obstructions require a change in duct shape, maintain equivalent areas. Sizes shown on Drawings are net dimensions inside the insulation.
 2. At discharge ductwork, internally seal with DP 1020 at joints.
- D. Connections:
 1. Install and make necessary connections for the complete supply, recirculation, and exhaust systems indicated on approved shop drawings, including ductwork, grille collars, intake housings, hangers, connections, fasteners, and other items required.
 2. Supply air and return air ducts, used for heating, cooling or both, shall have their longitudinal and transverse seams tightly sealed to provide an air-tight system.
 3. Provide flexible connections between units and duct.
- E. Volume dampers:
 1. Provide adjustable volume dampers in branch supply ducts.
 2. Locate the dampers as close as possible to the main duct.
 3. Provide remote operating device where damper is inaccessible. Locate device on shop drawings for Architect's approval.
- F. Flexible air ducts:

1. Flexible duct shall be maximum 5' length, size as indicated on Drawings and have galvanized sheet metal male and female end connectors. End connectors shall be attached to each other sheet metal fittings with four #8, 1/2" sheet metal screws spaced approximately 90 degrees apart; or with a 1/2" wide metal band screws type clamping device. All metal fittings, used with the flexible duct shall be insulated with a 2" thick, 1 lb. density flexible blanket insulation, jacketed with a vapor barrier and taped to provide a continuous seal and a neat, workmanlike appearance.
2. Flexible ducts shall be installed in a fully extended condition free of sags and kinks, using only the length required to make the connection. Where, in the opinion of the Architect, flexible duct length is excessive, the duct shall be shortened or replaced with a flexible duct of suitable length. The flexible duct bending radius shall not exceed the specified manufacturer's UL approval. Where horizontal support is required, flexible duct shall be suspended on 36" centers with a minimum 2" wide flat banding material.
3. Provide a manual damper at each take-off connector.

3.4 INSTALLATION OF GRILLES, REGISTERS, AND DIFFUSERS

- A. Install and connect grilles, registers, and diffusers in the locations shown on the reviewed shop drawings, securely anchoring each item in place and sealing with rubber gaskets to prevent leakage. No "tek" screws will be allowed in the face of any device.
- B. Sizes: As indicated on Drawings.
- C. Performance: Provide the required air throw and spread with no apparent drafts or excessive air movement within space served.

3.5 GENERAL DUCTWORK INSULATION

- A. All ductwork, equipment and appurtenances handling air at temperatures above or below room ambient shall be insulated as generally described herein. Certain plenums, exhaust ducts and transfer air ducts shall be insulated as described herein and where indicated on the Drawings.
- B. Installation shall be neat and workmanlike in appearance and quality of workmanship. Insulation shall be neatly cut at supports, etc., and beveled at inspection doors, unions, etc., and shall be first class in workmanship. Installation shall be in direct compliance with manufacturer's written and approved instructions for this particular materials. Care shall be taken during installation to eliminate or reduce dust and dirt to a minimum. waste and debris shall be removed as it accumulates. Provide plastic covers over ends of duct for overnight. Remove for next day work.
- C. Location: All supply and return air ductwork shall be insulated on the exterior where not indicated on the Drawings and/or specified to be lined on the interior.
- D. Application: Insulation shall be firmly wrapped duct and lapped minimum of 4" longitudinally and transversely. Securely fasten with 16 gauge galvanized wire spaced not more than 12" o.c. for straight runs and 3" o.c. for elbows and fittings. In addition, securely wire each transverse joint of the insulation.

3.6 ACOUSTICAL AND THERMAL LINED DUCTWORK

- A. Location: First 10 feet of duct run from air conditioning unit on both supply and returns or where indicated on the Drawings or as shown on Drawings.
- B. Application: Adhere to metal using fire-resistive adhesive over 100% of the surface (plus weld pins or friction clips on 12" centers when duct dimensions exceed 24"). Air side surface shall be uniform. No tufting allowed. Seal all raw edges.

- C. Where ducts are lined on the interior, no external insulation is required.
- D. Duct and plenum sizes shown on the Drawings are internal sheet metal sizes and shall be enlarged for lining.

3.7 ELECTRICAL WORK

- A. Motor starters, disconnect switches, line voltage wiring and all conduit (power line and low voltage) are specified in the Electrical Section of the Specifications unless otherwise specified and/or noted on Drawings.
- B. Wiring diagrams of electrical connections required for the installation of equipment of this Section shall be submitted to the Owner for approval. After approval, the wiring diagrams shall be submitted to the Electrical Contractor for use in installation.
- C. In the event the equipment furnished or submitted requires a greater number of motors, starters, etc., or requires motors, starters, etc., of higher rating than shown on the Drawings, the Contractor for the work of this Section shall be responsible for any additional cost involved in providing additional electrical services to the equipment.

3.8 PAINTING: Painting of all apparatus, unless hereinbefore specified, shall be done under the Painting Section of the Specifications. All apparatus furnished by the Contractor shall be provided with a shop coat at the factory. Inside of ducts and boxes behind all air inlets and outlets in finished areas shall be painted two coats of dull flat black by this Contractor.

3.9 EQUIPMENT IDENTIFICATION

- A. Provide a thorough and complete system of identification of all equipment including, dampers, and other appurtenances, to permit immediate and positive recognition of components.
- B. Equipment labels: On each item of equipment provided under this Section, provide the manufacturer's metal labels securely attached to each individual piece of equipment, and showing complete and comprehensive performance characteristics, size, model number, and serial number.
- C. Identify all equipment, using brass discs or black laminated plastic plates with white engraved letters. Install in readily visible location, not interfering with insulation. Includes existing equipment if not presently labeled.

3.10 CLEANING THE SYSTEM

- A. Ductwork: After the ductwork has been tested and proved tight, thoroughly clean all components of the ductwork and remove all dirt, scale, oil and other foreign substances which may have accumulated during the installation process.
- B. Equipment: After the equipment has been started and proved operational, carefully clean all accessible parts of each piece of equipment, thoroughly removing all traces of dirt, oil, grease, and other foreign substance.

3.11 COOPERATION WITH OTHER TRADES

- A. Do all things necessary to cooperate with other trades in order that all systems in the work may be installed in the best arrangement.
- B. Coordinate as required with other trades to share space in common areas and to provide the

maximum access to each system.

3.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Complete sets of instructions containing the manufacturer's operating and maintenance instruction for each piece of equipment shall be furnished in accordance with the general requirements to the Engineer. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers; the words "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor and the contract number.
- B. The Contractor shall incorporate, among others in the sets of operating and maintenance instructions to the Owner's representative, the following directions:
 1. Part numbers of all replaceable parts.
 2. Cuts and rating tables.
 3. Oiling, lubricating and greasing data.
 4. Complete electrical load data from operation tests.
 5. Air flow data on all fans indicated on the Drawings.
 6. Serial numbers of all principal pieces of equipment.
 7. Installing companies' names, addresses and telephone numbers.
- C. After approval by the Owner, three (3) copies of this instruction and maintenance manual shall be furnished to the Owner's representative.

3.13 INSTRUCTING

- A. Upon completion of all required testing and balancing, and at a date set by the Architect to coincide with the Owner's acceptance of the completed work, provide written instructions and thoroughly indoctrinate and instruct the Owner's maintenance and operating personnel in all aspects of operation and maintenance of the installed systems.
- B. Demonstrate the contents of the Manual required to be submitted and as described in 3.13 above, and ensure that the Owner's personnel are thoroughly familiar with all aspects of operation and maintenance of the installed systems (minimum of 4 hours).

3.14 **GUARANTEE:** In addition to other guarantees required and as a condition precedent to the issuing of the final certificate for completion payment, the Contractor shall deliver to the Architect a written guarantee that all materials, apparatus and equipment furnished and installed hereunder shall be new and free from all defects. Should any trouble develop within one (1) year from date of acceptance of the building, due to faulty or inferior material and/or workmanship, the trouble shall be corrected by the Contractor without expense to the Owner. The Contractor shall guarantee all apparatus and equipment to deliver the capacities as scheduled and/or specified.

3.15 **DESCRIPTIVE NAMES:** Selected manufacturers: Where the name of a selected manufacturer of equipment, fixtures, or material is specified, the proposal of the Contractor shall be based on the use of the named product or equivalent product of manufacturers if such are listed. No substitutions will be permitted.

END OF SECTION

SECTION 260500**COMMON WORK RESULTS FOR ELECTRICAL****PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common electrical installation requirements.
 - 6. Touchup painting.

1.03 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.04 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- D. Coordinate chases, slots, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
- E. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

- F. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.
- G. Coordinate connecting electrical service to components furnished under other sections, include connections for equipment specified in other Sections.

PART 2 - PRODUCTS

2.01 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated “wall pipe,” equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.02 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 3. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 4. 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.

2.03 GROUT

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

2.04 TOUCHUP PAINTING

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.
- F. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.02 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe 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.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.03 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.04 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

3.05 CONNECTIONS TO EQUIPMENT

- A. For each electrical connection indicated or otherwise required, provide complete assembly of materials, including but not necessarily limited to pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-

shrinkable insulating tubing, cable ties, solderless wirenuts, and other items and accessories as needed to complete splices and terminations of types indicated.

- B. Install in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.

3.06 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work. Replace damaged or faulty components.

END OF SECTION 260500

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.03 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.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN & SO.
- D. Multiconductor Cable:
 - 1. Type MC, 600V copper wire, with a full size green insulated copper grounding conductor. The insulated circuit and grounding conductors shall be cabled together and wrapped with a binder tape bearing the print legend. Light weight galvanized steel interlocked armor is applied over the assembly. The minimum size of MC cable

shall be #12 AWG unless specified otherwise. The use of MC cable is restricted by the requirements of local codes. Comply with NEMA WC 70.

2. Type SO with ground wire, Comply with NEMA WC 70.
3. Armored cable, Type AC, is not allowed.

2.02 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. O-Z/Gedney; EGS Electrical Group LLC.
 4. 3M; Electrical Products Division.
 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Wire sizes No. 6 and smaller shall be coded using factory-colored insulation. Wire size No. 4 or larger shall be coded with approved wrap-around permanent colored tape markers at each end and at every point where the conductor is accessible. Green wire shall be used as an equipment grounding conductor only.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC shall be permitted for temporary fixture installations only.

- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway; Power-limited cable, concealed in building finishes; or Power-limited tray cable, in cable tray.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."
- G. Seal around cable penetrating fire rated elements.

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.05 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above

END OF SECTION 260519

SECTION 260526**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Methods and materials for grounding systems and equipment, plus the following special applications:

1.03 SUBMITTALS

- A. Field quality-control test reports.

1.04 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.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.02 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.03 GROUNDING BUS

- A. Main Power Grounding Bus (MGB): Rectangular bars of annealed copper, size as indicated on drawings; with insulators.
- B. Main Telecommunications Grounding Bus (MTGB): Rectangular bars of annealed copper, 1/4-inch by 4-inch by 12-inch; with insulators. Cooper #SBTMGB12, or equal.
- C. Telecommunications Grounding Bus (TGB): Rectangular bars of annealed copper, 1/4-inch by 2-inch by 12-inch; with insulators. Cooper #SBTGB, or equal.

2.04 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, 3/4 inch by 10 feet in diameter where connected above grade. All other rods which are completely buried may be 5/8 by 96 inches.

PART 3 - EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. MGB will be installed as indicated on the drawings. TMGB will be installed at the Main Telecommunications Backboard 'MTTB' and bonded to the MGB as directed on the drawings. A TGB will be installed at each supplementary telecommunications backboard and bonded to the TMGB as directed on the drawings.
 - 2. Install bus on insulated spacers 1 inch minimum from wall, and 12 inches above finished floor, unless otherwise indicated.

3. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.
- D. Conductor Terminations and Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 2. Make connections with clean, bare metal at points of contact.
 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
 7. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 8. Connections to Ground Rods: Bolted connectors.
 9. Connections to Structural Steel: Bonding plate.

3.02 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at or above 120 V. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a grounding bus. Refer to Section 3.1 (D) (1) above.
 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.03 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches above finished floor or final grade.

- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

- D. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

- E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

END OF SECTION 260526

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.06 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS**2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 50 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with single-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 6. To Light Steel: Sheet metal screws.
 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete.
- C. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Raceways.
 - 2. Fittings.
 - 3. Boxes.
 - 4. Enclosures.
 - 5. Cabinets for electrical wiring.

1.03 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.04 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.
- B. Comply with NFPA 70.

1.05 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, 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.
- B. Coordinate layout and installation of raceway and boxes with other construction elements to ensure maximum headroom, working clearance, and access.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Provide products that comply with requirements.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. EMT: ANSI C80.3.
- E. FMC: Zinc-coated steel.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings for Conduit and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Fittings for EMT: Steel or die-cast, set-screw or compression type.
- H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Aruco Corporation.
 - 4. CANTEX Inc.
 - 5. Electri-Flex Co.
 - 6. Lamson & Sessions; Carlon Electrical Products.
 - 7. RACO; a Hubbell Company.
 - 8. Thomas & Betts Corporation.
- B. LFNC: UL 1660.
- C. Fittings for LFNC: UL 514B.

2.03 METAL WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw-cover type.
- E. Finish: Manufacturer's standard enamel finish.

2.04 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman.
 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 6. O-Z/Gedney; a unit of General Signal.
 7. RACO; a Hubbell Company.
 8. Robroy Industries, Inc.; Enclosure Division.
 9. Spring City Electrical Manufacturing Company.
 10. Thomas & Betts Corporation.
 11. Walker Systems, Inc.; Wiremold Company (The).
 12. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch.
 1. Metal Enclosures: Steel.
- G. Cabinets:
 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

2.05 FACTORY FINISHES

- A. Finish: For enclosure or cabinet components, provide manufacturer's standard finish inside and grey paint applied to exterior of enclosures and cabinets before shipping.

PART 3 - EXECUTION**3.01 RACEWAY APPLICATION**

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit or IMC.
 - 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed and Subject to Physical Damage: Rigid steel conduit. Including but not limited to raceways in the following locations:
 - a. Corridors.
 - b. Mechanical rooms.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 5. Damp or Wet Locations: Rigid steel conduit.
 - 6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

3.02 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

- G. Conceal conduit within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- J. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- K. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- L. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

3.03 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.04 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533

SECTION 260548**VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 1. Channel support systems.
 2. Restraint cables.
 3. Hanger rod stiffeners.
 4. Anchorage bushings and washers.

1.03 DEFINITIONS

- A. The IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.

1.04 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 1. Site Class as Defined in the IBC: **D**
 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: **II**
 - a. Component Importance Factor: **1.0**
 - b. Component Response Modification Factor: **2.5**
 - c. Component Amplification Factor: **1.0**
 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): **2.879g**
 4. Design Spectral Response Acceleration at 1.0-Second Period: **1.003g**

1.05 QUALITY ASSURANCE.

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
 - 1. Amber/Booth Company, Inc.
 - 2. California Dynamics Corporation.
 - 3. Cooper B-Line, Inc.; a division of Cooper Industries.
 - 4. Hilti Inc.
 - 5. Loos & Co.; Seismic Earthquake Division.
 - 6. Mason Industries.
 - 7. TOLCO Incorporated; a brand of NIBCO INC.
 - 8. Unistrut; Tyco International, Ltd.
- C. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- E. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- F. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
- G. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
- I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- J. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

- K. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
 - 1. Install restrained isolators on electrical equipment.
 - 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- D. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items

are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.05 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Identification for raceway and metal-clad cable.
 - 2. Identification for conductors and control cable.
 - 3. Warning labels and signs.
 - 4. Instruction signs.
 - 5. Equipment identification labels.
 - 6. Miscellaneous identification products.

1.03 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.145.

1.04 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS**2.01 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS**

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Color for Printed Legend:
 - 1. Power Circuits: Black letters on an orange field.
 - 2. Legend: Indicate system or service and voltage, if applicable.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.02 CONDUCTOR AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color code secondary service, feeder, and branch circuit conductors with field applied identification where factory applied color is not readily available.
- B. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.
- F. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.03 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.

- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14.

2.04 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
 1. Engraved legend with black letters on white face.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.05 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.06 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength: 50 lb (22.6 kg), minimum.
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black, except where used for color-coding.
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A. Identify with orange self-adhesive vinyl label or snap-around label.
- B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands or snap-around, color-coding bands:
 1. Fire Alarm System: Red.
 2. Fire-Suppression Supervisory and Control System: Red and yellow.

3. Combined Fire Alarm and Security System: Red and blue.
 4. Security System: Blue and yellow.
 5. Mechanical and Electrical Supervisory System: Green and blue.
 6. Telecommunication System: Green and yellow.
 7. Control Wiring: Green and red.
- C. Power-Circuit Conductor Identification: For secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use metal tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.
- F. Auxiliary Electrical Systems Conductor and Conduit Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Identify both ends of spare conduits and conduit stubs with source and destination locations.
 3. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 4. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- G. Instruction Signs:
1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where 2 lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 2. Equipment to be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Access doors and panels for concealed electrical items.

- c. Electrical switchgear and switchboards.
- d. Transformers.
- e. Emergency system boxes and enclosures.
- f. Disconnect switches.
- g. Enclosed circuit breakers.
- h. Motor starters.
- i. Contactors and relay panels.
- j. Fire-alarm control panel and annunciators.
- k. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
- l. Monitoring and control equipment.

3.02 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for feeder and branch-circuit conductors.
 - 1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Neutral: White.
 - e. Ground: Green.
 - 3. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - d. Neutral: Grey.
 - e. Ground: Green.
 - 4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or

taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

END OF SECTION 260553

SECTION 260923

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Lighting Control System

1.03 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.
- C. SPST: Single pole single throw.

1.04 SUBMITTALS

- A. Product Data: Lighting control panel system and devices.
- B. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.05 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.

1.06 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them.

PART 2 - PRODUCTS

2.01 LIGHTING CONTROL SYSTEM

1. Lighting control system shall be Acuity N-Light with devices as specified in the Construction Documents. Equivalent systems may be submitted for review and approval by the Engineer.

2.02 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG.
- B. nLight Communications Cabling: CAT5 for RS485 system with 115200 Baud rate.
- C. 0-10V Cabling: Stranded-copper twisted-pair 18AWG wiring, non-shielded. Runs exceeding 300-feet shall be increased to 16 AWG.

PART 3 - EXECUTION

3.01 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.02 WIRING INSTALLATION

- A. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- B. Size conductors according to lighting control device manufacturer's written instructions.
- C. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.03 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 1. Identify controlled circuits in lighting contactors.
 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.04 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing lighting control system, and after electrical circuitry has been energized, Contractor shall engage a factory-authorized nLight representative to provide start-up of the lighting control system, to verify that all system components are operating correctly, and to make any required adjustments.
 - 2. Factory representative shall provide a written report indicating that all system components are performing per design parameters.
- B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements. Test for compliance with requirements.

3.05 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262200

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Dry-type transformers rated 600 V and less, with capacities up to 1000 kVA.

1.03 SUBMITTALS

- A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.06 COORDINATION

- A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases.
- B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ACME Electric Corporation; Power Distribution Products Division.
 2. Eaton Electrical Inc.; Cutler-Hammer Products.
 3. Siemens Energy & Automation, Inc.
 4. Square D; Schneider Electric.

2.02 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices except for taps.
 1. Internal Coil Connections: Brazed or pressure type.
 2. Coil Material: Aluminum.
- D. Finishes:
 1. Indoor Units: Manufacturer's standard paint over corrosion-resistant pretreatment and primer.
 2. Finish Color: ANSI 61 Gray

2.03 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
- B. Cores: One leg per phase.
- C. Windings: One coil per phase in primary and secondary.
- D. Enclosure: Ventilated, NEMA 250, Type 2.
 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- E. Transformer Enclosure Finish: Comply with NEMA 250.
- F. Taps for Transformers 15 kVA to 300 kVA: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

- G. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
- H. Energy Efficiency for Transformers Rated 15 kVA and Larger:
 - 1. Complying with NEMA TP 1, Class 1 efficiency levels.
 - 2. Tested according to NEMA TP 2.
- I. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
 - 1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
 - 2. Include special terminal for grounding the shield.
 - 3. Shield Effectiveness:
 - a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
 - b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
 - c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.
- J. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.04 IDENTIFICATION DEVICES

- A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

2.05 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
 - 1. Brace wall-mounting transformers as specified in Division 26 Section “Vibration and Seismic Controls for Electrical Systems.”

3.03 CONNECTIONS

- A. Ground equipment according to Division 26 Section “Grounding and Bonding for Electrical Systems.”
- B. Connect wiring according to Division 26 Section “Low-Voltage Electrical Power Conductors and Cables.”

3.04 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Remove and replace units that do not pass tests or inspections and retest as specified above.
- C. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed “Satisfactory Test” label to tested component.

3.05 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- B. Output Settings Report: Prepare a written report recording output voltages and tap settings.
- C. Occupancy Adjustments: Once building has reached 75% occupancy, and within 6 to 12 months of date of Substantial Completion, provide on-site assistance in readjusting transformer tap settings to suit actual occupied conditions. Provide up to 2 visits to Project site for this purpose, coordinated with Owner, without additional cost.
 - 1. Voltage Recordings: Contractor performed. Provide up to 48 hours of recording on the low-voltage system of each medium-voltage transformer.
 - 2. Point of Measurement: Make voltage recordings at load outlets selected by Owner.

3.06 CLEANING

- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200

SECTION 262416**PANELBOARDS****PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Lighting and appliance branch-circuit panelboards.

1.03 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. RMS: Root mean square.
- C. SPDT: Single pole, double throw.

1.04 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
- C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems" Include the following:
 - 1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Field quality-control test reports including the following:
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Panelboard Schedules: For installation in panelboards.
- F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals.
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
 1. Ambient Temperature: Not below -22 deg F (-30 deg C) and not exceeding 104 deg F (40 deg C).
 2. Altitude: Not exceeding 6600 feet (2000 m).
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 1. Ambient temperatures within limits specified.
 2. Altitude not exceeding 6600 feet (2000 m).

1.07 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. Siemens Energy & Automation, Inc.
 - c. Square D.

2.02 MANUFACTURED UNITS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Flush and surface mounted cabinets. NEMA PB 1, Type 1.
 - 1. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 3. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
 - 4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 - 5. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
 - 6. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.
- C. Phase and Ground Buses:
 - 1. Material: Phase Bus - Tin-plated aluminum; Grounds Bus - Hard-drawn copper.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
 - 3. Split Bus: Vertical buses divided into individual vertical sections.
- D. Conductor Connectors: Suitable for use with conductor material.
 - 1. Main and Neutral Lugs: Compression type.
 - 2. Ground Lugs and Bus Configured Terminators: Mechanical type.
 - 3. Feed-Through Lugs: Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.03 PANELBOARD SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. GFCI Circuit Breakers for protection of personnel: Single- and two-pole configurations with 5-mA trip sensitivity.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.06 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.

- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install filler plates in unused spaces.
- F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.02 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit. Obtain approval before installing. Use a computer to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.03 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, and feeder.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.04 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Wall-box motion sensors.
 - 3. Wall switches.
 - 4. Communications outlets.
 - 5. Poke-through assemblies.

1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. UTP: Unshielded twisted pair.

1.04 SUBMITTALS

- A. Field quality-control test reports.
- B. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.06 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 3. Leviton Mfg. Company Inc. (Leviton).
 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.02 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-15R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5261 (single), 5262 (duplex).
 - b. Hubbell; HBL5261 (single), HBL5262 (duplex).
 - c. Leviton; 8088 (single), BR15 (duplex).
- B. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5361 (single), 5352 (duplex).

2.03 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped. Device shall fit in a 2-3/4 inch deep outlet box without an adapter.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; GF20.
 - b. Leviton; 6598.

2.04 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).

- C. Pilot Light Switches, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221PL for 120 V and 277 V.
 - b. Hubbell; HPL1221PL for 120 V and 277 V.
 - c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
 - 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."
- 2.05 LOW VOLTAGE SWITCHES:
- A. Switches: Acuity nLight per Construction Documents, or equal.
 - B. Comply with Division 26 Section "Lighting Control Devices"
- 2.06 WALL-BOX DIMMERS
- A. Dimmer Switches: Acuity nLight per Construction Documents, or equal.
 - B. Comply with Division 26 Section "Lighting Control Devices"
- 2.07 OCCUPANCY SENSORS
- A. Wall-Switch Sensors: Acuity nLight per Construction Documents, or equal.
 - B. Ceiling Sensors: Acuity nLight per Construction Documents, or equal.
 - C. Comply with Division 26 Section "Lighting Control Devices"
- 2.08 COMMUNICATIONS OUTLETS
- A. Telephone Outlet:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 3560-6.
 - b. Leviton; 40649.
 - 2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 6. Comply with UL 1863.
 - B. Combination TV and Telephone Outlet:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 3562.
 - b. Leviton; 40595.
 - 2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 6; and one Type F coaxial cable connector.
- 2.09 WALL PLATES
- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws:
 - a. Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic
 - 3. Material for Unfinished Spaces: Galvanized steel

- B. Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in “wet locations.”
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover that is weatherproof whether or not the attachment plug cap is inserted.

2.10 POKE-THROUGH ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Hubbell Incorporated; Wiring Device-Kellems.
 2. Pass & Seymour/Legrand; Wiring Devices & Accessories.
 3. Wiremold Company (The).
- B. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.
 1. Service Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks.
 2. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.
 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.
 5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, 4-pair, Category 6 voice and data communication cables.

2.11 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.
 2. Wiring Devices Connected to Emergency Power System: Red

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 4. Protect devices and assemblies during painting. Remove any paint that accidentally comes in contact with devices and assemblies.
 5. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
 6. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 7. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 8. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 9. Tighten unused terminal screws on the device.
 10. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing..
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.

3.02 CONNECTIONS

- A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 IDENTIFICATION

- A. Comply with Division 26 Section "Identification for Electrical Systems."

3.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
 - 3. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
 - 4. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 3. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 4. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 5. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Replace damaged or defective components.

3.05 CLEANING

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 262726

SECTION 265100

INTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.

1.03 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Ballast.
 - 4. Lumen output, color temperature, and optical distribution.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
- D. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.05 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.06 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
- B. Special Warranty for LED Fixtures: Manufacturer's standard form in which manufacturer agrees to repair or replace fixtures that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for LED Fixtures: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

2.02 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.

- F. Plastic Diffusers, Covers, and Globes:
 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

2.03 EXIT SIGNS

- A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.04 EMERGENCY LIGHTING UNITS

- A. Description: Self-contained units complying with UL 924.
 1. Battery: Sealed, maintenance-free, lead-acid type, with minimum 10-year nominal life.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

PART 3 - EXECUTION

3.01 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section “Hangers and Supports for Electrical Systems” for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).
- F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

3.02 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.
 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Lighting Fixture Support:
 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Adjust aimable lighting fixtures to provide required light intensities.
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.03 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Advance Notice: Give dates and times for field tests.
- C. Provide instruments to make and record test results.

- D. Tests: As follows:
 - 1. Verify normal operation of each fixture after installation.
 - 2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
 - 3. Verify normal transfer to battery source and retransfer to normal.
 - 4. Report results in writing.

- E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.04 CLEANING AND ADJUSTING

- A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

END OF SECTION 265100