SPECIFICATIONS AND CONTRACT DOCUMENTS
FOR

RIVERSIDE COUNTY OFFICE OF ECONOMIC DEVELOPMENT

Lakeland Village Branch Library Project

16275 Grand Avenue, Lake Elsinore, CA 92530

Prepared by
HOLT ARCHITECTURE
2300 Market Street, Suite 140
Riverside, CA 92501

JANUARY 2024

THIS PAGE IS INTENTIONALLY BLANK

SECTION 00 01 03

PROJECT DIRECTORY

OWNER REPRESENTATIVE:

County of Riverside
Contact: Erik Sydow
3403 10th Street, Suite 400
Riverside, CA 92501
951/955-9021 P
esydow@rivco.org

STAMP

ARCHITECT:

Holt Architecture
2300 Market Street, Suite 140
Riverside, CA 92501
951/462-1451 P
PM: David Yount
dyount@holtarchitecture.com
AOR: Matthew C. Acton
macton@holtarchitecture.com

STAMP

STRUCTURAL ENGINEER:

WISEMAN + ROHY
9915 Mira Mesa Blvd., Suite 200
San Diego, CA 92131
858/536-5166 P
PM: Nolan McWhorter
EOR: Steve Rohy
nmcwhorter@wrengineers.com

STAMP

CIVIL ENGINEER:

VCA ENGINEERS
1041 S. Garfield Avenue, Suite 210
Alhambra, CA 91801
323/729-6098 P
PM: Amber Lavello
EOR: Virgil Aoanan
Amber.Lavello@vcaeng.com

STAMP

MECHANICAL ENGINEER:

DESIGN WEST ENGINEERING
412 E. Vanderbilt Way
San Bernardino, CA 92408
909/890-3700 P
PM: Alvaro Olague
EOR: Steven Johnson
AOlague@designwesteng.com

STAMP

ELECTRICAL ENGINEER:

DESIGN WEST ENGINEERING
412 E. Vanderbilt Way
San Bernardino, CA 92408
909/890-3700 P
PM: Arcadio Nungaray
EOR: Steven Johnson
ANungaray@designwesteng.com

STAMP

PLUMBING ENGINEER:

DESIGN WEST ENGINEERING
412 E. Vanderbilt Way
San Bernardino, CA 92408
909/890-3700 P
PM: Alvaro Olague
EOR: Steven Johnson
AOlague@designwesteng.com

DOOR HARDWARE CONSULTANT:

ASSA ABLOY
657/258-7071 P
Valarie Harris
Valarie.Harris@assabloy.com

END OF SECTION

SECTION 00 01 10

TABLE OF CONTENTS

DIVISION 21 – FIRE SUPPRESION

NOT USED

DIVISION 22 – PLUMBING

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

DIVISION 26 – ELECTRICAL

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Furnish all labor and equipment necessary to perform demolition and site clearing work as shown on drawings and specified herein, including removal of slabs, curbs, walls, partitions, fixtures, finishes, and other items as indicated and required for new construction.

B. Protect all existing installations from damage. Take measures to prevent damage to existing facilities and finishes during demolition and construction.

C. Carefully remove items which are to remain property of Owner, and store in secure, dry area for later reuse.

D. Salvaged Material (not wanted by Owner): Items which the Owner does not want and is of salvable value to Contractor may be removed from structure as work progresses. Owner and CBC 2022 require a minimum of 50% (by weight) of all non-hazardous construction materials be recycled, composted and/or salvaged.

E. Related Work Specified elsewhere:

1. Disconnecting and capping existing gas, water, sewer and electrical utilities is included under other Divisions. Coordinate with work under these Divisions to make sure their work is complete before starting demolition work affecting these utilities.
2. Removal of Plumbing: Division 22.
3. Removal of Mechanical: Division 23.
4. Removal of Electrical: Division 26.

1.03 STANDARDS AND REFERENCES

A. Definitions:

1. Except for items or materials indicated to be reused, salvaged or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition by the Contractor(s) in a legal disposal area appropriate to the materials being disposed
2. "Remove": Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
3. "Removed and salvaged": Items to remain the Owner's property shall be removed, cleaned, and packed or crated to protect against damage. Identify contents and deliver to Owner's designated storage area.
4. "Existing to Remain" Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.
5. "Remove and Reinstall": Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.

B. Codes and Regulations: Demolition work shall comply with local ordinances and Safety Codes of State of California and rules and regulations of Industrial Accident Commission of State of California' applicable to demolition work.

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition work similar to that indicated for this Project.

B. Safety Precautions: Perform demolition work in such a manner as to prevent damage to existing facilities to remain or to be salvaged, and to prevent injury to public and workmen engaged on site under this or other contracts.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Submit according to the requirements of Section 01 33 00 Submittal Procedures.

B. Proposed Dust Control Measures.

C. Proposed Noise Control Measures.

D. Schedule of demolition activities indicating the following:

1. Detailed sequence of demolition, salvage, and removal work, with starting and ending dates for each activity.

2. Dates for shutoff, capping, and continuation of utility services.

E. Salvage Plan - Inventory of items to be removed and salvaged. Salvage plan shall show how all materials are to be sorted, salvaged and recycled. Plan must include all final destinations for each type of material.

1. Contractor shall submit salvage plan showing how all materials are to be sorted, salvaged and recycled. Plan must include all final destinations for each type of material.

2. Salvaged items must be transported from site as they are removed, unless materials are to be reused on site.

3. Storage or sale of removed items on site will not be permitted, unless materials are to be reused on site.

4. Contractor shall provide certification for all salvaged materials. Certifications may take the form of receipts from recycling facilities, manufacturers, or any other legitimate form of certification. Certification types shall be outlined in salvage plan and approved by Owner.

F. Inventory of items to be removed and salvaged, and deliver to Owner's designated storage area.

G. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and improvements that might be misconstrued as damage caused by demolition operations.

H. Pre-Demolition Conference: Conduct conference at Project site with Owner, Architect and Construction Manager

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

Comply with the requirements of Sections 01 50 00 Construction Facilities.

1.09 RECORD DRAWINGS

Comply with the requirements of Section 01 77 00 Project Closeout.

1.10 WARRANTY

Provide manufacturer's standard warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

Not applicable

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Confirm existing conditions and correlate with requirements indicted to determine extent of demolition required.

C. Inventory and record the conditions of items to be removed and reinstalled and items to be removed and salvaged.

D. Correct conditions detrimental to timely and proper completion of the Work.

E. Do not proceed until unsatisfactory conditions are corrected.

F. Beginning of installation means acceptance of conditions.

G. Confirm condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.

H. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.02 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

B. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways.

2. Protect existing site improvements, appurtenances, and landscaping to remain.

D. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to remain.

E. Strengthen or add new supports when required during progress of demolition.

3.03 SCHEDULING

A. Protect all existing installations from damage. Take measures to prevent damage to existing facilities and finishes during demolition and construction.

B. Arrange demolition and salvage schedule so as not to interfere with Owner's on-site operations.

3.04 ITEMS REMOVED BY CONTRACTOR AND RETAINED BY OWNER

General: Items noted on drawings shall be removed without damage and turned over to Owner. Coordinate with Owner and arrange for designated storage area.

3.05 UTILITY SERVICES

A. Utility Requirements: Refer to Division 21 through Division 26 sections for shutting-off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

B. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

C. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner, and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

D. Provide not less than 72 hours notice to Owner if shutdown of service is required during changeover.

3.06 EXPLOSIVES

The use of explosives will not be permitted.

3.07 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Do not create hazardous or objectionable conditions, such as flooding, and pollution, when using water.

C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

E. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.08 DEMOLITION

A. Demolish concrete and/or asphalt paving, and densified granite surfaces, as required to prepare for new construction.

B. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.

C. Fill below-grade areas and voids resulting from demolition of building elements and pavements and soil materials according to requirements of Division 31.

D. Promptly repair damages to adjacent facilities caused by demolition operations.

E. Wherever cutting and removal of portions of existing work is indicated, such work shall be sawn in a manner that will produce neat and straight lines, parallel to adjacent surfaces or plumb for vertical surfaces. Execute cutting and demolition by methods which will prevent

damage to other work, and which will provide proper surfaces to receive installation of repairs and new work.

3.09 DISPOSAL OF DEMOLISHED MATERIALS

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

B. Removal: All materials resulting from demolition work, except those items specifically listed to be retained by Owner, shall become property of contractor and shall be removed from premises. All material to be removed needs to be out of the area as scheduled.

1. Establish haul routes in advance and post flagmen to assure safety of public and workmen.

2. Keep streets (and facilities) free of mud, rubbish, etc. Assume responsibility for any damage resulting from hauling operations and hold Owner free and clear of any liability in connection therewith.

C. Burning demolished materials is not allowed.

D. Transport demolished materials off Owner's property and legally dispose of these materials.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 03 24 00

FIBROUS REINFORCING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Supply and install all fibrous reinforcing, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete and proper installation.

B. Section includes, but is not limited to:

1. Polypropylene fibers used as concrete secondary reinforcement.

C. Related Sections:

1. Section 03 20 00 - Reinforcing Steel.
2. Section 03 30 00 - Cast-in-Place Concrete.

1.03 STANDARDS AND REFERENCES

A. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

B. ASTM C 1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.

C. Southwest Certification Services (SWCS), Omega Point Laboratories No. 8662-1.

D. UL Report File No. R8534-11.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Synthetic fiber reinforcement manufactured in ISO 9001:2000 certified facility.
2. Minimum 10-year satisfactory performance history of specified synthetic fiber reinforcement.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Submit manufacturer's product data, including application rate and mixing instructions.

C. Samples: Submit manufacturer's sample of synthetic fiber reinforcement.

D. Manufacturer's Certification:

1. Submit manufacturer's certification that synthetic fiber reinforcement complies with specified requirements.
2. Submit evidence of manufacturer's ISO 9001:2000 certification.
3. Submit evidence of satisfactory performance history of synthetic fiber reinforcement.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Delivery: Deliver synthetic fiber reinforcement in manufacturer's original, unopened, undamaged containers and packaging, with labels clearly identifying product name, unique identification number, code approvals, directions for use, manufacturer, and weight of fibers.

C. Storage:

1. Store synthetic fiber reinforcement in clean, dry area indoors in accordance with manufacturer's instructions.

2. Keep packaging sealed until ready for use.

D. Handling: Protect synthetic fiber reinforcement during handling to prevent contamination.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with the Manufacturer's Standard Requirements.

1.9 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MANUFACTURER

Basis of Design: Propex Operating Company, LLC, PO Box 22788, Chattanooga, TN 37422. Toll Free (800) 621-1273. Website: www.fibermesh.com

2.02 SYNTHETIC FIBER REINFORCEMENT

A. Synthetic Fiber Reinforcement: Fibermesh 300.

1. Material: 100 percent virgin homopolymer polypropylene multifilament fibers, containing no reprocessed olefin materials.

2. Conformance: ASTM C 1116, Type III.

3. Fire Classifications:

a. UL Report File No. R8534-11.

b. Southwest Certification Services (SWCS), Omega Point Laboratories No. 8662-1.

4. Fiber Length: Graded and Single-cut lengths.

5. Alkali Resistance: Alkali proof.

6. Absorption: Nil.

7. Specific Gravity: 0.91.

8. Melt Point: 324 degrees F (162 degrees C).

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Notify the Construction Manager and Architect in writing of any conditions detrimental to the proper and timely completion of the installation.

C. Correct conditions detrimental to timely and proper complete of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 MIXING

A. Add synthetic fiber reinforcement to concrete mixture in accordance with manufacturer's instructions.

B. Add synthetic fiber reinforcement into concrete mixer before, during, or after batching other concrete materials.

C. Application Rate: Add synthetic fiber reinforcement at standard application rate of 1.5 pounds per cubic yard (0.90 kg/m^3) of concrete.

D. Mix synthetic fiber reinforcement in concrete mixer in accordance with mixing time and speed of ASTM C 94 to ensure uniform distribution and random orientation of fibers throughout concrete.

E. Concrete shall be as specified in Section 03 30 00.

3.03 PLACING AND FINISHING

Placing and finishing concrete shall be as specified in Section 03 30 00.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 03 10 00 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.

2. Section 03 20 00 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.

2. Fly ash.

3. Slag cement.

4. Aggregates.

5. Admixtures:

a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

6. Vapor retarders to the architect only.

7. Liquid floor treatments to the architect only.

8. Curing materials.

9. Joint fillers to the architect only.

B. Sustainable Design Submittals:

C. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.

2. Minimum 28-day compressive strength.

3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    a. Location of construction joints is subject to approval of the Architect and Engineer.

E. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Aggregates.
5. Admixtures:

C. Research Reports: For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.

D. Preconstruction Test Reports: For each mix design.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C9 and ACI 301.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1 (ACI 305.1M).

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150, Type II.

2. Fly Ash: ASTM C618, Class C or F.

3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.

b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.

c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. (2.37 kg/cu. m) for moderately reactive aggregate or 3 lb./cu. yd. (1.78 kg/cu. m) for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

2. Maximum Coarse-Aggregate Size: per structural drawings.

3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C49, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

E. Water and Water Used to Make Ice: ASTM C94, potable.

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

LIQUID FLOOR TREATMENTS

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:
    a. Ambient Temperature Below 50 deg F (10 deg C): Black.
    b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
    c. Ambient Temperature Above 85 deg F (29 deg C): White.

C. Curing Paper: Eight-feet- (2438-mm-) wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

D. Water: Potable or complying with ASTM C1602/C1602M.

E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming, Non-dissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Floor Slab Protective Covering: Eight-feet- (2438-mm-) wide cellulose fabric.

2.6 CONCRETE MIXTURES, GENERAL

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

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.

2. Slag Cement: 50 percent by mass.

3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.

4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete for parking structure slabs, and concrete with a w/cm below 0.50.

2.7 CONCRETE MIXTURES

A. See concrete mix requirements for strength, w/c ratio and aggregate on the structural drawings.

1. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.2 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.

2. Face laps away from exposed direction of concrete pour.

3. Lap vapor retarder over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.

4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.

6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.

7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

3.3 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.

2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.

    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

4. Space joints as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth u.o.n. of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.

2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.

2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.4 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.

2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.

2. Deposit concrete to avoid segregation.

3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

a. Do not use vibrators to transport concrete inside forms.

b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.

c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.

2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

3. Maintain reinforcement in position on chairs during concrete placement.

4. Screed slab surfaces with a straightedge and strike off to correct elevations.

5. Level concrete, cut high areas, and fill low areas.

6. Slope surfaces uniformly to drains where required.

7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.

8. Do not further disturb slab surfaces before starting finishing operations.

3.5 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.

b. Remove projections larger than 1 inch (25 mm).

c. Tie holes do not require patching.

d. Surface Tolerance: ACI 117 Class D.

e. Apply to concrete surfaces not exposed to public view.

2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.

b. Remove projections larger than 1/4 inch (6 mm).

c. Patch tie holes.

d. Surface Tolerance: ACI 117 (ACI 117M) Class B.

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

3. ACI 301 Surface Finish SF-3.0:

a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.

b. Remove projections larger than 1/8 inch (3 mm).

c. Patch tie holes.

d. Surface Tolerance: ACI 117 Class A.

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

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.6 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.

2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch (6 mm) in one direction.

3. Apply scratch finish to surfaces to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.

2. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.

3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.

2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.

3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

4. Do not add water to concrete surface.

5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.

6. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

7. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch (4.8 mm).

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.

2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

2. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish to concrete stair treads, platforms, ramps as indicated on Drawings

1. Apply in accordance with manufacturer's written instructions and as follows:

a. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate over surface in one or two applications.

b. Tamp aggregate flush with surface, but do not force below surface.

c. After broadcasting and tamping, apply float finish.

d. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.

2. Mix, place, and cure concrete, as specified, to blend with in-place construction.

3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.

2. Screed, tamp, and trowel finish concrete surfaces.

3.8 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.

2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1,) before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.

2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.

3. If forms remain during curing period, moist cure after loosening forms.

4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.

b. Continuous Sprinkling: Maintain concrete surface continuously wet.

c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.

2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Begin curing immediately after finishing concrete.

2. Interior Concrete Floors:

a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12-inches (300-mm).

b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.

b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).

b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.

b) Continuous water-fog spray.

c. Floors to Receive Polished Finish: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).

b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.

b) Continuous water-fog spray.

d. Floors to Receive Chemical Stain:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.

2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.

3) Butt sides of curing paper tight; do not overlap sides of curing paper.

4) Leave curing paper in place for duration of curing period, but not less than 28 days.

e. Floors to Receive Urethane Flooring:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches (150 mm) and sealed in place.

3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.

4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

5) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

f. Floors to Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.

2) Recoat areas subjected to heavy rainfall within three hours after initial application.

3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.9 TOLERANCES

A. Conform to ACI 117 (ACI 117M).

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.

3. Rinse with water; remove excess material until surface is dry.

4. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31.

2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.

3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31, ASTM C39, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.

2) Name of testing agency.

3) Names and certification numbers of field and laboratory technicians performing inspections and testing.

4) Name of concrete manufacturer.

5) Date and time of inspection, sampling, and field testing.

6) Date and time of concrete placement.

7) Location in Work of concrete represented by samples.

8) Date and time sample was obtained.

9) Truck and batch ticket numbers.

10) Design compressive strength at 28 days.

11) Concrete mixture designation, proportions, and materials.

12) Field test results.

13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.

14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.

2. Verification of use of required design mixture.

3. Concrete placement, including conveying and depositing.

4. Curing procedures and maintenance of curing temperature.

5. Verification of concrete strength before removal of shores and forms from beams and slabs.

6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/ shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143:

a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231 pressure method, for normal-weight concrete; ASTM C173 volumetric method, for structural lightweight concrete.

a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064:

a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Unit Weight: ASTM C567 fresh unit weight of structural lightweight concrete.

a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

6. Compression Test Specimens: ASTM C31:

   a. Cast and laboratory cure two sets of four 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C39.

   a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.

   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

10. Additional Tests:

    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

       1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 (ACI 301M), section 1.6.6.3.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 (ASTM E1155M) within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.12 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.

2. Diaper hydraulic equipment used over concrete surfaces.

3. Prohibit vehicles from interior concrete slabs.

4. Prohibit use of pipe-cutting machinery over concrete surfaces.

5. Prohibit placement of steel items on concrete surfaces.

6. Prohibit use of acids or acidic detergents over concrete surfaces.

7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 04 73 00

MANUFACTURED STONE MASONRY

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all manufactured stone veneer and architectural trim products, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation.

1.03 STANDARDS AND REFERENCES

A. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

B. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile

C. ASTM C 177 - Standard Test Method for Steady-State Head Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

D. ASTM C 190 - Method of Test for Tensile Strength of Hydraulic Cement Mortars

E. ASTM C 192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

F. ASTM C 482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste

G. ASTM C 567 - Standard Test Method for Determining Density of Structural Lightweight Concrete

H. ASTM C 1329 - Standard Specification for Portland Cement

I. ASTM C 1670 - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units.

J. ASTM C 1780 - Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer

K. ICC AC 38 Acceptance Criteria for Water Resistive Barriers

L. ICC ESR 2598 Coronado Stone Products Evaluation Report

M. LEED: US Green Building Council's Leadership in Energy and Environmental Design Green Building Rating System

N. Texas Department of Insurance: Product Evaluation - EC101

O. UBC Standard No. 14-1, Kraft Waterproof Building Paper

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Coronado Stone Products

B. Installer Qualifications: Minimum 5 years' experience with similar scope of work and must be able to furnish list of previous jobs and references if requested by Architect.

C. Certifications: Products approved by ICC-ES Evaluation Service.

D. Mock-Up: Provide field panel sample to evaluate preparation and application techniques.

E. Pre-Installation Conference: Conduct a pre-installation meeting to verify all products, application methods, site conditions and warranty terms no less than thirty days prior to stone veneer installation.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Submit following in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Manufacturer's specification and data sheets for each product used, including:

1. Preparation instructions.
2. Storage and handling requirements and recommendations.
3. Installation guidelines.
4. Cleaning and maintenance methods.

C. Shop Drawings: Submit elevations and cross-section details showing proper installation methods.

D. Sample Selection

1. Standard sample board with selected stone profile and color should be submitted for each product specification.
2. Selection of approved grout colors and styles (if applicable).

E. Sample Verification: A field panel sample with the minimum size of 3’ x 3’ should be installed for every product selection showing: styles, colors, textures and grout colors.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Closeout Submittals: Provide manufacturer’s warranty and maintenance recommendations.

1.07 DELIVERY, STORAGE & HANDLING

A. Coordination of on-site delivery and storage should be arranged in advance to avoid work delays.

B. Store and handle stone products in accordance with the manufacturer’s recommendations.

C. All material stored on-site should be protected from the elements before and during the installation process. Store material under cover and in a dry location.

D. Store mortar, sealant and other installation material in compliance with the manufacturer’s recommendations.

1.08 PROJECT CONDITIONS

A. Maintain manufacturer’s recommended environmental conditions to ensure optimum results.

B. Cold Weather Requirements: Installations should be performed in temperatures exceeding 40 degrees Fahrenheit prior to, during and for 48 hours after completion of work. If temperatures are below 40 degrees Fahrenheit, masons should use heaters and tents during the installation process to regulate temperature.

C. Hot Weather Requirements: If temperatures exceed 90 degrees Fahrenheit during the installation, additional moisture will need to be added to the backs of the stone veneer and scratch coated surface. Shade and/or frequent misting of the wall and stone may be required.

1.09 WARRANTY

A. Provide manufacturer’s 50-year limited warranty.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Manufacturer: Coronado Stone Products (Corporate Office), which is located at: 11191 Calabash Ave, Fontana, CA 92337; Toll Free Tel: 800-847-8663; Fax: 909-357-7362; Email: sales@coronado.com; Web: www.Coronado.com

B. Or Architect approved equal.

2.02 MATERIALS

A. Manufactured Stone Veneer profile and color:

1. Pro-Ledge in Brookside.

B. Stone Accessories profile and color:

1. Chiseled Stone Sill in Brownstone.
2. Post Cap in Brownstone.
3. Wall Cap in Brownstone.

C. Manufactured Stone Veneer - Properties: Units consisting of Portland cement, lightweight aggregates and oxide pigments.

1. Compressive Strength: Tested in accordance with ASTM C39 and ASTM C192, greater than 1800 psi.
2. Shear Bond Test: Tested in accordance with ASTM C482, greater than 50 psi.
3. Water Absorption: Tested in accordance with section 3.1.4 and 4.6 of ICC-ES AC51.
4. Freeze / Thaw: Tested in accordance with ASTM C67, less than 3% mass loss.
5. Unit Weight: Shipping weight is less than 15 lbs. per sq ft, density is determined in accordance with ASTM C567.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Do not begin the installation process until substrates have been properly prepared.

B. Notify architect of any unsatisfactory preparation of substrate before proceeding.

C. Correct all unsatisfactory substrate conditions before installation begins.

D. Verify roofs use proper water displacement methods to direct moisture away from the installed stone veneer.

E. If substrate surface is questionable, bonding tests should be performed before installation to assess adhesion and confirm proper bonding strength.

F. Flashing must be installed at wall penetrations and terminations of the stone veneer. Assure that all flashing and kickouts are corrosion resistant, integrated with the WRB properly (when used), and installed in accordance with the local building code requirements.

3.02 PREPARATION

A. Clean all surfaces thoroughly prior to installation.

B. Use manufacturer surface preparation recommendations to achieve best result.

3.03 INSTALLATION

A. Product should be pulled from a variety of boxes and blended on site during installation to ensure a consistent overall project color on the wall.

B. Install in accordance with manufacturer's installation instructions. Visit this page for detailed installation instructions - https://www.coronado.com/InstallationGuide

C. Application details and mortar recommendations may vary depending on the stone style. Consult manufacturer for proper installation instructions.

D. All dry-stacked and large format standard stones should be installed using a polymer-modified mortar meeting ANSI A118.4 or ANSI 118.15.

E. All Classic Series and WoodStone products must be applied with a polymer-modified thinset bonding mortar meeting ANSI A118.4 or ANSI 118.15.

F. All applications in freeze-thaw environments require a polymer-modified mortar.

3.04 CLEANING AND PROTECTION

A. Installed manufactured stone veneer can be cleaned with a mild soap and water solution.

B. Cleaning efflorescence can be done by lightly scrubbing the face of the stone with a soft bristle brush and water. In some cases, a 25% vinegar 75% water solution may need to be used. Do not use any harsh cleaning methods to remove efflorescence.

C. Touch-up, repair or replace damaged stone before completion of project.

D. Water repellents and enhancers can be used to further protect a finished project. Only breathable, penetrating water-based silane water repellents should be used.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shear stud connectors.
3. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Shop primer.
8. Galvanized-steel primer.
9. Etching cleaner.
10. Galvanized repair paint.
11. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

C. Delegated-Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Mill test reports for structural-steel materials, including chemical and physical properties.

C. Source quality-control reports.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Option 1: Connection designs have been completed and connections indicated on the Drawings.

C. Moment Connections: Type FR, fully restrained.

D. Construction: Moment frame, Braced frame.

2.2 STRUCTURAL-STEEL MATERIALS

A. All shapes: per structural drawings

B. Welding Electrodes: Comply with AWS requirements E70XX.

2.3 BOLTS AND CONNECTORS

A. High-Strength Bolts, Nuts, and Washers: per structural drawings

1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1 (Type 8.8-1), compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: per structural drawings

1. Direct-Tension Indicators: ASTM F959/F959M, Type 490-1 (Type 10.9-1), compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: per structural drawings

1. Finish: Hot-dip or mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1 (Type 8.8-1), compressible-washer type with mechanically deposited zinc coating finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: per structural drawings

1. Finish: Mechanically deposited zinc coating.

E. Shear Stud Connectors: per structural drawings RODS

F. Unheaded Anchor Rods: Per structural drawings.

1. Configuration: Straight.

2. Finish: Plain.

G. Headed Anchor Rods: Per structural drawings, straight.

1. Finish: Plain.

H. Threaded Rods: Per structural drawings.

1. Finish: Plain.

2.4 PRIMER

A. Steel Primer:

1. Comply with Section 09 91 13 Exterior Painting.

2. SSPC-Paint 23, latex primer.

3. Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26.

1. Etching Cleaner: MPI#25, for galvanized steel.

2. Galvanizing Repair Paint: ASTM A780/A780M.

2.5 SHRINKAGE-RESISTANT GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

B. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with the latest edition of AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Per connection details.

B. Weld Connections: Comply with the latest edition of AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.9 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7 (WAB)/NACE WAB-4.
4. SSPC-SP 6 (WAB)/NACE WAB-3.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    a. Liquid Penetrant Inspection: ASTM E165/E165M.
    b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    c. Ultrasonic Inspection: ASTM E164.
    d. Radiographic Inspection: ASTM E94/E94M.
4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M.
5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

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

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Per connection details.

B. Weld Connections: Comply with the latest edition of AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with the latest edition of AWS D1.1/D1.1M.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1) Liquid Penetrant Inspection: ASTM E165/E165M.

2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

3) Ultrasonic Inspection: ASTM E164.

4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports
2. Metal ladders
3. Miscellaneous steel trim
4. Metal bollards
5. Pipe and Downspout guards
6. Abrasive metal nosing, tread, and thresholds
7. Loose bearing and leveling plates

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes
2. Fasteners
3. Shop primers
4. Shrinkage-resisting grout
5. Manufactured metal ladders
6. Metal bollards
7. Pipe and Downspout guards
8. Abrasive metal nosings, treads, and thresholds

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Samples: For each type and finish of extruded nosing and tread.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance of Aluminum Ladders: Ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 316L.

D. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

E. Rolled-Stainless Steel Floor Plate: ASTM A793.

F. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface

1. As manufactured by Ohio Grating, Inc. or approved equal.

G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

I. Zinc-Coated Steel Wire Rope: ASTM A741.

1. Wire Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

J. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

K. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

L. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

M. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

N. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).

O. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (leaded red brass) or UNS No. C84400 (leaded semired brass).

P. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening aluminum, stainless steel or nickel silver.

2. Provide bronze fasteners for fastening bronze.

B. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 09 90 00 Painting.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, except for elevator pit ladders.

2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.

2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.

3. Rungs: 1-inch- (25-mm-) square, steel bars.

4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

5. Provide nonslip surfaces on top of each rung.

6. Galvanize and prime exterior ladders, including brackets.

7. Prime exterior ladders, including brackets and fasteners, with zinc-rich primer.

C. Aluminum Ladders:

1. As manufactured by O'Keeffe's Inc., Precision Ladders or approved equal.

2. Space siderails 18 inches (457 mm) apart unless otherwise indicated.

3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches (64 mm) deep, 3/4 inch (19 mm) wide, and 1/8 inch (3.2 mm) thick.

4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch (19 mm) deep and not less than 1/8 inch (3.2 mm) thick, with ribbed tread surfaces.

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.8 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe

1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel.

B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick, steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch (19-mm) anchor bolts.

C. Fabricate sleeves for bollard anchorage from steel or stainless steel pipe or tubing with 1/4-inch- (6.4-mm-) thick, steel or stainless-steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard.

D. Prime steel bollards with zinc-rich primer.

2.9 PIPE AND DOWNSPOUT GUARDS

A. Fabricate pipe and downspout guards from 3/8-inch- (9.5-mm-) thick by 12-inch- (300-mm-) wide, steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch (50-mm) clearance between pipe and pipe guard. Drill each end for two 3/4-inch (19-mm) anchor bolts.

B. Galvanize and prime steel pipe and downspout] guards.

C. Prime steel pipe and downspout guards with zinc-rich primer.

2.10 ABRASIVE METAL NOSINGS, TREADS AND THRESHOLDS

A. Cast-Metal Units: Cast aluminum, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. As manufactured by Balco, or approved equal.

B. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. As manufactured by Balco, Nystrom, or approved equal.

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.

3. Provide solid-abrasive-type units without ribs.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

D. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

E. Apply bituminous paint to concealed surfaces of cast-metal units.

F. Apply clear lacquer to concealed surfaces of extruded units.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items **not indicated to be galvanized** unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Section 09 unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."

5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards to existing construction with through bolts. Provide four 3/4-inch (19-mm) bolts at each bollard unless otherwise indicated.

1. Embed anchor bolts at least 4 inches (100 mm) in concrete.

C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete] [in formed or core-drilled holes not less than 42 inches (1050 mm) deep and 3/4 inch (19 mm) larger than OD of bollard. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

D. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

E. Fill bollards solidly with concrete, mounding top surface to shed water.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. General: Fabricate, supply and install pipe metal railings as shown in Drawings and as specified herein, including all accessories and hardware for a complete, timely and proper installation.

B. Additional:

1. Field measuring for weld plates, sleeves and insert locations.
2. Field measuring.
3. Anchors or inserts precast concrete.
4. Prime painting of galvanized materials

1.03 STANDARDS AND REFERENCES

A. American Architectural Manufacturers Association (AAMA)

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

C. American Institute of Steel Construction (AISC)

D. American Iron and Steel Institute (AISI)

E. American National Standards Institute (ANSI)

1. ANSI A21.1 Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.
2. ANSI A58.1 Minimum Design Loads in Buildings and Other Structures.
3. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities.

F. American Society for Testing and Materials (ASTM)

1. A 29 Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for.
2. A 47 Specification for Ferritic Malleable Iron Castings.
3. A 48 Specification for Gray Iron Castings.
4. A 53 Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless.
5. A 108 Steel Bars, Carbon, Cold Finished, Standard Quality.
6. A 123 Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
7. A 500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
8. A 570 Specification for Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality.
9. A 575 Specification for Steel Bars, Carbon, Merchant Quality, M Grades.

10. A1264-1 Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems
11. C 595 Specification for Blended Hydraulic Cements.
12. E 84 Test Method for Surface Burning Characteristics of Building Materials.
13. E 894 Standard Test Methods for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
14. E 935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
15. E 985 Specification for Permanent Metal Railing Systems and Rails for Buildings.

G. American Welding Society (AWS): Specifications for Welding Rods and Bare Electrodes.

H. Americans With Disabilities Act Accessibility Guidelines (ADAAG)

I. National Association of Architectural Metal Manufacturers (NAAMM) and National Ornamental and Miscellaneous Metals Association (NOMMA): Metal Finishes Manual

J. National Association of Architectural Metal Manufacturers (NAAMM): Pipe Railing Manual and Metal Stair Manual

K. National Fire Protection Association (NFPA): 101 Life Safety Code

1.04 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications: Furnish references listing projects of similar size and scope.

B. Regulatory Requirements:

1. Components and installation are to be in accordance with state and local code authorities
2. Components and installation are to follow current ADA and ICC/ANSI A117.1 guidelines.

C. Structural Requirements:

1. Railing assembly shall withstand a minimum concentrated load of 200 pounds applied vertically downward or horizontally in any direction, but not simultaneously, at any point on the top rail.
2. Guard intermediate rails, balusters, panel fillers, posts or cables shall be designed for a uniform load of not less than 50 pounds per square foot applied horizontally over the gross area of the guard of which they are part. Reactions due to this loading need not be added to the loading specified for the main supporting members of the guard.
3. Railing frame components and cable hardware shall be designed to withstand loads encountered without excessive deflection or distortion when cables are tensioned to conform to building code requirements.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 23 Submittals.

1. Show sections and plans of stairs, dimensions and assembly of components.
    a. Railings
    b. Handrail

c. Brackets

d. Reinforcements

e. Anchors

f. Welded and bolted connections

2. Show all field connections

3. Provide setting diagrams for installation of anchors, location of pockets, weld plates for attachment of rails to structure, and blocking for attachment of wall rail.

4. Specify adequate back up support for anchoring handrail bracket.

5. Indicate all required field measurements.

6. Submit one set of digital files for approval.

7. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.

B. Submit manufacturer's installation instructions under provisions of Section.

C. Certifications

1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.

2. Furnish certification that components were installed in accordance to the manufacturer's engineering data to meet the specified design loads.

D. Samples:

Submit duplicate samples of railing showing style and finish. One approved sample will be returned to contractor.

E. Pre-Installation Meeting

1. Prior to the beginning of work, conduct a pre-job conference at the job site.

2. Provide seven calendar days advance written notice ensuring the attendance by competent authorized representatives of the fabricator, building owner's representative, architect and subcontractors whose work interfaces with the work of this section.

3. Review the specifications to determine any potential problems, changes, scheduling, unique job site conditions, installation requirements and procedures and any other information pertinent to the installation.

4. Record the results of the conference and furnish copies to all participants.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Section 01 60 00 Materials and Equipment.

B. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.

C. Storage on site:

1. Store material in a location and in a manner to avoid damage. Stacking shall be done in a way, which will prevent bending.

2. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.

3. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer's Standard Requirements.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 78 39 Contract Closeout.

1.10 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 00 Warranties.

PART 2 - PRODUCTS

2.01 MANUFACTURER

Basis of Design: Railing pipe and components shall be as manufactured or supplied by The Wagner Companies; P.O. Box 423; Butler, WI 53007. Phone: 888-243-6914. Fax: 414-214-0550. Web site: www.wagnercompanies.com. E-mail: info@mailwagner.com

2.02 MATERIALS AND FINISHES

Steel:

A. Pipe: ASTM A 53

B. Castings: Malleable, Ductile, Grey Iron meeting ASTM A 47 and ASTM A 48

C. Finish (refer to NAAMM/NOMMA Metal Finishes Manual):

1. Surface Preparation: Remove loose scale, rust, grease, oil, moisture or other foreign materials to properly prepare the surface for subsequent coating application.

   Remove mill scale, rust and dirt following SSPC SP2 for hand cleaning and SSPC SP3 for power tool cleaning.

2. Galvanizing:

   a. Products fabricated from shapes, plates, bars and strips shall be galvanized in accordance with ASTM A 123.
   b. Sheet products shall be galvanized in accordance with ASTM A 525 and ASTM A 526.
   c. Minimum coating weight 0.90 oz/sq. ft.

3. Paint:

   a. Minimum one coat of rust-inhibitive primer, FS-TT-P-641 Zinc Dust-Zinc Oxide Primer Coating (for Galvanized Surfaces) and FS-TT-P-645 Alkyd Type, Zinc Chromate, Paint Primer.

   b. Painted finish shall be as indicated in the Drawings.

   c. Touch up for Galvanized Surfaces: Use paint primer meeting FS-TT-P-645.

2.03 RAILING SYSTEM

A. Material shall conform to 2.02 and be finished in accordance with 2.02.

B. Railing system shall be permanently anchored.

C. Rails and Posts: Fabricate rails and posts from steel pipe with nominal size of 1 1/2", (1.900" outside diameter) Schedule 40 (.140" wall).

D. Pickets: .750" diameter, 0.050" wall steel tubing.

E. Toe Board: Provide Toe Board of matching material as required.

2.04 FASTENERS

A. All mechanical fasteners used in the assembly of stainless steel or aluminum railings shall be manufactured from stainless steel.

B. Exposed mechanical fasteners for use with bronze materials shall be manufactured from yellow brass.

C. Cement: Hydraulic, ASTM C 595, factory prepared with accelerator.

2.05 FABRICATION

A. Form rail-to-end post connections and all changes in rail direction by miter elbows.

B. Cut material square and remove burrs from all exposed edges, with no chamfer.

C. Make exposed joints butt tight and flush.

D. Close exposed ends of pipe and handrail by use of appropriate end cap.

E. For posts set in concrete, furnish matching sleeves or inserts not less than 5 inches long.

F. Locate intermediate rails equally spaced between top rail and finished floor or center line of tread.

G. Verify dimensions on site prior to shop fabrication.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Notify the Construction Manager and Architect in writing of any conditions detrimental to the proper and timely completion of the installation.

C. Correct conditions detrimental to timely and proper complete of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

Supply items to be cast in concrete.

3.03 INSTALLATION

A. Install in accordance with shop drawings and manufacturer’s instructions at locations indicated on the drawings.

B. Erect work square and level, horizontal or parallel to rake of steps or ramp, rigid, and free from distortion or defects detrimental to appearance or performance.

C. Expansion joints shall be provided as needed to allow for thermal expansion or contraction.

3.04 CLEANING

A. As installation is completed, wash thoroughly using clean water and soap; rinse with clean water.

B. Do not use acid solution, steel wool or other harsh abrasives.

C. If stain remains after washing, remove finish and restore in accordance with NAAMM/NOMMA Metal Finishes Manual.

3.05 REPAIR OF DEFECTIVE WORK

A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

B. Repair damaged finish as directed by Architect

C. Replace defective or damaged components as directed by Architect.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Shear wall panels.
4. Rooftop equipment bases and support curbs.
5. Wood blocking and nailers.
6. Wood furring.
7. Wood sleepers.
8. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Shear panels.
5. Power-driven fasteners.
6. Post-installed anchors.
7. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency WCLIB & WWPA.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.

3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: per structural drawings.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground unless otherwise noted in drawings, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items as specified in structural drawings

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms.

2. Framing for stages.

3. Concealed blocking.
4. Framing for non-load-bearing partitions.
5. Framing for non-load-bearing exterior walls.
6. Roof construction.
7. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: per structural drawings

1. Application: All interior partitions
2. Species:
   a. per structural drawings.

B. Framing Other Than Non-Load-Bearing Partitions: per structural drawings

1. Application: Framing other than interior partitions
2. Species:

C. Exposed Framing: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Species and Grade: As indicated above for load-bearing construction of same type.

2.5 ENGINEERED WOOD PRODUCTS

A. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Comply with material requirements of and with structural capacities established and monitored according to ASTM D5055.

1. Products shall be per Red Built as indicated on the structural drawings.
2. Structural Properties: Depths and design values not less than those indicated.
3. Comply with APA PRI-400. Factory mark I-joists with APA-EWS trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA-EWS standard.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. Dimension Lumber Items: per structural drawings

2.7 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.8 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on current edition as appropriate for the substrate.

2.9 METAL FRAMING ANCHORS

A. Per structural drawings

B. Allowable design loads, as published by manufacturer, shall meet or exceed those per structural drawings Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

D. Adhesives for Gluing Furring and Sleepers to Concrete: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

D. Install shear wall panels to comply with manufacturer's written instructions.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Fastening schedule No. 2304.10.2 per most recent edition of CBC unless otherwise noted per structural drawings.

2. ICC-ES evaluation report for fastener.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 06 16 00

SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Parapet sheathing.
4. Underlayment.
5. Sheathing joint and penetration treatment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.

3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F (76 deg C) shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings.

2.5 WALL SHEATHING

A. Plywood Sheathing: per structural drawings

B. Oriented-Strand-Board Sheathing: per structural drawings

C. Paper-Surfaced Gypsum Sheathing: ASTM C1396/C1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.

1. Type and Thickness: Regular, 1/2 inch (13 mm), Type X, 5/8 inch (15.9 mm) thick.

D. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Type and Thickness: Regular, 1/2 inch (13 mm), Type X, 5/8 inch (15.9 mm) thick.

E. Cellulose Fiber-Reinforced Gypsum Sheathing: ASTM C1278/C1278M, gypsum sheathing.

1. Product: Subject to compliance with requirements, provide "Fiberock Sheathing with Aqua-Tough" by United States Gypsum Co.

2. Type and Thickness: Regular, 1/2 inch (13 mm), Type X, 5/8 inch (15.9 mm) thick.

F. Cementitious Backer Units: ASTM C1325, Type A.

1. Thickness: 5/8 inch (15.9 mm) thick.

G. Extruded-Polystyrene-Foam Sheathing: ASTM C578, Type IV, in manufacturer's standard lengths and widths with tongue-and-groove or shiplap long edges as standard with manufacturer.

1. Thickness: As indicated in the Drawings.

2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

H. Foil-Faced, Polyisocyanurate-Foam Sheathing: ASTM C1289, Type I or Type II, Class 2, rigid, cellular, polyisocyanurate thermal insulation. Foam-plastic core and facings shall have a flame-spread index of 25 or less when tested individually.

1. Thickness: As indicated in the Drawings.

2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

2.6 ROOF SHEATHING

A. Plywood Sheathing: per structural drawings

B. Oriented-Strand-Board Sheathing: Per structural drawings

2.7 PARAPET SHEATHING

A. Plywood Sheathing: per structural drawings sheathing.

B. Oriented-Strand-Board Sheathing: per structural drawings.

C. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Type and Thickness: Regular, 1/2 inch (13 mm), Type X, 5/8 inch (15.9 mm)] thick.

D. Cementitious Backer Units: ASTM C1325, Type A.

1. Thickness: 5/8 inch (15.9 mm).

2.8 FASTENERS

2.9 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Paper-Surfaced Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 07 92 00 "Joint Sealants."

B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

C. nufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

D. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Fastening schedule No. 2304.10.2 per most recent edition of CBC unless otherwise noted per structural drawings.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Coordinate all sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:
   a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
   b. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with [**nails**] [**or**] [**screws**].
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
4. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.4 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 FOAM-PLASTIC SHEATHING INSTALLATION

A. Comply with manufacturer's written instructions.

B. Foam-Plastic Wall Sheathing: Install vapor-relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.

C. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.6 PARTICLEBOARD UNDERLAYMENT INSTALLATION

A. Comply with CPA's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.

1. Fastening Method: Glue and nail underlayment to subflooring.

3.7 HARDBOARD UNDERLAYMENT INSTALLATION

A. Comply with CPA's recommendations and hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.

1. Fastening Method: Nail underlayment to subflooring.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 06 18 00

GLUED-LAMINATED CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing using structural glued-laminated timber.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: per structural drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark. Place mark on surfaces that are not exposed in the completed Work.

2. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.

B. Species and Grades for all Structural Glued-Laminated Timber: per structural drawings

C. Appearance Grade: Premium where exposed, Framing elsewhere, complying with AITC 110.

2.2 TIMBER CONNECTORS

A. Materials: per structural drawings

B. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil (0.05-mm) dry film thickness.

C. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A123/A123M or ASTM A153/A153M.

2.3 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.4 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.

B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

C. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing.

1. Predrill for fasteners using timber connectors as templates.

2. Finish exposed surfaces to remove planing or surfacing marks.

3. Coat cross cuts with end sealer.

3.2 ADJUSTING

A. Repair damaged surfaces after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.3 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SCOPE OF WORK SUMMARY

Supply and install complete Finish Carpentry Work as shown on Drawings and as specified herein. Provide hardware and attachment accessories as required for a complete and proper installation.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

A. Verify all dimensions shown on Drawings by taking field measurements; proper fit and attachment of all parts is required.

B. Following standards apply to Work of this Section except where more stringent requirements are specified herein:

1. Architectural Woodwork Institute "Quality Standards".
2. Western Wood Products Association Manual.
3. American Wood Preservers Association Specifications.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitutions Procedures.

1.06 SUBMITTALS

A. In accordance with Section 01 33 00 Submittal Procedures.

B. Submit shop drawings of millwork at full size or large-scale showing sizes, materials, grain run, methods of construction, connection to adjacent members and installation. Indicate all backing members for installations and all hardware

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

Comply with the requirements of Section 01 55 00 Construction Facilities.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 WARRANTY

Provide Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Douglas Fir: West Coast Lumber Inspection Bureau "Standard Grading and Dressing Rules" and Western Wood Products Association, graded "C" and better, flat grain grade marked by WCLIB or WWPA.

B. Douglas Fir Plywood: U.S. Product Standard PS-1, American Plywood Association, grade trademarked "C-D", plugged, exterior glue, sanded.

C. Blocking, Furring, etc.: Standard Grade Western White Pine, Construction grade Douglas Fir or other equally sound softwood, as graded by WCLIB or WWPA.

D. Softwood Lumber: PS 20; custom grade in accordance with AWI maximum moisture content of 6%; of quality capable of transparent finish.

E. Hardwood Lumber: FS MM-L-736; custom grade in accordance with AWI; maximum moisture content of 6% of quality capable of transparent finish.

2.02 ACCESSORIES

A. Nails, bolts, nuts, washers, blind fasteners, lags and screws, size and type to suit application.

B. Wood Filler: oil base, tinted to match surface finish color.

C. Shelf Standards and Rests: Knape and Vogt #255 & #256 for recessed application. Provide two hold down clips for each shelf in the slot above

D. Closet Hanger Bars and Supports: Knape and Vogt #770, #660, #734, #735, and #1195. Provide intermediate support of spans over 6'-0".

2.03 SHOP TREATMENT OF WOOD MATERIALS

A. Shop pressure treat wood materials requiring UL fire rating or preservations.

Provide UL approved identification on fire retardant treated material.

B. Wood Preservative (PT type) Wolmanized, Pressure Treated Lumber, manufactured by Osmose Wood Products or approved equal.

C. Fire Retardant (FR-S Type) chemically treated, and pressure impregnated, capable of providing a maximum rating of 25; manufactured by Demose Wood Products. Dricon FRT or approved equal.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that surfaces and openings are ready to receive work and field measurements are as shown on Shop Drawings and instructed by the fabricator.

C. Verify that mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

D. Correct conditions detrimental to timely and proper completion of the Work.

E. Do not proceed until unsatisfactory conditions are corrected.

F. Beginning of installation means acceptance of conditions.

3.02 PRIMING

Back paint all wood surfaces inaccessible and unexposed after installation before delivery with an approved linseed oil and aluminum primer.

A. Prime coat all unfinished metal parts.

B. Prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.03 FINISH CARPENTRY INSTALLATION

A. Use only hot dip galvanized or aluminum finish or casting nails. Set nails for putty stopping in surface members. Hammer marks not acceptable on any exposed finished surface and may be cause rejection of Work by Architect.

B. Make all end splices exposed in finished members bevel splices and not square butted. Install members in as long lengths as possible.

C. Install Work to details shown, plumb, level and to line and securely anchored per AWI custom quality standard. Make scribes where required accurate. Miter corners of trim.

D. Provide and install other miscellaneous millwork items and related Work required to complete Work of this Section.

E. Prepare all woodwork installed hereunder by cleaning and sanding as required to receive finishes specified in Section "Painting and Finishing".

F. Install all doors and frames; finish hardware and bathroom accessories per manufacturer's recommendation.

G. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth and site finish.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 06 41 00

ARCHITECTURAL CASEWORK

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SCOPE OF WORK SUMMARY

A. Section Includes:

1. Plastic laminate casework
2. Plastic laminate countertops
3. Solid surface countertops
4. Hardware typically furnished by the casework manufacturer
5. Shelving
6. Structural supports incorporated into wood casework

B. Excluding:

1. Metal support brackets and fittings that are part of the building structure
2. Plumbing, electrical fixtures, and telephone equipment

C. Related sections:

1. Rough carpentry: Wood blocking or grounds inside finished walls or above finished ceilings
2. Plumbing: Fixtures and fittings installed in countertops

1.03 STANDARDS AND REFERENCES

A. The *North American Architectural Woodwork Standards (NAAWS),* latest edition. Jointly published by Woodwork Institute and the Architectural Woodwork Manufacturers Association of Canada.

B. NEMA LD-3, High Pressure Decorative Laminate, latest edition

C. ANSI 208.1, Particle Board, latest edition

D. ANSI 208.2, MDF, latest edition

1.04 QUALITY ASSURANCE

A. Work shall be in accordance with the Grade or Grades specified of the *North American Architectural Woodwork Standards*.

B. Certified Compliance Program (CCP):

1. Before delivery to the job site, provide a Woodwork Institute Certified Compliance Certificate indicating the millwork and countertop products being supplied and certifying that these products fully meet the requirements of the *NAAWS* Grade or Grades specified.
2. Provide a Woodwork Institute Certified Compliance Label on each countertop and elevation of casework.

3. At completion of installation provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and certifying that the installation of these products fully meets the requirements of the *NAAWS* Grade or Grades specified.
4. All fees charged by the Woodwork Institute for its Certified Compliance program are the responsibility of the millwork manufacturer and/or installer and shall be included in their bid.

C. Qualification:
1. A Woodwork Institute Accredited Millwork Company in good standing.
2. Firm (woodwork and countertop manufacturer) with no less than five years of production experience similar to a specific project, whose qualifications indicate the ability to comply with the requirements of this section.
3. The woodwork manufacturer must have at least one project in the past five years where the value of the woodwork was within 20 percent of the cost of woodwork for this project.

D. Single source responsibility: A single manufacturer shall provide and install the work of described in this section.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Shop drawings:
1. Submit shop drawings in conformance with the requirements of the *North American Architectural Woodwork Standards*.
2. Furnish a Woodwork Institute Certified Compliance Label on the first page of the shop drawings.
3. Submit two copies, one of which will be returned with reviewed notations. Make corrections noted (if any), and distribute required copies prior to the start of work.

C. Samples:
1. Submit four finished samples of each species and cut of wood to be used. Lumber samples to be minimum 6 inches by 18 inches, and sheet product samples to be minimum 12 inches square. Samples shall represent the range of color and grain expected to be provided.
2. Submit four unfinished samples of each product to be provided for job-site painting or finishing. Lumber samples to be minimum 6 inches by 18 inches, and sheet goods to be 12 inches square.
3. Submit a sample of each plastic laminate, and/or solid surface color and pattern to be used.

1.07 DELIVERY STORAGE AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Coordinate fabrication, delivery, and installation with the general contractor and other applicable trades.

C. Deliver materials only when the project is ready for installation and the general contractor has provided a clean storage area.

1. Delivery of architectural millwork shall be made only when the area of operation is enclosed, all plaster and concrete work is dry and the area broom clean.
2. Maintain indoor temperature and humidity within the range to be expected after occupancy.

1.08 PROJECT CONDITIONS

Comply with the requirements of Section 01 50 00 Construction Facilities.

1.9 RECORD DRAWINGS

Comply with the requirements of Section 01 77 00 Project Closeout.

1.10 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MILLWORK COMPONENTS

A. Lumber: In accordance with the *North American Architectural Woodwork Standards* Grade specified for the product being fabricated. Moisture Content: 6% to 12% for boards up to 2-inch (50.8 mm) nominal thickness, and shall not exceed 19% for thicker pieces.

B. Core:

1. Particleboard meeting the requirements of *North American Architectural Woodwork Standards*.

a. Water-resistant core, where required: Medium Density Fiberboard meeting the requirements of ANSI A208.2 Grade 130 MR-50.

C. Veneer core plywood: A non-telegraphing hardwood manufactured with exterior glue.

D. Plastic laminate: Meeting the requirements of the *North American Architectural Woodwork Standards* for its use.

1. High pressure laminated plastic conforming to NEMA LP-3, 0.048-inch thickness for tops and 0.028-inch thickness for vertical surfaces.
2. Low Pressure Melamine for exposed interior and semi-exposed surfaces.
3. Backing sheet: LD-3-BK 20 backing grade undecorated plastic laminate.

E. Edgeband: 3mm PVC for doors and drawer fronts and 1mm for cabinet body & shelves of the same pattern and color as the exposed surfaces.

F. Hardboard: PS-58, pressed wood fiber with resin binder, tempered grade, smooth two sides for drawer bottoms.

G. Adhesives: Type II, water-resistant typical. Type I, fully waterproof at sink tops and sink cabinets.

H. Hardware:

1. Finish: Satin aluminum unless noted otherwise.
2. Pulls: Amerock BP76312-G10 or Architect approved equal.
3. Drawer guides for Drawers 24" wide or less: 100-pound capacity, full extension, ball bearing. Accuride 3832 or Architect approved equal.
4. Drawer guides for File, Paper Storage and Heavy-Duty Drawers 42" wide or less: 150-pound capacity, over travel extension, ball bearing. Accuride 4043 or Architect approved equal.

5. Hinges: Concealed, European style, self-closing, Grade II hinges minimum 120 degree opening.
6. Shelf supports: Knape & Vogt KV 255 or Architect approved equal.
7. Shelf clips: Knape & Vogt KV 256 or Architect approved equal.
8. Locks: Provide on all doors and drawers unless noted otherwise in Drawings.
    a. Door locks: Olympus Door Lock 100 series or Architect approved equal.
    b. Drawer locks: Olympus Door Lock 200 series with re-keying feature or Architect approved equal.
    c. Keying: Contractor to confirm with client keying type and quantities prior to construction.
9. Miscellaneous Accessories: Provide grommet(s) as indicated in the Drawings.

2.02 MILLWORK FABRICATION

A. Grade: *NAAWS* Custom Grade.

B. Exposed exterior surfaces: High-pressure decorative laminate Grade VGS. Color and pattern as indicated in the Drawings.

C. Exposed interior (open cases) and semi-exposed (behind doors) interior surfaces: White melamine.

D. Cabinet construction type: Frameless.

E. Door Interface Style: Flush overlay

F. Edgebanding at all exposed and semi-exposed edges including doors, drawer fronts and false fronts: 3mm PVC of the same color and pattern as the exposed surfaces.

G. Shelves: Adjustable shelves to be 1” thick.

H. Doors and drawer fronts: High pressure laminate Grade VGS face, cabinet liner Grade CLS back.

I. Drawer Boxes:
    1. Front and back: 1/2” particleboard with melamine surfacing.
    2. Sides: 1/2” Particle board with melamine surfacing
    3. Bottoms: 1/4” Hardboard
    4. Joinery: Dowels

2.03 COUNTERTOPS

A. Grade: *NAAWS* Custom Grade

B. Plastic Laminate
    1. Flat countertops: NEMA LD-3 Grade HGS. 0.048” thick.
    2. Formed countertops: NEMA LD-3 Grade HGP. 0.039” thick.
    3. Manufacturer, Pattern, Color: As indicated in the Drawings.
    4. Core: 3/4” Particleboard, composed of wood chips and waterproof resin binders at dry tops, 3/4” MDF MR-50 at sink tops.
    5. Backsplash detail: Cove, 4” high minimum
    6. Front edge: No-drip bullnose edge

7. Cutouts: Seal edges of cutouts in sink countertops with a color-toned (for verification) water-resistant sealer before sinks are installed.

C. Solid Surface

1. Manufacturer, Pattern, Color: As indicated in the Drawings
2. Backsplash detail: Cove, 4" high minimum.
3. Front edge: No-drip bullnose edge

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

E. Verify that surfaces and openings are ready to receive work and field measurements are as shown on Shop Drawings and instructed by the fabricator. Verify dimensions for work of other trades incorporated into the casework.

F. Verify the adequacy and proper location of any required backing or support framing.

G. Verify that mechanical, electrical, plumbing, and other building components affecting work in this section are in place and ready.

3.02 INSTALLATION

A. Install all work in conformance with the *North American Architectural Woodwork Standards*, latest edition.

1. Installation shall conform to the *NAAWS* grade of the items being installed.

B. All work shall be secured in place, square, plumb, and level.

C. All work abutting other building components shall be properly scribed.

D. Mechanical fasteners used at exposed and semi-exposed surfaces, excluding installation attachment screws and those securing cabinets end to end, shall be countersunk.

E. Equipment cutouts shown on plans shall be cut by the installer.

3.03 ADJUSTING AND TOUCH UP

A. Before completing installation, the installer shall adjust all moving and operating parts to function smoothly and correctly.

B. All nicks, chips, and scratches in the finish shall be filled and retouched. Damaged items that cannot be repaired shall be replaced.

3.04 CLEANUP

A. Upon completion of installation, the installer shall clean all installed items of pencil and ink marks and broom clean the area of operation, depositing debris in containers provided by the general contractor.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 06 60 00

PLASTIC FABRICATIONS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Provide factory-finished Surface Materials and similar items where shown on the drawings, as specified herein, and as needed for a complete and proper installation. Work may include, but is not limited to:

1. Standard Decorative Laminates.
2. Solid Surfacing.

1.03 STANDARDS AND REFERENCES

A. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

B. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. ISO 4586-2 - High Pressure Decorative Laminates; International Organization for Standardization.

1.04 QUALITY ASSURANCE

Comply with the Standard requirements established by Manufacturer.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Samples:

1. Selection Samples: Submit actual samples of surfacing materials to illustrate full range of colors, patterns, and finishes available.
2. Verification Samples: Submit two samples, each 12 inches square; illustrating each selected surfacing material in specified color, pattern, and finish.

C. Manufacturer's Instructions:

1. Submit manufacturer's printed installation instructions for each product.
2. Submit manufacturer's Safety Data Sheets (M.S.D.S.) for each adhesive.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer’s Standard Requirements.

1.09 OPERATION AND MAINTENANCE DATA

Comply with the requirements of Section 01 77 00 Project Closeout.

1.10 RECORD DRAWINGS

Comply with the requirements of Section 01 77 00 Project Closeout.

1.11 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 STANDARD DECORATIVE LAMINATES

A. Acceptable Products: As indicated on the Drawings.

B. Product Description: Decorative surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins.

C. Standard Decorative Laminate – General Purpose Type: having the following physical characteristics:

1. Sheet thickness: 0.048-inch (1.219 mm) plus/minus 0.005-inch (0.127 mm).
2. Exceeding performance requirements of NEMA LD 3-1995 Grade HGS.
3. Surface burning characteristics in accordance with ASTM E 84; unbonded: Flame spread 55; Smoke developed 30.
4. Patterns and Finishes: Selected from manufacturer's full range of available selections, as selected and approved by Architect.

2.02 SOLID SURFACING MATERIAL

A. Acceptable Product: As indicated on the Drawings.

B. Product Description: Homogenous sheet material composed of acrylic resins, fire-retardant filler materials, and coloring agents.

1. Nominal sheet thickness: 0.50 inch (13 mm).
2. Surface burning characteristics in accordance with ASTM E 84: Flame spread less than 25; Smoke developed less than 25.
3. Liquid Absorption, ISO 4586-2, for 1/2-inch material thickness: 0.4 percent after 2 hours boiling water.

C. Izod Impact, ASTM D 256, Method A: 0.2 foot pounds per inch.

1. Tensile Modulus, ASTM D 638 Nominal: 1.7 million pounds per square inch.
2. Thermal Expansion, ASTM D 696: 0.000019-inch per inch per degree F, maximum.
3. Hardness, ASTM D 2583, Barcol Impressor: 59.
4. Flexural Modulus, ASTM D 790: 1.6 million pounds per square inch.
5. Deflection Temperature under load, ASTM D 648: 90 degrees C.
6. Stain Resistance: ANSI Z124.6 modified, Method 3.4: No effect.
7. Boiling Water Resistance, NEMA LD 3-1995, Method 3.5: No effect.
8. High Temperature Resistance: NEMA LD 3-1995, Method 3.6: No effect.
9. Radiant Heat Resistance: NEMA LD 3-1995, Method 3.10: No effect.
10. Light Resistance: NEMA LD 3-1995, Method 3.3: No effect.
11. Ball Impact Resistance, NEMA LD 3-1995, Method 3.8, one half pound ball, unsupported: 125 inches.

12. Specific Gravity: 0.977 ounces per cubic inch (1.69 grams per cubic centimeter).
13. Approximate weight: 4.2 pounds per square foot (20.5 kg/square m).
14. Weatherability: ASTM D 2565: Pass.
15. Fungus Resistance, ASTM G 21: Pass.
16. Bacterial Resistance, ASTM G 22: Pass.
17. Pittsburgh Protocol Toxicity: 66.9 grams.
18. Patterns and Finishes: Selected from manufacturer's full range of available selections, selected and approved by Architect.
19. Impact Resistance NEMA LD3-1995 (1/2 lb. Ball) SSV bonded to substrate*** Method 3.08 modified. 125" (No Failure)
20. Tensile Toughness ASTM D 638. 21 (in. – lb./in. ^{3})
21. Tensile Modulus ASTM D 638 Nominal. 1.7 x 10^{-5} lb./in.^{3}
22. Density 1.60 gram/cm^3
23. Approximate weight 4.2 lbs./ft^2
24. Pittsburgh Protocol Toxicity = 30 grams range

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.
B. Verify that specified items may be installed in accordance with the approved design.
C. Correct conditions detrimental to timely and proper completion of the Work.
D. Do not proceed until unsatisfactory conditions are corrected.
E. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

Surface preparation: Precondition surfacing materials and surfaces to receive surfacing materials in accordance with manufacturer’s printed installation instructions.

3.03 APPLICATION

Install materials in accordance with manufacturer’s printed instructions.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 06 83 16

FIBERGLASS REINFORCED PANELING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished gypsum wallboard.

1. PVC trim.

1.03 STANDARDS AND REFERENCES

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

1. ASTM D 256 - Izod Impact Strengths (ft #/in)
2. ASTM D 570 - Water Absorption (%)
3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
5. ASTM D 2583- Barcol Hardness
6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

C. Selection Samples: Submit manufacturer’s standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.

1. Submit complete with specified applied finish.
2. For selected patterns show complete pattern repeat.
3. Exposed Molding and Trim: Provide samples of each type, finish, and color.

E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site (available as downloads for most Marlite’s products at http://www.marlite.com/tech-details.aspx or by contacting Marlite at info@marlite.com).

1.05 QUALITY ASSURANCE

A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:

1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)

a. Wall Required Rating – Class A.

B. Sanitary Standards: System components and finishes to comply with:

1. United States Department of Agriculture (USDA) / Food Safety & Inspection Services (FSIS) requirements for food preparation facilities, incidental contact.

2. Food and Drug Administration (FDA) 2013 Food Code 6-101.11.

3. Canadian Food Inspection Agency (CFIA) requirements.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (range of 60 to 75°F) for 48 hours prior to installation.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.

1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.08 WARRANTY

A. Furnish one-year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Manufacturer: Marlite at 1 Marlite Drive, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com.

B. Or Architect approved equal.

2.02 PANELS

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.

1. Dimensions:

a. Thickness: 0.090” (2.29mm) nominal

b. Width: 4'-0” (1.22m) nominal

c. Length: As indicated in the Drawings

2. Tolerance:

a. Length and Width: +/-1/8” (3.175mm)

b. Square – Not to exceed 1/8” for 8 foot (2.4m) panels or 5/32” (3.96mm) for 10 foot (2.4m) panels

B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.

1. Flexural Strength - 1.7 x 10^4 psi per ASTM D 790.
2. Flexural Modulus – 6.0 x 10^5 psi per ASTM D 790.
3. Tensile Strength – 8.0 x 10^3 psi per ASTM D 638.
4. Tensile Modulus – 9.43 x 10^5 psi per ASTM D 638.
5. Water Absorption - 0.17% per ASTM D 570.
6. Barcol Hardness (scratch resistance) of 30 as per ASTM D 2583.
7. Izod Impact Strength of 7.0 ft. lbs./in ASTM D 256

C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

D. Front Finish: As Indicated in the Drawings.

1. Surface: Pebbled (indicated by “P” designation)
2. Fire Rating: Class A (I)
3. Size: 48” x 120” (1.2m x 3m) x .090” (3mm) nom.

2.03 MOLDINGS

A. PVC Trim: Thin-wall semi-rigid extruded PVC.

1. M 350 Inside Corner
2. M 360 Outside Corner
3. M 365 Division
4. M 370 Edge
5. V 177 135° Inside Corner
6. V 179 135° Outside Corner
7. Color: To match panel as selected by Architect.

2.04 ACCESSORIES

A. Fasteners: Non-staining nylon drive rivets.

1. Match panel colors.
2. Length to suit project conditions.

B. Adhesive: Either of the following construction adhesives complying with ASTM C 557.

1. Marlite C-551 FRP Adhesive - Water- resistant, non-flammable adhesive.
2. Marlite C-915 Construction Adhesive - Flexible, water-resistant, solvent based adhesive, formulated for fast, easy application.
3. Titebond Advanced Polymer Panel Adhesive – VOC compliant, non-flammable, environmentally safe adhesive.

C. Sealant:

1. Marlite Brand MS-250 Clear Silicone Sealant.
2. Marlite Brand MS-251 White Silicone Sealant.

3. Marlite Brand - Color Match Sealant.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

1. Verify that stud spacing does not exceed 24” (61cm) on-center.

B. Repair defects prior to installation.

1. Level wall surfaces to panel manufacturer’s requirements. Remove protrusions and fill indentations.

3.02 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence.

B. Cut sheets to meet supports allowing 1/8” (3 mm) clearance for every 8 foot (2.4m) of panel.

1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
2. Pre-drill fastener holes 1/8” (3mm) oversize with high speed drill bit.
    a. Space at 8” (200mm) maximum on center at perimeter, approximately 1” from panel edge.
    b. Space at in field in rows 16’ (40.64cm) on center, with fasteners spaced at 12” (30.48 cm) maximum on center.

C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.

1. Install panels with manufacturer's recommended gap for panel field and corner joints.
    a. Adhesive trowel and application method to conform to adhesive manufacturer’s recommendations.
    b. Drive fasteners for snug fit. Do not over-tighten.

D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.

1. All moldings must provide for a minimum 1/8 “(3mm) of panel expansion at joints and edges, to insure proper installation.
2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.03 CLEANING

A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION

SECTION 07 05 00

CONCRETE FLOOR TESTING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Administrative and procedural requirements for testing interior concrete slabs for moisture vapor emission rate, alkalinity, and temperature and humidity.

B. Testing shall be conducted by the Owner's Testing Agency.

1.03 STANDARDS AND REFERENCES

A. ASTM F-1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor using Anhydrous Calcium Chloride.

B. ASTM F-710 Standard Practice for Preparing Concrete Floors and other Monolithic Floors to receive Resilient Flooring.

C. ASTM F-2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

1.04 QUALITY ASSURANCE

A. Owner Responsibilities: Owner will engage a qualified testing agency to perform testing indicated.

1. Owner will furnish Construction Manager with name, address, and telephone number of testing agency.

2. Payment for testing services will be made by the Owner directly to the testing agency.

a. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be paid by the Owner and charged to Contractor by an adjustment to the Contract Sum through a Change Order.

B. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken.

3. Perform tests and submit a certified written report of each test, inspection, and similar quality-control service to Owner, Architect, Construction Manager and Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

5. Do not perform any duties of Contractor.

C. Contractor Responsibilities: Coordinate sequence of activities to accommodate required testing services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities. Notify agency sufficiently in advance of operations to permit assignment of personnel.
2. Acclimate enclosed spaces to the anticipated occupied temperature and humidity as required by the manufacturer of the specified flooring material(s) and in accordance with ASTM testing requirements.
3. Cooperate with agencies performing required tests and inspections, provide reasonable auxiliary services as requested. Provide the following:
    a. Access to the Work.
    b. Incidental labor and facilities necessary to facilitate tests and inspections.
    c. Security and protection for testing and inspecting equipment at Project site.
4. Project Meeting: Schedule and conduct project meeting not less than 30 days prior to flooring installation to discuss testing requirements, specifications and locations prior to testing. Attendees shall include Owner, Architect, Construction Manager, Contractor, Testing Agency, and adhered floor installer representatives.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Reports: Reports of results of all testing shall be submitted by the Owner's Testing Agency. Reports shall include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. For each test provide a record of interior temperature, humidity, moisture vapor emission, in-concrete relative humidity and alkalinity results for testing period.
8. Test and inspection results and an interpretation of test results.
9. Provide on the Architectural Floor Plan(s) as furnished by the Architect a test number identifying each test conducted.
10. Name and signature of laboratory inspector.
11. Recommendations on retesting and re-inspecting.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

Comply with the requirements of Section 01 50 00 Construction Facilities.

1.09 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment to be provided by Testing Agency.

B. American Moisture Test, Inc., Website: americanmoisturetest.com, Tel: (866) 670-9700.

1. ASTM F1869 Moisture Vapor Emission Test kits
2. ASTM F-2170 In-Concrete Relative Humidity Testing System
3. ASTM F-710 Alkalinity-pH wide range 1 – 14pH meter

PART 3 – EXECUTION

3.01 EXAMINATION

Site: Weatherproofed, doors installed and windows secured. Do not start testing process when site has standing water, surface contaminants, exposed to exterior conditions or concrete installation is less than 90 days of age.

3.02 PREPARATION

A. Contractor Responsibilities:

1. Preparation of Substrates:
    a. Prepare concrete substrates according to ASTM requirements.
    b. Verify that substrates are dry and free of curing compounds, sealers, and hardeners for vapor emission testing per ASTM F-1869.
    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.
2. Temperature and Humidity: Maintain site at the temperature and humidity conditions to those anticipated during normal occupancy and maintain these conditions 48 hours prior and during testing period. If meeting this criteria is not possible, then minimum conditions should be 75± 10°F and 50± 10% relative humidity.
    a. When a building is not under HVAC control, record temperature and humidity at start and end of testing using a portable data logging system.

3.03 TESTING

A. Testing: Testing Agency shall perform tests as follows:

1. Water vapor emission testing, ASTM F 1869.
    a. Perform all gram scale weights on site.
    b. Expose dome for 60 to 72 hours.
    c. Report results as pounds of emission per 24 hours per ASTM F-1869.
    d. Perform subfloor moisture testing in accordance with the Manufacturer's requirements for each floor system type. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained

2. In-Concrete Relative humidity testing, ASTM F 2170.
    a. Satisfactory results shall have a maximum 75 percent relative humidity level measurement.
3. Alkalinity Testing:
    a. Apply neutral-pH solution to form a 1-inch diameter circle directly to interior of moisture dome.
    b. Allow to absorb into concrete for 1 minute.
    c. Apply flat tip pH meter to solution and document result as required by manufacturer.
    d. Perform pH tests on concrete floors regardless of their age or grade level in accordance with the Manufacturer's requirements for each floor system type. PH level shall not exceed range of the Manufacturer's requirements for each floor system type. All test results shall be documented and retained

B. Adhered floor coverings shall not be installed in areas where satisfactory test results have not been obtained.

C. Consult Architect on remedial measures to reduce concrete levels prior to installing flooring. Installation of flooring deems acceptance of on-site conditions for a warranted application.

3.04 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

C. Protect construction exposed by or for quality-control service activities.

D. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 – GENERAL

1.01 SUMMARY

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SCOPE OF WORK SUMMARY

A. Furnish and install Thermal Insulation indicated on the Drawings and as specified herein.

B. The principal items of work include:

1. Thermal Insulation within roof.
2. Thermal Insulation within exterior walls.
3. Thermal Insulation within interior walls.
4. Thermal Insulation for below concrete slabs-on-grade.

1.03 STANDARDS AND REFERENCES

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

1. ASTM C 518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. ASTM C 578: Standard Specification for Rigid Cellular Polystyrene Thermal Insulation.
3. ASTM C 612: Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
4, ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
5. ASTM E 96: Standard Test Methods for Water Vapor Transmission of Materials.
6. ASTM E 119: Standard Test Methods for Fire Tests of Building Constructions and Materials.

B. NFPA 285: Standard Fire Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies Containing Combustible Components.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen 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. Upon completion of this portion of the Work, complete and post a certificate of insulation compliance in accordance with pertinent requirements of governmental agencies having jurisdiction.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
3. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

1.07 DELIVERY, STORAGE AND HANDLING

Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities

B. Comply with Manufacturer’s Standard Requirements

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 RECORD DRAWINGS

Provide in accordance with Section 01 77 00 Project Closeout.

1.11 WARRANTY

A. Provide Manufacturer’s Standard Warranty in accordance with Section 01 78 36 Warranties.

B. Contractor Guarantee: Contractor guarantees the work covered by this specification against all defects in material and workmanship for a period of not less than two (2) years from the date the Owner records Notice of Completion.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Provide thermal insulation as indicated on Drawings. Insulation shall comply with ASTM Testing Standards and local Energy Codes. Fire Hazard Classification, Flame Spread Index, Smoke Developed Index, Combustibility, and Fire Endurance Ratings as required by Code.

B. Insulation shall be as manufactured by Certain-Teed, Johns-Manville, Owens-Corning, or Architect approved equal.

2.02 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used at Contractor’s option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665, friction fit.

1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
2. Flame Spread/Smoke Developed: 25/50 or less in accordance with ASTM E84.
3. Basis-of-Design:
    a. Owens Corning Corp: Pink Next Gen Fiberglass Insulation
    b. Recycled Content: minimum 55%
    c. Certified Formaldehyde Free

d. Indoor Air Quality: Certified GreenGuard Gold

C. Mineral Wool Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665, friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.

1. Combustibility: Non-combustible when tested in accordance with ASTM E136.
2. Basis-of-Design:
    a. Owens Corning Corp: Thermafiber Insulation
    b. Recycled Content: minimum 70%
    c. Indoor Air Quality: Must meet or exceed standards established per California Department of Public Health Section 01350.

2.03 CONTINUOUS INSULATION MATERIALS

A. Provide continuous insulation as indicated on Drawings.

B. Rigid Polystyrene Board: ASTM C 578 Type IV Classification.

1. Basis-of-Design: Owens Corning Corp: Foamular 250 XPS Insulation
    a. Thermal Resistance @ 75ºF: R-5
    b. Thermal Resistance @ 40ºF: R-5.4
    c. Water Absorption after 24 hrs submergence per ASTM C 272: 0.10%
    d. Surface Burning Characteristics per ASTM E 84: Flame Spread >25; Smoke Developed >450
    e. Compressive Strength: 25 psi minimum
    f. Recycled Content: 20% minimum

C. Mineral Wool Board: ASTM C 612 Types IA, IB, II, III, IVA.

1. Basis-of-Design: Owens Corning Corp: Thermafiber Continuous Insulation Rain Barrier
    a. Thermal Resistance @ 75ºF: R-4.2
    b. Combustibility: Non-combustible when tested in accordance to ASTM E 136.
    c. Surface Burning Characteristics per ASTM E 84: Flame Spread 0, Smoke Developed 0.
    d. Compressive Strength: Type IA, IB, IVA @ 4.5 pcf; Type II, III @ 6 pcf
    e. Recycled Content: 70% minimum
    f. Insulation Retaining Clips: Thermafiber RainBarrier Clips
    g. Open joint rainscreen application: Thermafiber Rainbarrier Dark (4.5 pcf and 6 pcf)
        a. Corrosion of Steel, Aluminum, and Copper per ASTM C665
        b. Stress Corrosion - Austenitic Steel per ASTM C795
        c. Non-Combustibility per ASTM E136
        d. Water Vapor Permeance per ASTM E96 (Unfaced): RainBarrier® 45, 47 perms as tested RainBarrier® HD, 38 perms as tested
        e. Surface Burning Characteristics per ASTM E84: Flame Spread 20, Smoke Developed 15
        f. Fungi Resistance per ASTM C1338

g. UV Testing ICC-ES AC38 Section 4.1.2, UV Exposure with ASTM D224 Color Evaluation; acceptable change in black color after UV exposure

2.05 CONCRETE SLAB ON GRADE INSULATION

A. Provide homogenous, hydrophobic extruded polystyrene rigid insulation board with compressive strength and thickness to meet foundation Ultimate Loads.

1. Basis-of-Design: Owens Corning Corp: Foamular XPS 250/400/600/1000

a. ASTM C578 Types and minimum Compressive Strengths:

Foamular 250: Type IV, 25 psi

Foamular 400: Type VI, 40 psi

Foamular 600: Type VII, 60 psi

Foamular 1000: Type V, 100 psi

b. Thermal Resistance @ 75ºF: R-5 per inch

c. Thermal Resistance @ 40ºF: R-5.4 per inch

d. Water absorption after 24 hrs submergence per ASTM C272: 0.05%

e. Water vapor permeance per ASTM E 96: 1.1 maximum perms

f. Indoor Air Quality: Meet GreenGuard Gold Certification

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Verify adjacent materials are dry and ready to receive installation.

B. Verify mechanical and electrical services within walls have been installed and tested.

3.03 INSPECTION

A. Before any installation is started, determine that the other work is suitable to receive insulation.

B. 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 are corrected.

C. Remove or protect against projections in construction framing that may damage or prevent proper insulation.

3.04 INSTALLATION

A. All work shall be performed by licensed applicators, shall comply with the recommendations of the manufacturer and the National Association of Insulation Manufacturers.

B. Install insulation with factory applied membrane facing warm side of building spaces. Lap ends and side flanges of membrane over and between framing numbers. Secure in place. Tape seal butt ends and lapped side flanges. Tape seal tears or cuts in membrane.

C. Trim insulation neatly to fit spaces. Use batts free of damage. Install batt insulation, in wall spaces without gaps or voids.

D. Install Insulation in all indicated walls from floor to underside of roof. Secure batt insulation with 19-gage wire or 1" wide, 20 gage steel strips. Architect shall approve all insulation details, including methods of fastening, before commencement of the work.

3.05 CLEAN UP AND DISPOSAL

At frequent intervals during and again upon completion of work, remove from building and working premises tools and equipment, surplus materials, all rubbish and debris of whatever nature not caused by other trades, and leave the work in a clean, orderly and acceptable condition approved by the Architect.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 07 25 00

SHEET WEATHER BARRIER

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Section Includes:

1. Commercial weather barrier assemblies.
2. Flexible flashing.
3. Weather barrier flashing.
4. Fluid-applied flashing.
5. Weather barrier accessories.
6. Drainage material.

1.03 DEFINITIONS

A. Weather Barrier: A combination of materials and accessories that do the following:

1. Prevent the accumulation of water as a water-resistive barrier.
2. Minimize the air leakage into or out of the building envelope as a continuous air barrier.
3. Provide sufficient water vapor transmission to enable drying as a vapor-permeable membrane.

B. Water-Resistive Barrier: A combination of materials and accessories that prevent the accumulation of water within the wall assembly per International Building Code Section 1403.2.

C. Continuous Air Barrier: The combination of interconnected materials, assemblies, and sealed joints and components of the building envelope that minimize air leakage into or out of the building envelope per ASHRAE 90.1 section 5.4.3.1.

D. Vapor Diffusion: A slow movement of individual water vapor molecules from regions of higher to lower water vapor concentration (higher to lower vapor pressure).

E. Vapor Permeable Membrane: The property of having a water-vapor permeance rating of 10 perms (575 ng/Pa x s x sq. m) or greater, when tested in accordance with the desiccant method using Procedure A of ASTM E96 per definition in International Building Code. Vapor permeable material permits the passage of moisture vapor through vapor diffusion.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Two weeks prior to start of weather barrier installation, meet with Owner, Architect, Manufacturer's Certified Installer, weather barrier manufacturer's designated field representative, and installers of work that interfaces with or affects weather barrier.
2. Review methods and procedures related to weather barrier installation, including manufacturer's written instructions.

3. Review and finalize construction, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine substrate conditions and finishes for compliance with requirements.
5. Review flashings, special weather barrier details, weather barrier penetrations, and condition of other construction that affects weather barrier.
6. Review weather barrier manufacturer's Project Registration and Observation process.
7. Review Construction Indoor Air Quality Management Plan "Moisture Protection for Absorbent Materials."
8. Review temporary protection requirements for weather barrier during and after installation.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For weather barrier, include data on air and water-vapor permeance based on testing in accordance with referenced standards.

B. Shop Drawings: Show details of weather barrier at terminations, openings, and penetrations. Show details of flexible flashing applications.

1.06 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For weather barrier and flexible flashing, from ICC-ES.

B. Manufacturer's Instructions: For installation of each product specified.

C. Qualification Data: For Installer

D. Sample Warranty: For manufacturer's warranty.

E. Reports: Field test and inspection reports.

F. Installer's weather barrier manufacturer-training certificate.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is certified by weather barrier system manufacturer to install manufacturer's product.

B. Mockups: Build mockups to set quality standards for materials and execution.
   1. Build integrated mockups of exterior wall assembly, 10 feet by 10 feet, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of weather barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
      a. Include junction with roofing membrane at parapet condition, and junction at foundation wall, fenestration, and wall interface.
      b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply weather barrier until mockups are approved.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Manufacturer's Field Service: Register Project with weather barrier manufacturer prior to installation of weather barrier and comply with weather barrier manufacturer's Project registration and observation process.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not store near heat source or open flame.

1.09 WARRANTY

A. Manufacturer's Product Warranty: To repair or replace weather barrier product that fails in materials within specified warranty period.

1. Warranty Period: 10 years from date of purchase.

B. Manufacturer's Product and Labor Warranty: Manufacturer agrees to repair or replace weather barrier that fails in materials within specified warranty period, including removal and replacement of affected construction up to manufacturer's limits.

1. Warranty Period: 10 years from date of purchase

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Products as manufactured by DuPont Safety & Construction: E.I. du Pont de Nemours and Company.

B. Source Limitations: Obtain weather barrier assembly components from single manufacturer or from manufacturer approved by weather barrier manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Installed weather barrier and accessories shall withstand specified wind pressures, liquid water penetration, and water vapor pressures without failure due to defective manufacture of products.

B. High-Performance Installations:

1. For installation with one of the following building envelope performance or structural characteristics:

a. Exceeding 65 mph (100 km/h) equivalent structural load.

b. Exceeding 50 mph/6.24 psf (80 km/h) equivalent wind-driven rainwater infiltration.

c. Construction with gypsum or cement-based exterior sheathing.

d. Non-wood based primary structure such as steel, light gauge steel, masonry, or concrete

2.03 WEATHER BARRIER

A. Commercial Building Wrap: ASTM E2357 passed, ABAA (Air Barrier Association of America) evaluated air barrier assembly, and assembly water resistance per ASTM E331; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E84; UV stabilized for nine-month exposure; and acceptable to authorities having jurisdiction.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; Tyvek CommercialWrap and Tyvek CommercialWrap D or Architect approved equal.

2. System Description for use with siding, Single-Layer Drainable: Single-layer weather barrier with integral drainage, including flashing and sealing of penetrations and seams.

3. System Description for us with stucco assemblies and stone masonry wall finishes, Double-Layer Drainable: Double-layer weather barrier, including flashing and sealing of penetrations and seams, arranged as follows:

    a. Primary Layer: Commercial building wrap with integral drainage installed closest to building interior.

    b. Secondary Layer: 60-minute Grade D Building Paper.

4. Drainability:

    a. 98 percent or greater when tested in accordance with ASTM E2273

5. Air Permeance, Product: Not more than 0.001 cfm/sq. ft. at 1.57 lbf/sq. ft. (0.005 L/s x sq. m at 75 Pa) when tested in accordance with ASTM E2178.

6. Air Permeance, Assembly: Not more than 0.04 cfm/sq. ft. at 1.57 lbf/sq. ft. (0.2 L/s x sq. m at 75 PA) when tested in accordance with ASTM E 2357 and evaluated by ABAA.

7. Water Penetration Resistance, Product: Hydrostatic head resistance greater than 22 inches (55 cm) in accordance with AATCC 127.

8. Water Penetration Resistance, Assembly: Assembly wall specimen described in ASTM E2357 to water resistance in accordance with ASTM E331 to 2.86 lbf/sq. ft. (137 Pa).

10. Water-Vapor Permeance: Not less than 23 perms (1300 ng/Pa x s x sq. m) per ASTM E96/E96M, Desiccant Method (Procedure A) or not less than 28 perms (1600 ng/Pa x s x sq. m) per ASTM E96/E96M, Water Method (Procedure B).

11. Water-Vapor Permeance: Not less than 30 perms (1700 ng/Pa x s x sq. m) per ASTM E96/E96M, Water Method (Procedure B).

12. Allowable UV Exposure Time: Not less than 9 months (270 days) when tested in accordance with ASTM G155 (Accelerated Weathering).

13. Flame Propagation Test: Materials and construction shall be as tested in accordance with NFPA 285.

14. Heat and Visible Smoke Release Rates: Maximum rates in accordance with NFPA 285.

    a. Peak Heat Release: 13,217 Btu/sq. ft. (150 kW/sq. m).

    b. Total Heat Release: 1762 Btu/sq. ft. (20 MJ/sq. m)

    c. Effective Heat of Combustion: 7744 Btu/lbs. (18 MJ/kg)

15. Weather barrier system to have a VOC content of 30 g/L or less.

2.04 WEATHER BARRIER FLASHING

A. Conformable Weather Barrier Flashing: Composite flashing material composed of micro-creped, polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711 Class A (no primer), Level 3 thermal exposure, 176 deg F (80 deg C) for seven days.

    1. Basis-of-Design Product: DuPont de Nemours, Inc.; DuPont™ FlexWrap™ or Architect approved equal.

    2. Conformability: Able to create a seamless sill pan extending up the jambs without cuts, patches, or fasteners.

3. Water Penetration: No leakage at 15 psf (720 Pa) per ASTM E331.
4. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm) at 25 deg F (minus 4 deg C) as Class A (without primer use).
5. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm), after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.

B. Conformable Weather Barrier Flashing for Sealing Penetrations: Composite flashing material composed of micro-creped, polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711 Class A (no primer), Level 3 thermal exposure, 176 deg F (80 deg C) for 7 days.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: DuPont de Nemours, Inc.; DuPont™ FlexWrap™ EZ or Architect approved equal.
2. Conformability: Able to create a continuous watertight seal around penetrations from weather barrier to penetration without cuts, patches, or fasteners.
3. Water Penetration: No leakage at 15 psf (720 Pa) per ASTM E 331.
4. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm) at 25 degrees F (minus 4 deg C) as Class A (without primer use).
5. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm), after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.

C. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with 100 percent butyl-based, dual-sided, adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure, 176 deg F (80 deg C) for seven days.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; DuPont™ StraightFlash™ or Architect approved equal.
2. Water Penetration: No leakage at 15 psf (720 Pa) per ASTM E331.
3. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm) at 25 deg F (minus 4 deg C) as Class A without primer use.
4. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm), after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.

D. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with 100 percent butyl-based, dual-sided, adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure, 176 deg F (80 deg C) for 7 days.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: DuPont de Nemours, Inc.; DuPont™ VersaFlange™ or Architect approved equal.
2. Water Penetration: No leakage at 6.24 psf (300 Pa) per ASTM E 331.
3. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm) at 25 deg F (minus 4 deg C) as Class A without primer use.
4. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm), after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.

E. Strip Flashing: Composite flashing material composed of polypropylene laminate with 100 percent butyl-based, adhesive layer; AAMA 711, Class A (no primer), Level 3 thermal exposure, 176 deg F (80 deg C) for 7 days.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Safety & Construction: DuPont de Nemours, Inc.; DuPont™ Flashing Tape or Architect approved equal.
2. Water Penetration: No leakage at 6.24 psf (300 Pa) per ASTM E 331.
3. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm) at 25 deg F (minus 4 deg C) as Class A without primer use.
4. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in. (0.26N/mm), after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3, Test B.

2.05 FLUID-APPLIED FLASHING

A. Fluid-Applied Flashing: Trowel or brush applied, non-water soluble, single component, silyl terminated polyether technology (STPE), vapor permeable, flashing material.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; Tyvek Fluid Applied Flashing & Joint Compound+ or Architect approved equal.
   2. VOC Content: ASTM C1250, less than 2 percent by weight and between 25 to 30 g/L.
   3. Water Vapor Transmission: ASTM E96, Method B, greater than 20 perms (1100 ng/Pa x s x sq. m) at 25 mils (0.635 mm) thick.
   4. Minimum Tensile Strength: ASTM D412, 165 lb/sq. ft. (1140 kPa).
   5. Minimum Elongation at Break: ASTM D412; 380 percent.

2.06 WEATHER BARRIER ACCESSORIES

A. Building Wrap Tape: Pressure-sensitive plastic tape recommended by weather barrier manufacturer for sealing joints and penetrations in commercial building wrap.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; Tyvek® Tape or Architect approved equal.

B. Closed-Cell Polyurethane Foam Insulation: Low-pressure, low-expansion, single-component polyurethane foam, with maximum flame-spread and smoke-developed indexes of 15 and 25, respectively, per ASTM E84.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; DuPont™ Great Stuff Pro or Architect approved equal.

C. Fasteners with Self-Gasketing Washers: Commercial building wrap manufacturer's recommended pneumatically or hand-applied fasteners with 2-inch- (50-mm-) diameter, high-density polyethylene cap washers with UV inhibitors.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont de Nemours, Inc.; Tyvek® Wrap Caps or Architect approved equal.

D. Primer for Flashings: Synthetic rubber-based product; spray applied. Strengthen adhesive bond at low temperature applications between weather products such as self-adhered flashing products, commercial building wraps, and common building sheathing materials.
   1. Peel Adhesion Test: Passes in accordance with ASTM D3330, Test Method F, for the following.
      a. Peel Angles: 0, 25, 72, and 180 degrees.
      b. Substrates: Concrete masonry units (CMUs), exterior gypsum sheathing, oriented strand board (OSB), aluminum, and vinyl.
   2. Chemical Compatibility: Pass; AAMA 713.

3. Flame Spread Index: 5; ASTM E84.
4. Smoke Development Index: 0; ASTM E84.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements.

B. Verify that substrate and surface conditions are in accordance with commercial weather barrier manufacturer recommendations prior to installation.

1. Verify that rough sill framing for doors and windows is sloped downwards towards the exterior and is level across width of the opening.

C. Verify that surfaces to receive weather barrier flashing are clean, dry, and free of frost.

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

3.02 PREPARATION

A. Direct water onto an acceptable weather barrier drainage plane with an unobstructed path to exterior of wall.

1. Provide a drainage path for water intrusion through window and door attachment system that collects at window and door sills and directs water to the exterior or weather barrier.

3.03 COMMERCIAL BUILDING WRAP INSTALLATION

A. General: Comply with weather barrier manufacturer's written installation guidelines and warranty requirements.

B. Cover exposed exterior surface of sheathing with weather barrier securely fastened to framing immediately after sheathing is installed.

1. Maintain continuity of air and water barrier assemblies.
2. Start weather barrier installation at a building corner, leaving 12 inches (300 mm) of weather barrier extended beyond corner to overlap.
3. Install weather barrier horizontally starting at lower portion of wall surface.
4. Provide minimum 6 inches (150 mm) overlap at horizontal- and vertical-wrap seams in a shingle manner to maintain continuous downward drainage plane and air and water barrier.

C. Seams: Seal seams with building wrap tape per manufacturer's recommended installation instructions.

1. Shiplap horizontal seams in weather barrier to facilitate proper drainage.

D. Fasteners: Use weather barrier manufacturer's recommended fasteners to secure weather barrier and install fasteners according to weather barrier manufacturer's installation guidelines.

1. Do not use temporary fasteners to permanently attach weather barrier.
2. Do not place fasteners with gasketing washers where weather barrier flashing will be installed.
3. Install fasteners with gasketing washers through flashing where recommended by manufacturer.

E. Openings: Completely cover openings with weather barrier, then cut weather barrier membrane to openings in accordance with weather barrier manufacturer's installation guidelines.

1. Provide head and jamb flaps and seam overlaps to maintain continuous drainage.
2. Repair damage to weather barrier using method recommended by weather barrier manufacturer.
3. Install flashing in accordance with weather barrier manufacturer's installation guidelines.

3.04 WEATHER BARRIER FLASHING INSTALLATION

A. Installation: Remove wrinkles and bubbles, reposition weather barrier as necessary to produce a uniform, smooth surface.

1. Ensure that ambient and substrate surface temperatures are acceptable in accordance with manufacturer instructions and recommendations.
2. Wipe surfaces to remove moisture, dirt, grease and other debris that could interfere with adhesion.
3. Apply weather barrier manufacturer's recommended primer over concrete, masonry, and glass-mat gypsum wall sheathing substrates to receive weather barrier flashing.
4. Lap weather barrier flashing a minimum of 2 inches (50 mm) onto weather barrier.
5. Apply pressure over entire surface using roller or firm hand pressure

B. Rough Openings: Shiplap flashing with weather barrier in a shingle manner to maintain a continuous downward drainage plane and air and water barrier in accordance with manufacturer's written instructions.

1. Apply 6-inch (150-mm) wide (at 4” framing) & 9-inch (230-mm) (at 6” framing) conformable weather barrier flashing at door and window sills.
2. Ensure that sill flashing does not slope to the interior.
3. Install backer rod in joint between frame of opening product and flashed rough opening on the interior.
4. Apply sealant or closed-cell polyurethane foam insulation around entire opening/fenestration product to create air seal around interior perimeter of window openings in accordance with weather barrier manufacturer's instructions.
5. Around door and window openings, apply butyl-based flashing to flaps of weather barrier.
6. Use strip flashing with wrap cap screws to secure head flap of the windows.

C. Penetrations: Apply weather barrier manufacturer's recommended weather barrier flashing patches behind fastening plates, such as brick-tie base plates, metal-flashing clips, and metal channels.

1. Seal weather barrier around each penetration with weather barrier manufacturer's recommended self-adhered flashing product or sealant. Integrate products with flanges into the weather barrier.

D. Terminations: Provide minimum 2 inches (50 mm) overlap using strip flashing on adjoining roof and base of wall systems to maintain continuous downward drainage plane.

1. Secure weather barrier with fasteners and weather barrier flashing.

3.05 FLUID-APPLIED FLASHING INSTALLATION

A. General: Before installing fluid-applied flashing, do the following:

1. Ensure drainage path is not blocked or disrupted. Do not install on walls that do not feature a continuous path for moisture drainage. Blocked or disrupted paths for drainage can result in excess moisture buildup in wall cavity. Do not install below grade.
2. Remove surface dust, dirt, and loose mortar.
3. Verify that surface is free of grease and other contaminants and that surface is smooth.
4. Fill joints in CMUs and voids in cast-in-place concrete with trowel-applied fluid-applied flashing to ensure surface is flush and smooth.
5. Allow masonry mortar and cast-in-place concrete a minimum of 24 hours to cure before installing fluid-applied flashing.

B. Fluid-Applied Flashing Installation: Using a trowel or brush, apply fluid-applied flashing around perimeter of recessed window and door openings to a minimum thickness of 25 mils (0.635 mm).
1. Extend flashing a minimum of 2 inches (50 mm) onto top of transition membrane.
2. Inspect for gaps and pinholes in fluid-applied flashing and apply additional coats until no gaps and pinholes appear.
3. Joint Applications: Using a trowel or a brush, fill cracks and voids up to 1/4 inch (6 mm) in width.
a. For joints and cracks between 1/4 and 1/2 inch (6 and 12 mm) wide, cover first with mesh tape.
b. For joints and cracks between 1/2 and 1 inch (12 and 24 mm) wide, cover first with butyl-based strip flashing.
c. Apply a bead, then trowel smooth.
d. Seam coverage should be a minimum of 2 inches (50 mm) wide and 15 to 20 mils (0.38 to 0.51 mm) thick.
e. Inspect for gaps and pinholes in fluid-applied flashing and apply additional coats until no gaps and pinholes appear.

3.06 DRAINAGE MATERIAL INSTALLATION

A. Install drainage material with grooves or channels running vertically in compliance with manufacturer's written instructions.

3.07 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to train installers and observe subject test-wall areas and installations.

B. Field Quality Control Testing: Perform the following tests:
1. Air Infiltration Whole Building: ASTM E779 at not more than 0.40 cfm/sf (2.00 L/s per sq. m).
2. Water Penetration: ASTM E1105 at a minimum [**uniform**] [**and**] [**cyclic**] static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 2.86 lbf./sq. ft. (137 Pa). No water penetration shall occur as defined in ASTM E1105.
a. Perform a minimum of two tests in areas as directed by Architect.
b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10 and 50 percent completion.

C. Prepare test and inspection reports.

3.08 CLEANING

A. Immediately remove release paper and scrap from work area and dispose of material in accordance with requirements of Section 01 74 00.

3.09 PROTECTION

A. Protect installed weather barrier from the following:

1. Damage from cladding, structure, or a component of the structure (for example, window, door, or wall system).
2. Contamination from building site chemicals, premature deterioration of building materials, or nonstandard use or application of products.
3. Foreign objects or agents, including the use of materials incompatible with weather barrier products.
4. UV exposure in excess of products' stated limits.

END OF SECTION

SECTION 07 26 00

VINYL SCRIM SHEET

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install above-grade vapor retarder, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete and proper installation.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

Use adequate numbers of skilled workmen 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.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Samples for Verification:

1. Vapor Retarder Facings: Nominal 6-inch (150-mm) square Samples.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Deliver components so as not to be damaged or deformed.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with the Manufacturer's Standard Requirements.

1.9 EXTRA MATERIALS

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide Lamtec Corporation. Address: 5010 River Road, Mt. Bethel, PA 18343-5610. Phone: 800-852-6832. Website: www.lamtec.com, Contact: sales@lamtec.com

B. Acceptable alternates

1. Raven Industries.

2. Reef Industries.

2.02 PRODUCTS

A. Basis of Design Vapor-Retarder Facing: Lamtec WMP-10

1. Facing: Lamtec WMP-10.

a. Composition: 0.0015 inch (38.1 micron) white metallized polypropylene film, reinforcing layer, and 14 # (23 g/m²) white kraft paper.

i. Reinforcement: 5x5 tri-directional scrim which has a blend of fiberglass and polyester yarns.

ii. Color: Black

b. Performance:

i. Water Vapor Permeance: 0.02 perm (1.15 ng/N · s) per ASTM E 96, Procedure A.

ii. Mullen Burst: 65 psi (4.6 kg/cm²).

iii. Tensile Strength: 40 lbs/inch (7.0 kN/m) in the machine direction and 35 lbs/inch (6.1 kN/m) in the cross-machine direction.

c. Compliance: ASTM C 1136; ASTM C 991; ASTM E 84; ASTM E 96; ASTM C 1258; ASTM C 1338; Factory Mutual (FM) 4880; and UL 723.

C. Vapor Retarder Tape: Pressure-sensitive tape of type recommended by the vapor retarder or tape manufacturer for small repairs and sealing around penetrations in vapor retarder. Should match the vapor retarder above.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Notify the Construction Manager and Architect in writing of any conditions detrimental to the proper and timely completion of the installation.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Clean and prepare surfaces to receive vapor retarder.

3.03 INSTALLATION

A. Install concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

B. Refer for Section 07 21 00 and install concurrently with thermal insulation.

C. Install in accordance with the industry guidelines found in North American Insulation Manufacturers Association (NAIMA) MB-316.

3.04 CLEANING AND PROTECTION

At frequent intervals during and again upon completion of work, remove from building and working premises tools and equipment, surplus materials, all rubbish and debris of whatever nature not caused by other trades, and leave the work in a clean, orderly and acceptable condition approved by the Architect.

END OF SECTION

SECTION 07 26 16

BELOW-GRADE VAPOR BARRIER

PART 1 – GENERAL

1.01 GENERAL REQUIRMENTS

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SCOPE OF WORK SUMMARY

A. Supply and install all below-grade vapor barriers, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete and proper installation.

B. Section includes, but is not limited to:

1. Section 02 06 14 and/or Soils Report for subgrade preparation.
2. Section 03 30 00 Cast-in-Place Concrete.

1.03 STANDARDS AND REFERENCES

A. ASTM D1709 - 09 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.

B. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

C. ASTM E154 - Standard Test Methods for Water Vapor Barriers Used in Contact with Earth Under Concrete Slabs.

D. ASTM E1643 - Standard Practice for Installation of Water Vapor Barriers Used in Contact with Earth or Granular Fill Under Concrete Slabs.

E. ASTM E1745 - Standard Specification for Plastic Water Vapor Barriers Used in Contact with Soil or Granular Fill Under Concrete Slabs.

F. ASTM F1249-01 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.04 QUALITY ASSURANCE

A. Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the vapor barrier.

B. Obtain vapor barrier materials from a single manufacturer regularly engaged in manufacturing the product.

C. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

D. Pre-Construction Meeting: Convene one week prior to installation of under slab vapor barrier. Attendees to be as follows: - Architect, Engineer, General Contractor, Vapor Barrier Installer, and Vapor Barrier Manufacturer to discuss the application in detail.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Include independent laboratory test results showing compliance with ASTM and ACI Standards. Include manufacturer's installation instructions for placement, seaming, and pipe boot installation.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

C. Store materials in a clean, dry area in accordance with manufacturer's instructions.

D. Protect materials during handling and application to prevent damage or contamination

E. Ensure membrane is stamped with manufacturer’s name, product name, and membrane thickness at intervals of no more than 85” (220 cm).

1.08 PROJECT CONDITIONS

Comply with the requirements of Section 01 50 00 Construction Facilities.

1.09 WARRANTY

Provide Manufacturer’s Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Perminator 15 Mil by W.R. Meadows

B. Stego Wrap 15 Mil Vapor Barrier by Stego Industries

C. Vapor-Block 15 Mil by Raven Industries

D. Or Architect approved equal

2.02 MATERIALS

A. Vapor Barrier must have the following qualities:

1. 15 mil thickness minimum.
2. Permeance of 0.01 UP perms as tested by ASTM E154.
3. Puncture resistance of 2,200 grams per ASTM D1709, Method B.
4. Tensile Strength of 45lbf/inch as per ASTM E1745-17
5. ASTM E 1745 Class A (Plastics) after conditioning testing.

B. Vapor Barrier Tape:

1. As recommended by Vapor Barrier Manufacturer.
2. Manufactured from High Density Polyethylene.
3. Pressure Sensitive Adhesive.

C. Pipe Boots: Construct from vapor barrier sheeting material and pressure sensitive tape in accordance with manufacturer’s instructions.

D. Sand: Clean yard sand, free from excessive dirt, debris, organic matter, and fines smaller than No. 200 sieve size.

PART 3 – EXECUTION

3.01 INSPECTION

A. Below grade and grading work and items penetrating moisture barrier shall be completed prior to start of installation.

B. Examine the areas and conditions under which work of this Section will be performed.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 INSTALLATION REQUIREMENTS

A. Vapor Barrier Sheeting:

1. Install in accordance with manufacturer's instructions and ASTM E1643.
2. Unroll with the longest dimension parallel with the direction of the pour.
3. Lap vapor barrier over footings and seal to foundation walls.
4. Overlap joints 6-inches and seal with manufacturer's pressure sensitive tape.
5. Seal penetrations, including pipes, with pipe boot.
6. Penetrations through vapor barrier sheeting except for reinforcing steel and permanent utilities are not permitted.
7. Repair damaged areas by cutting patches of vapor barrier sheeting, overlapping damaged area 6-inches and taping all four sides with pressure sensitive tape.

B. Sand Cushion:

1. Provide 2-inch layer over moisture barrier, unless otherwise indicated.
2. Spread over surfaces required and work to fill voids; leave in stable condition with finished surfaces reasonably uniform at established grade.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 07 42 93

SOFFIT PANELS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Supply and install all aluminum siding & soffits, trim, accessories, 65mm slat and small infill, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation.

B. Section includes, but is not limited to:

1. DIV 05 – Cold-Formed Metal Framing: Metal framing for support of aluminum soffits.
2. DIV 07 – Building Insulation: Rigid thermal insulation installed behind siding.
3. DIV 07 – Flashing and Sheet Metal: Sheet Metal gutters and downspouts.
4. DIV 07 – Joint Sealants: Sealants used in conjunction with aluminum siding installation.

1.03 STANDARDS AND REFERENCES

A. ASTM D 958 – Practice for Determining Temperatures of Standard ASTM Molds for Test Specimens of Plastics.

B. AAMA 2605-05 - Voluntary Specification, Performance requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. AAMA 2604 - Voluntary Specification, Performance requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels.

D. AAMA 2603 - Voluntary Specification, Performance requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels.

1.04 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Minimum ten years’ experience producing aluminum finishes of the types specified in AAMA 2604 and 2605 Certified.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

C. Mock-up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designed by Architect.
2. Do not proceed with remaining work until workmanship, color, and gloss are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

D. Performance Requirements

1. Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of walls as calculated in accordance with applicable code.

2. Movement: Accommodate movement within system without damage to components or movement within system: movement between system and perimeter components when subject to seasonal temperature cycling: dynamic loading and release of loads: deflection of structural support framing.

3. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop drawings: indicate dimensions, layout, joints, expansion joints, construction details, methods of anchorage, and interface with adjacent materials.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing the manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 2 inches (51mm) by 3-1/2 inches (89mm), representing actual product, color and gloss.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of components.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package and store products under cover in manufacturer's unopened packaging until ready for transport and installation.

B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

C. Store prefinished material off ground protected from weather, to prevent twisting, bending, or abrasion, and provide ventilation. Slop metal sheets to ensure drainage.

D. Prevent contact with materials capable of causing discoloration or staining.

1.08 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not fabricate products under environmental conditions outside manufacturer's absolute limits.

1.09 PROJECT COORDINATION

A. Coordinate work with installation of windows, louvers, and adjacent components or materials.

1.010 WARRANTY

A. Knotwood's limited lifetime warranty against cracking, peeling and gloss/color retention within the guidelines stated by the American Aluminum Manufacturers Association (AAMA).

1. Standard Colors

a. Interpon / AkzoNobel – AAMA 2604 (5-year Florida) 15-year manufacturer's warranty.

b. Interpon / AkzoNobel – AAMA 2605 (10-year Florida) 20-year manufacturer's warranty.

2. Wood Grains

a. AMMA 2064 (5-year Florida) 15-year manufacturer's warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Knotwood LLC.: sales@parallelrep.com web: www.parallelrep.com;

Regional Representative
Paralllel Rep. LLC
www.parallelrep.com
Phone: 866.472.7255
Contact: Hailey Poehlman
Direct: 720.435.1099
Email: Hpoehlman@parallelrep.com

2.02 MATERIALS

A. Extruded Aluminum Siding and Soffits: Knotwood Wood Grain Aluminum Siding and Soffits with Alluminate bonded film finish is extruded aluminum.

KED100-	4" 5/8" x 18'6" Cladding Board Smooth
KED150-	6" x 5/8" x 18'6" Cladding Board Smooth
KESM3816-	1-1/2" x 5/8" x 18'6" Self-Mating Slat (2-part)
KESM6516-	2-1/2" x 5/8 x 18'6" Self-Mating Slat (2-part)
KESM10016-	4" x 5/8" x 18'6" Self-Mating Slat (2-part)
KESM15016-	6" x 5/8" x 18'6" Self-Mating Slat (2-part)

B. Extruded Aluminum Vented Soffit: Knotwood Wood Grain Aluminum Vented soffits with Alluminate bonded film finish is extruded aluminum.

KECV150-	6" x 5/8" x 18'6" Cladding Vented Board

C. Extruded Aluminum Accessories and Trim: Knotwood Wood Grain Aluminum Trim and Accessories with Alluminate bonded film finish is extruded aluminum.

KEDSTRADJ-	Starter Piece for Cladding and Decking 18'6"
KECFBF-	Cladding Flashing Base 18'6" (used with KWCFTTLM)
KECFTTLM-	Cladding Top Clip 18'6"
KECJBF-	Cladding Bottom Joiner 18'6" (used with KWCTJ)
KECTJM-	Cladding Top Joiner 18'6"
KECIECF-	Cladding Internal/External Female Corner 18'6"
KECIECM-	Cladding Internal/External Male Corner 18'6"

2.03 FINISHES

A. Pretreatment: E-CLPS Chrome Free five stager aluminum pretreatment system. Complies with, AAMA 2604, and AAMA 2605 Superior Performance Standard and meets EPA, OSHA, State and Local environmental requirements and contains no chromates, cyanides, or other heavy metals. Waste treatment is usually a simple pH neutralization and disposal to the sanitary sewer.

B. Dulux Group Mannex base coat and Duratec Series electrostatic applied Architectural Powder Coatings are approved to AAMA 2604 Performance Standard.

    1. Gloss Level: Standard Gloss is 30 percent, plus or minus 5 percent.

C. Super Durable Powder Coatings: Alluminate Premium Wood Finishes use a polyurethane powder coat with ink-based wood grain patterns sublimated into the base powder effectively tattooing the powder. The combined effect creates all the aesthetic aspects of real wood while offering the same environmental advantages of powder coated finishes.

    1. Color: As indicated in the Drawings.

2.04 FABRICATION

A. Prepare surfaces, pre-treat and coat components in accordance with AAMA 2604 and 2605 Quality Standards and applicable European standards for the coating material specified.

B. Wrap and package coated components using methods suitable for transit and covered site storage without damage.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until colors have been verified.

B. Verify framing members are ready to receive panel system.

C. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean Surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by the manufacturer.

3.03 INSTALLATION

A. Install in accordance with manufacturer’s installation instructions.

B. Barrier Protection: Do not install over cementitious materials, dissimilar metals or pressure treated material without adequate barrier protection.

    1. Install building paper horizontally on walls to receive metal siding.
    2. Weather lap edges 6 inches (150mm) and ends minimum 6 inches (150mm).
    3. Stagger vertical joints f each layer.
    4. Securely staple, nail in place.

C. Fasten siding to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Install expansion control joints where needed.

F. Use concealed fasteners unless otherwise approved by Architect.

G. Install soffits, and accessories in accordance with best practice, with all joint members plumb and true.

3.04 FIELD QUALITY CONTROL

A. After installation of soffits, check entire surface for obvious flaws or defects.

B. Replace and repair any problem areas, paying close attention to the substrate for causes of the problem.

3.05 CLEANING

A. After application of soffits, clean as necessary to remove all fingerprints and soiled areas.

B. Upon completion of soffit application, clean entire area, removing all scrap, packaging and unused materials related to this work.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 07 50 00

THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. To install an adhered Single Ply Thermoplastic (PVC) Roofing Membrane with flashings and other system components to comprise a roofing system for the County of Riverside, Lakeland Library, City of Lake Elsinore, California.

B. Related Work: The work includes but is not necessarily limited to the installation of:

1. Adhesive for Flashings
2. Clad Edge Metal
3. Fasteners
4. Metal Flashings
5. Roof Membrane
6. Roof Membrane Flashings
7. Sealants
8. Separation Board
9. Substrate Preparation
10. Tapered Insulation
11. Walkways
12. Wood Blocking

C. Upon successful completion of work the following warranties may be obtained:

1. Manufacturer Warranty
2. Roofing Contractor Warranty

D. System Description:

1. One ply PVC membrane adhered over separation board adhered over tapered insulation (crickets) and mechanically fastened (or adhered) over sloped plywood decking.

1.03 STANDARDS AND REFERENCES

The applicator shall submit evidence that the proposed roof system meets the requirements of the local building code and has been tested and approved or listed by the following test organizations. These requirements are minimum standards, and no roofing work shall commence without written documentation of the system's compliance, as required in the "Submittals" section of this specification.

A. Factory Mutual Research Corporation (FM) - Norwood, MA

1. Class 1-90 (Attachment Criteria)

B. Underwriters Laboratories, Inc. - Northbrook, IL

1. Class A assembly

1.04 QUALITY ASSURANCE

A. Membrane Manufacturer must certify that the proposed equal has a membrane thickness equal to the membrane thickness specified 80 mils thick, without ASTM (+/-) mil tolerance, as

such tolerance is not acceptable. The felt backing shall not be included when measuring membrane thickness.

B. Membrane must have at least forty (40) mils of waterproofing polymers above the reinforcement as documented in the Typical Physical Properties section of the Manufacturer's published Product Data Sheet for 80 mil membranes.

C. Roofing Membrane Manufacturer must have a demonstrated performance history of producing thermoplastic membranes no less, in duration of years, than the warranty duration specified.

D. Membrane Manufacturer must provide a list of at least 10 (ten) projects in which the submitted roofing material has been performing for the specified warranty duration. Membranes with modified formulation changes and undocumented proven performance will not be accepted.

E. Membrane Manufacturer must not require the use of membrane cut edge sealant at any location. This is a maintenance item that the Owner does not accept.

F. Manufacturer's warranty must have "No Dollar Limit" for the replacement of defective materials and labor with no exclusions for ponding water.

G. Membrane Manufacturer to confirm in writing that they directly manufacture the roofing membrane; private labeled membranes are not acceptable.

H. Membrane Manufacturer must have an established program for recycling membrane at the end of its useful life. Must provide 3 (three) instances in which they have done so.

I. Membrane Manufacturer must have recycled content certification from UL (Underwriters Laboratories) Environment.

J. Membrane Manufacturer must have ISO 14001 Certification and a Responsible Care program in place.

K. Upon completion of the installation and the delivery to the Manufacturer, by the Applicator of certification, that all work has been done in strict accordance with the contract specifications and Membrane Manufacturer's requirements, a Technical Service Representative will review the installed roof system.

L. There is no deviation made from the project specification or the approved shop drawings without prior written approval by the Architect, the Owner's Representative and Roofing Manufacturer.

M. The installer must have a minimum of 5 years' experience in installing roofing system of this type and nature. Contractor must be certified and approved by the roofing materials Manufacturer.

N. All work pertaining to the installation of PVC membrane and flashings must only be completed by Applicator personnel trained and authorized by roofing Manufacturer in those procedures.

O. Membrane to have no formulation changes in the last fifteen (15) years as certified by the manufacturer.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. All submittals which do not conform to the following requirements will be rejected. Submit proposed equals to be considered for use on this project no less than ten (10) days prior to bid date. Proposed roof systems which have been reviewed and accepted will be listed in an

addendum prior to bid date; only then will roof systems be accepted at bidding. Submittals shall include the following:

1. Copies of Specification including physical properties.
2. Samples of each primary component to be used in the roof system and the manufacturer's current literature for each component.
3. Written approval by the insulation manufacturer (as applicable) for use and performance of the product in the proposed system.
4. Sample copy of Manufacturer's warranty including no exclusion for ponding water and no time limit shall be assigned to any such ponding water.
5. Sample copy of Applicator's warranty.
6. Dimensioned shop drawings which shall include:
    a. Outline of roof with roof size and elevations shown.
    b. Profile details of flashing methods for penetrations.
    c. Technical acceptance from Manufacturer.
7. Certifications by manufacturers of roofing and insulating materials that all materials supplied comply with all requirements of the identified ASTM and industry standards or practices and requirements of this specification as stated in Section 2.01, C & D and all requirements listed in Quality Assurance.
8. Certification from the Applicator that the system specified meets all identified code and insurance requirements as required by the Specification.
9. Letter from the proposed manufacturer confirming the number of years it has DIRECTLY manufactured the proposed roof system under the trade names and/or trademarks as proposed.
10. Material Safety Data Sheets (MSDS)

1.07 DELIVERY, STORAGE AND HANDLING

A. All products delivered to the job site shall be in the original unopened containers or wrappings bearing all seals and approvals.

B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.

C. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions that may affect the ease of membrane weldability.

D. All adhesives shall be stored at temperatures between 40º F (5º C) and 80º F (27º C).

E. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.

F. All materials which are determined to be damaged by the Owner's Representative or the manufacturer are to be removed from the job site and replaced at no cost to the Owner.

1.08 PROJECT CONDITIONS

A. Membrane materials may be installed under certain adverse weather conditions but only after consultation with the Manufacturer, as installation time and system integrity may be affected.

B. Only as much of the new roofing as can be made weathertight each day, including all flashing and detail work, shall be installed. All seams shall be cleaned, and heat welded before leaving the job site that day.

C. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.

D. All surfaces to receive new insulation, membrane or flashings shall be dry. Should surface moisture occur, the Applicator shall provide the necessary equipment to dry the surface prior to the application.

E. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.

F. Uninterrupted waterstops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated membrane shall be replaced at no cost to the Owner.

G. The Applicator is cautioned that certain membranes are incompatible with asphalt, coal tar, heavy oils, roofing cements, creosote, and some preservative materials. Such materials shall not remain in contact with the membranes. The Applicator shall consult the manufacturer regarding compatibility, precautions, and recommendations.

H. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the general contractor or construction manager shall provide for all necessary protection and barriers as required to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over Felt or plywood over insulation board shall be provided for all new and existing roof areas that receive rooftop traffic during construction.

I. Prior to and during application, all dirt, debris, and dust shall be removed from surfaces by vacuuming, sweeping, blowing with compressed air and/or similar methods.

J. The Applicator shall follow all safety regulations as required by OSHA and any other applicable authority having jurisdiction.

K. All roofing, insulation, flashings, and metal work removed during construction shall be immediately taken off site to a legal dumping area authorized to receive such materials. Hazardous materials, such as materials containing asbestos, are to be removed and disposed of in strict accordance with applicable City, State and Federal requirements.

L. All new roofing waste material (i.e., scrap roof membrane, empty cans of adhesive) shall be immediately removed from the site by the Applicator and properly transported to a legal dumping area authorized to receive such material.

M. The Applicator shall take precautions that storage and/or application of materials and/or equipment does not overload the roof deck or building structure.

N. Flammable adhesives and deck primers shall not be stored and not be used in the vicinity of open flames, sparks and excessive heat.

O. All rooftop contamination that is anticipated or that is occurring shall be reported to the manufacturer to determine the corrective steps to be taken.

P. The Applicator shall verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Applicator shall report any such blockages in writing (letter copy to the manufacturer) to the Owner's Representative for corrective action prior to installation of the roof system.

Q. Applicator shall immediately stop work if any unusual or concealed condition is discovered and shall immediately notify Owner of such condition in writing for correction at the Owner's expense (letter copy to the manufacturer).

R. Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be completed to the Owner's satisfaction.

S. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.

T. The Applicator shall conduct fastener pullout tests in accordance with the latest revision of the SPRI/ANSI Fastener Pullout Standard to help verify condition of deck/substrate and to confirm expected pullout values.

U. The adhered membrane shall not be installed under the following conditions without consulting the manufacturer's technical department for precautionary steps:

1. The roof assembly permits interior air to pressurize the membrane underside.
2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
3. The wall/deck intersection permits air entry into the wall flashing area.

V. Precautions shall be taken when using adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Always keep lids on unused cans.

W. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

1.09 BIDDING REQUIREMENTS

A. Pre-Bid Meeting: A pre-bid meeting shall be held with the Owner's Representative and involved trades to discuss all aspects of the project. The Applicator's field representative or roofing foreman for the work shall be in attendance. Procedures to avoid rooftop damage by other trades shall be determined.

B. Site Visit: Bidders shall visit the site and carefully examine the areas in question as to conditions that may affect proper execution of the work. All dimensions and quantities shall be determined or verified by the contractor. No claims for extra costs will be allowed because of lack of full knowledge of the existing conditions unless agreed to in advance with the Owner or Owner's Representative.

1.10 WARRANTIES

A. Manufacturer's System Warranty (only products purchased from the membrane manufacturer are covered under System Warranty): Upon successful completion of the work to the Roofing Manufacturer's and Owner's satisfaction, and receipt of final payment, the twenty-five (25) Year System Warranty shall be issued. The System Warranty shall provide for the roof membrane, all accessories that comprise a roof system, and contractor labor. The Warranty shall be **Non-Prorated** provide for No Dollar Limit (NDL) and **shall not exclude ponding water and no time limited shall be assigned for any such ponding water during the warranty period**. Warranty shall not exclude regular foot traffic or storage on the roof surface, and it shall not obligate the owner to a maintenance schedule of any type as a condition of the warranty.

B. Applicator/Roofing Contractor Warranty: The Applicator shall supply the Owner with a separate five-year workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, the Applicator shall repair that defect at no cost to

the Owner. The Applicator's warranty obligation shall run directly to the Owner, and a copy shall be sent to the manufacturer.

C. Owner Responsibility: Owner shall notify both the manufacturer and the Applicator of any leaks as they occur during the time when both warranties are in effect.

PART 2 – PRODUCTS

2.01 GENERAL

A. The components of the Adhered roof system are to be products of the membrane manufacturer as indicated on the Detail Drawings and specified in the Contract Documents.

B. Components to be used that are other than those supplied or manufactured by the membrane manufacturer may be submitted for review and acceptance by the manufacturer. The manufacturer's acceptance of any other product is only for a determination of compatibility with membrane products and not for inclusion in the manufacturer's warranty. The specifications, installation instructions, limitations, and/or restrictions of the respective manufacturers must be reviewed by the Owner's Representative for acceptability for the intended use with the manufacturer's products.

C. Membrane shall be certified by the manufacturer to be the exact thickness as specified; ASTM tolerance does not apply.

D. Membrane shall have a minimum of forty (40) mils of waterproofing polymers above the reinforcements as documented by a third-party source.

2.02 MEMBRANE

A. Sarnafil® G410 Feltback fiberglass reinforced membrane with a factory-applied integral lacquer coating to repel dirt and sustain reflectivity.

B. Membrane shall conform to ASTM D4434-15 (or latest revision), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II, Grade I, Fiberglass Reinforced. Membranes fabricated with scrim/ polyester reinforcements will not be considered or approved as equal for adhered applications.

1. Sarnafil G410-20 feltback, 80 mil (2.0 mm), thermoplastic membrane with fiberglass reinforcement and a factory applied 9 oz. geotextile felt backing.

C. Color of Membrane

1. EnergySmart feltback (White), initial reflectivity of 0.83, initial emissivity 0.92, solar reflective index (SRI) of >104.

D. Typical Physical Properties

Parameters	ASTM Test Method	Minimum ASTM Requirement
Reinforcing Material	-	Fiberglass
Overall Thickness, min., inches (mm)	D638	[0.080inches)]
Tensile Strength, min., psi (MPa)	D638	1600 (11.1)
Elongation at Break, min. (machine x tranverse)	D638	270% / 250%
Seam strength*, min. (% of tensile strength)	D638	80
Retention of Properties After Heat Aging	D3045	-
Tensile Strength, min., (% of original)	D638	95

Elongation, min., (% of original)	D638	90
Tearing Resistance, min., lbf (N)	D1004	14 (63.0)
Low Temperature Bend, -40º F (-40º C)	D2136	Pass
Accelerated Weathering Test (Xenon Arc)	D2565	10,000 Hours
Cracking (7x magnification)	-	None
Discoloration (by observation)	-	Negligible
Crazing (7 x magnification)	-	None
Linear Dimensional Change	D1204	0.02%
Weight Change After Immersion in Water	D570	2.5%
Static Puncture Resistance, 33 lbf (15 kg)	D5602	Pass
Dynamic Puncture Resistance, 7.3 ft-lbf (10 J)	D5635	Pass

*Failure occurs through membrane rupture, not seam failure.

2.03 FLASHING MATERIALS

A. Wall/Curb/Perimeter Flashing

1. Flashing Membrane: A fiberglass reinforced membrane adhered to approved substrate using adhesive.
2. Clad: A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Clad is a 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported membrane laminated on one side.
3. Coping Metal: Wall Grip Coping is formed from .063 in (1.60 mm) or .050 in (1.25 mm) aluminum; 24ga. galv. steel with Kynar 500® coating. Cleats are 20ga. galvanized steel. Chairs are metal in the same color and finish as the coping cap. Fabricated to the wall width required between 6 in and 32 in. Face and back leg are 4 in (102mm) nominal length with tested approvals up to 6” (152mm).

B. Miscellaneous Flashing

1. Flash: A prefabricated expansion joint cover made from membrane. Flash is designed for securement to wall or horizontal surfaces to span and accommodate the movement of new and existing expansion gaps from 1 inch to 4½ inches (25 mm to 114 mm) across.
2. Reglet: A heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Reglet is produced from 6063-T5, 0.10 inch - 0.12 inch (2.5 mm - 3.0 mm) thick extruded aluminum. Reglet has a 2¼ inch (57 mm) deep profile and is provided in 10-foot (3 m) lengths. Use prefabricated Reglet mitered inside and outside corners where walls intersect.
3. Stack: A prefabricated vent pipe flashing made from 0.048 inch (48 mil/1.2 mm) thick G410 membrane.
4. Circle-"G": Circular 0.048 inch (48 mil/1.2 mm) thick G410 membrane patch welded over T-joints formed by overlapping thick membranes.
5. Corner: Prefabricated outside and inside flashing corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are heat-welded to membrane or Clad base flashings. Corner is available in 2 outside sizes (5 inch and 8½ inch diameter/127 mm and 215 mm) and 1 inside size.
6. Multi-Purpose Sealant: A sealant used at flashing terminations.

7. StaBond Adhesive: A solvent-based reactivating-type adhesive used to attach membrane to flashing substrate.
8. Felt: A non-woven polyester or polypropylene mat cushion layer that is necessary behind G410 or G459 Flashing Membrane when the flashing substrates are rough-surfaced or incompatible with the flashing membrane.
9. Flashing G459 Membrane: An asphalt-resistant, fiberglass reinforced membrane adhered to approved substrate using adhesive.

2.04 SEPARATION BOARD

A. Dens-Deck Prime®: A siliconized gypsum, fire-tested hardboard with glass-mat facers. Dens-Deck Prime is provided in a 4 ft x 8 ft (1.2 m x 2.4 m) board size and in thickness of 1/4".

2.05 INSULATION

A. Insulation: A rigid polyisocyanurate foam insulation with black mat facers. Insulation is available in 4 ft x 4 ft (1.2 m x 1.2 m) or 4 ft x 8 ft (1.2 m x 2.4 m) sizes and various thicknesses. Provide tapered insulation for cricket application. Refer to roof plan.

2.06 ATTACHMENT COMPONENTS

A. Membrane adhesive: 2121 Adhesive: A water-based adhesive used to attach the membrane to horizontal or near-horizontal substrates. Application rates are as follows:

APPLICATION RATES FOR FELTBACK MEMBRANE						
	Adhesive Rates - Gallons/100 Ft² *(Liters/Meter²)*					**Approximate Sq. Ft./Pail** *(meter²)*
	Substrate		**Membrane**		**Total**	
GP Dens-Deck®	1.75 *(0.71)*	+	0	=	1.75 *(0.71)*	285 *(26.48)*

Notes:

a) There is a significant increase in drying time due to an increase in humidity and/or a decrease in temperature. Do not install when outdoor or substrate temperatures during drying period are expected to fall below 40º F (5º C).

b) Do not allow 2121 adhesive to skin-over or surface-dry prior to installation of membrane.

c) Use a water-filled, foam-covered lawn roller to press the membrane consistently and evenly into the adhesive layer.

B. Plate: Used with various Fasteners to attach insulation boards to roof deck. Plate is a 3-inch (75 mm) square or round, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating.

C. Fastener No. 12: Number 12 corrosion-resistant fastener used with Plates to attach insulation boards to steel or wood roof decks. Fastener No. 12 has a modified buttress thread, a shank diameter of approximately 0.168 inch (4 mm) and a thread diameter of approximately 0.214 inch (5 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement.

D. Fastener-XP: A #15, heavy-duty, corrosion-resistant fastener used with Plate to attach insulation or Stop and Bar to attach G410 roof membrane to steel or wood roof decks. Fastener-XP has a shank diameter of approximately 0.21 inch (5.3 mm) and the thread diameter is approximately 0.26 inch (6.6 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement.

E. Fastener-XPS: A specially designed, heavy-duty, corrosion-resistant fastener used with Stop or Bar to attach G410 roof membrane to steel roof decks. Fastener-XPS has a shank diameter of approximately 0.21 inch (5.3mm) and a thread diameter of approximately 0.26 inch (6.6). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement and simplicity of application.

F. Fastener-King Con: A nail-in, corrosion-resistant fastener used with Plate to attach insulation or with Bar to attach membrane to poured structural concrete roof decks.

G. Stop: An extruded aluminum, low profile bar used with certain Fasteners to attach to the roof deck or to walls/curbs at terminations, penetrations and at incline changes of the substrate. Stop is a 1 inch (25 mm) wide, flat aluminum bar 1/8 inch (3 mm) thick that has predrilled holes every 6 inches (152 mm) on center.

H. Bar: An FM-approved, heavy-duty, 14 gauge, galvanized or stainless, roll-formed steel bar used to attach membrane to roof decks. The formed steel is pre-punched with holes every 1 inch (25 mm) on center to allow various Fastener spacing options.

I. Cord: A 5/32-inch (4 mm) diameter, red-colored, flexible thermoplastic extrusion that is welded to the top surface of the membrane and against the side of the Bar, used to hold the membrane in position.

J. Low-Rise Foam Adhesive: A two-component, polyurethane, commercial grade, low-rise expanding foam adhesive formulated for securement of feltbacked roofing membrane to acceptable substrates and for assembly of system components adhered to approved structural decks.

2.07 WALKWAY PROTECTION

A. Tread: A polyester reinforced, 0.096 inch (96 mil/2.4 mm), weldable membrane with surface embossment. Used as a protection layer from rooftop traffic. Tread is supplied in rolls of 39.3 inches (1.0 m) wide and 32.8 feet (10 m) long.

2.08 MISCELLANEOUS ACCESSORIES

A. Aluminum Tape: a 2-inch (50 mm) wide pressure-sensitive aluminum tape used as a separation layer between small areas of asphalt contamination and the membrane and as a bond-breaker under the coverstrip at Clad joints.

B. Sealing Tape Strip: Compressible foam with pressure-sensitive adhesive on one side. Used with metal flashings as a preventive measure against air and wind-blown moisture entry.

C. Multi-Purpose Tape: A high performance sealant tape with used with metal flashings as a preventive measure against air and wind-blown moisture entry.

D. Seam Welder 641mc: 220 volt, self-propelled, hot-air welding machine used to seal long lengths of membrane seams.

E. Perimat Welder: 120 volt, self-propelled, hot-air welding machine used to seal long-lengths of membrane seams along perimeter details.

F. Solvent: A high quality solvent cleaner used for the general cleaning of residual asphalt, scuff marks, etc., from the membrane surface. Solvent is also used daily to clean seam areas prior to hot-air welding in tear off or dirty conditions or if the membrane is not welded the same day it is unrolled. Consult Product Data Sheet for additional information.

2.09 MISCELLANEOUS FASTENERS AND ANCHORS

A. All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approved for such use by the fastener manufacturer. All miscellaneous wood fasteners and anchors used for flashings

shall have a minimum embedment of 1 inch (25 mm) and shall be approved for such use by the fastener manufacturer.

2.10 RELATED MATERIALS

A. Wood Nailer: Treated wood nailers shall be installed at the perimeter of the entire roof and around such other roof projections and penetrations as specified on Project Drawings. Thickness of nailers must match the insulation thickness to achieve a smooth transition. Wood nailers shall be treated for fire and rot resistance (wolmanized or osmose treated) and be #2 quality or better lumber. Creosote or asphalt-treated wood is not acceptable. Wood nailers shall conform to Factory Mutual Loss Prevention Data Sheet 1-49. All wood shall have a maximum moisture content of 19% by weight on a dry-weight basis.

B. Plywood: When bonding directly to plywood, a minimum ½ inch (12 mm) CDX (C side out), smooth-surfaced exterior grade plywood with exterior grade glue shall be used. Rough-surfaced plywood or high fastener heads will require the use of Felt behind the flashing membrane. Plywood shall have a maximum moisture content of 19% by weight on a dry weight basis.

PART 3 – EXECUTION

3.01 PRE-CONSTRUCTION CONFERENCE

A. The Applicator, Owner's Representative/Designer and Manufacturer(s) shall attend a pre-construction conference.

B. The meeting shall discuss all aspects of the project including but not limited to:

1. Safety
2. Set up
3. Construction schedule
4. Contract conditions
5. Coordination of the work

3.02 SUBSTRATE CONDITION

A. Applicator shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.

B. Applicator shall verify that the work done under related sections meets the following conditions:

1. Roof drains and/or scuppers have been reconditioned and/or replaced and installed properly.
2. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
3. All surfaces are smooth and free of dirt, debris, and incompatible materials.
4. All roof surfaces shall be free of water, ice, and snow.

3.03 SUBSTRATE PREPARATION

The roof deck and existing roof construction must be structurally sound to provide support for the new roof system. The Applicator shall load materials on the rooftop in such a manner to eliminate risk of deck overload due to concentrated weight. The Owner's Representative shall ensure that the roof deck is secured to the structural framing according to local building code and in such a manner as to resist all anticipated wind loads in that location.

A. New Construction

1. Wood Deck:

a) FM approved wood deck - The roof deck shall be minimum 2 inch (50 mm) thick lumber or ¾ inch (19 mm) thick treated plywood. The deck shall conform to FM requirements for Class 1 fire-retardant and rot-resistant wood decks. Deck shall be installed according to FM and local code requirements.

b) Non-FM approved wood deck - The roof deck shall be minimum 1½ inch (25 mm) thick lumber or 15/32 inch (12 mm) thick plywood. Deck shall be installed according to local code requirements. Contact Manufacturer's Technical for fastening patterns and methods.

3.04 SUBSTRATE INSPECTION

A. A dry, clean, and smooth substrate shall be prepared to receive the Adhered roof system.

B. The Applicator shall inspect the substrate for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect the quality of work.

C. The substrate shall be clean, smooth, dry, free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until all defects have been corrected.

D. All roof surfaces shall be free of water, ice, and snow.

E. The membrane shall be applied over compatible and accepted substrates only.

3.05 WOOD NAILER INSTALLATION

A. Install continuous wood nailers at the perimeter of the entire roof and around roof projections and penetrations as shown on the Detail Drawings.

B. Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center, if necessary, to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Nailer attachment shall meet this requirement and that of the current Factory Mutual Loss Prevention Data Sheet 1-49.

C. Thickness shall be as required to match substrate or insulation height to allow a smooth transition.

D. Any existing nailer woodwork which is to remain shall be firmly anchored in place to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction and shall be free of rot, excess moisture or deterioration. Only woodwork shown to be reused in Detail Drawings shall be left in place. All other nailer woodwork shall be removed.

3.06 SEPARATION BOARD AND INSULATION INSTALLATION

A. Separation board and insulation shall be installed according to insulation manufacturer's instructions.

B. Separation board and insulation shall be neatly cut to fit around penetrations and projections.

C. Install tapered insulation in accordance with insulation manufacturer's shop drawings.

D. Install tapered insulation around drains creating a drain sump.

E. Do not install more insulation board than can be covered with the membrane by the end of the day or the onset of inclement weather.

F. Use at least 2 layers of insulation when the total insulation thickness exceeds 2½ inches (64 mm). Stagger joints at least 12 inches (0.3 m) between layers.

G. Mechanical Attachment (Initial Layer, Board)

1. Separation board and insulation shall be mechanically fastened to the deck with approved fasteners and plates at a rate according to the separation board and insulation manufacturer's, FM's and the manufacturer's recommendations for fastening rates and patterns. The quantity and locations of the fasteners and plates shall also cause the insulation or separation boards to rest evenly on the roof deck/substrate so that there are no significant and avoidable air spaces between the boards and the substrate. Each insulation board shall be installed tightly against the adjacent boards on all sides.
2. Fasteners are to be installed consistently in accordance with fastener manufacturer's recommendations. Fasteners are to have minimum penetration into structural deck recommended by the fastener manufacturer and the membrane manufacturer.
3. Use fastener tools with a depth locator and torque-limiting attachment as recommended or supplied by fastener manufacturer to ensure proper installation.

H. Adhered Attachment (Subsequent Layers, Boards)

1. Lay each layer of insulation in full bed of low-rise adhesive.
2. Cover final layer of insulation with gypsum underlayment. Set in full bed of low-rise adhesive.
3. Butt boards tightly together. Set to provide smooth substrate for roofing membrane with no off-set exceeding 1/16-inch at board joints.
4. Apply using a four-bead applicator or by hand with a dual component manual applicator over properly installed and prepared substrates in bands 12 in. o.c. Bands shall be 1/4 - 1/2 inches wide before foaming. Immediately set insulation boards into wet adhesive. Walk insulation boards into place to ensure full embedment. On roof slopes greater than 1/2 inch in 12 inches, begin adhering insulation at low point and work upward to avoid slippage. One person should be designated to walk in, trim/slit and, if necessary, add additional weight for proper securement. Only areas that can be made completely watertight in the same day's operations shall be installed.

3.07 INSTALLATION OF ROOF MEMBRANE

The surface of the insulation or substrate shall be inspected prior to installation of the roof membrane. The substrate shall be clean, dry, free from debris and smooth with no surface roughness or contamination. Broken, delaminated, wet or damaged insulation boards shall be removed and replaced.

A. 2121 Adhesive:

1. Over the properly installed and prepared substrate, 2121 adhesive shall be poured out of the pail and spread using notched ¼ inch x ¼ inch x ¼ inch (6 mm x 6 mm x 6 mm) rubber squeegees. The 2121 adhesive shall be applied at a rate according to the manufacturer's requirements. No adhesive is applied to the back of the G410 feltback membrane. **Do not allow adhesive to skin-over or surface-dry prior to installation of G410 feltback membrane.**
2. The G410 feltback roof membrane is unrolled immediately into the wet 2121 adhesive. Adjacent rolls overlap previous rolls by 3 inches (75 mm). This process is repeated throughout the roof area. Immediately after application into adhesive, each roll shall be pressed firmly into place with a water-filled, foam-covered lawn roller by frequent rolling in two directions. **Do not allow adhesive to skin-over or surface-dry prior to installation of G410 feltback membrane.**
3. Weld G410 coverstrips at all G410 feltback seams that do not have a factory selvage edge. Notes:

a. 2121 adhesive shall not be used if temperatures below 40º F (5º C) are expected during application or subsequent drying time.

b. No adhesive shall be applied in seam areas. All membrane shall be applied in the same manner.

3.08 HOT-AIR WELDING OF SEAM OVERLAPS

A. General

1. All seams shall be hot-air welded. Seam overlaps should be 3 inches (75 mm) wide when automatic machine-welding and 4 inches (100 mm) wide when hand-welding, except for certain details.

2. Welding equipment shall be provided by or approved by the manufacturer. All mechanics intending to use the equipment shall have successfully completed a training course provided by a Technical Representative prior to welding.

3. All membrane to be welded shall be clean and dry.

B. Hand-Welding

1. Hand-welded seams shall be completed in two stages. Hot-air welding equipment shall be allowed to warm up for at least one minute prior to welding.

2. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.

3. The nozzle shall be inserted into the seam at a 45-degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow," the hand roller is positioned perpendicular to the nozzle and pressed lightly. For straight seams, the 1½ inch (40 mm) wide nozzle is recommended for use. For corners and compound connections, the ¾ inch (20 mm) wide nozzle shall be used.

C. Machine Welding

1. Machine welded seams are achieved using automatic welding equipment. When using this equipment, the manufacturer’s instructions shall be followed and local codes for electric supply, grounding and over current protection observed. Dedicated circuit house power or a dedicated portable generator is recommended. No other equipment shall be operated off the generator.

2. Metal tracks may be used over the deck membrane and under the machine welder to minimize or eliminate wrinkles.

D. Quality Control of Welded Seams

1. The Applicator shall check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of dark grey material from the underside of the top membrane. On-site evaluation of welded seams shall be made daily by the Applicator to locations as directed by the Owner's Representative or a manufacturer’s representative. One inch (25 mm) wide cross-section samples of welded seams shall be taken at least three times a day. Correct welds display failure from shearing of the membrane prior to separation of the weld. Each test cut shall be patched by the Applicator at no extra cost to the Owner.

3.09 MEMBRANE FLASHINGS

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the manufacturer. Approval shall only be for specific locations on specific dates. If any water enters under the newly completed roofing, the affected area shall be removed

and replaced at the Applicator's expense. Flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces. Use caution to ensure adhesive fumes are not drawn into the building.

A. Adhesive for Membrane Flashings

1. Over the properly installed and prepared flashing substrate, adhesive shall be applied according to instructions found on the Product Data Sheet. The adhesive shall be applied in smooth, even coats with no gaps, globs, or similar inconsistencies. Only an area which can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.

2. No adhesive shall be applied in seam areas that are to be welded. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by welding techniques.

B. Install Stop/Bar/Cord according to the Detail Drawings with approved fasteners into the structural deck at the base of parapets, walls, and curbs. Stop is required by the manufacturer at the base of all tapered edge strips and at transitions, peaks, and valleys according to the manufacturer’s details.

C. The manufacturer’s requirements and recommendations and the specifications shall be followed. All material submittals shall have been accepted by the manufacturer prior to installation.

D. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the Owner's Representative and the Technical Department.

E. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and hot-air welded into place. No bitumen shall be in contact with the membrane.

F. All flashing membranes shall be mechanically fastened along the counter-flashed top edge with Stop at 6-8 inches (0.15-0.20 m) on center.

G. Flashings shall be terminated according to the manufacturer’s recommended details.

H. All flashings that exceed 30 inches (0.75 m) in height shall receive additional securement. Consult Technical Department for securement methods.

3.10 METAL FLASHINGS

A. Metal details, fabrication practices and installation methods shall conform to the applicable requirements of the following:

1. Factory Mutual Loss Prevention Data Sheet 1-49 (latest issue).

2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - latest issue.

B. Metal, other than that provided by the manufacturer, is not covered under the warranty.

C. Complete all metal work in conjunction with roofing and flashings so that a watertight condition exists daily.

D. Metal shall be installed to provide adequate resistance to bending to allow for normal thermal expansion and contraction.

E. Metal joints shall be watertight.

F. Metal flashings shall be securely fastened into solid wood blocking. Fasteners shall penetrate the wood nailer a minimum of 1 inch (25 mm).

G. Airtight and continuous metal hook strips are required behind metal fascias. Hook strips are to be fastened 12 inches (0.3 m) on center into the wood nailer or masonry wall.

H. Counter flashings shall overlap base flashings at least 4 inches (100 mm).

I. Hook strips shall extend past wood nailers over wall surfaces by 1½ inch (38 mm) minimum and shall be securely sealed from air entry.

3.11 CLAD METAL BASE FLASHINGS / EDGE METAL

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the manufacturer. Acceptance shall only be for specific locations on specific dates. If any water enters under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Applicator's expense.

A. Clad metal flashings shall be formed and installed per the Detail Drawings.

1. All metal flashings shall be fastened into solid wood nailers with two rows of post galvanized flat head annular ring nails, 4 inches (100 mm) on center staggered. Fasteners shall penetrate the nailer a minimum of 1 inch (25 mm).

2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

B. Adjacent sheets of Clad shall be spaced ¼ inch (6 mm) apart. The joint shall be covered with 2 inch (50 mm) wide aluminum tape. A 4-inch minimum (100 mm) wide strip of flashing membrane shall be hot-air welded over the joint. Each flashed joint shall be covered by a clad metal fascia plate to match the color of the clad edge metal. Install the clad fascia plate per Sarnafil standards.

3.12 COPING METAL INSTALLATION

A. The substrate should be flat and level from front to back. Shim areas not level.

B. The first cleat/chair set should be installed with the center line of the cleat set to the miter leg length and 24 in (300mm) from the end of a wall. Install cleats/chairs sets at all corners and ends first, then work along the wall to the center locating sets every 60” on center for walls less than 17 in and 40 in on center for walls 17 in – 32 in. Adjust the cleat location in the middle of a run to fit a short coping length. This procedure will provide a symmetrical appearance of the installed coping. Install metal gutter chair/concealed joint covers at joint locations. Hook coping face leg over the cleat face (front) leg and swing over the top. Snap the roof side (back) leg by pressing firmly down on the back edge directly over the cleat chair sets. Allow 1/8 in (3mm) gap, ¼ in (6mm) in colder weather, at each joint.

3.14 WALKWAY INSTALLATION

A. Tread Walkway

1. Roofing membrane to receive the Tread Walkway shall be clean and dry. Place chalk lines on deck sheet to indicate location of Walkway. Apply a continuous coat of 2170 adhesive to the deck sheet and the back of Walkway in accordance with manufacturer’s technical requirements and press Walkway into place with a water-filled, foam-covered lawn roller. Clean the deck membrane in areas to be welded. Hot-air weld the entire perimeter of the Walkway to the membrane deck sheet. Check all welds with a rounded screwdriver. Re-weld any inconsistencies. **Important:** Check all existing deck membrane seams that are to be covered by Walkway with rounded screwdriver and re-weld any inconsistencies before Walkway installation. Do not run Walkway over Bars.

3.15 TEMPORARY CUT-OFF

A. All flashings shall be installed concurrently with the roof membrane to maintain a watertight condition as the work progresses. All temporary waterstops shall be constructed to provide a 100% watertight seal. The stagger of the insulation joints shall be made even by installing partial panels of insulation. The new membrane shall be carried into the waterstop. The

waterstop shall be sealed to the deck and/or substrate so that water will not be allowed to travel under the new or existing roofing. The edge of the membrane shall be sealed in a continuous heavy application of sealant as described in Section 2.10. When work resumes, the contaminated membrane shall be cut out. All sealant, contaminated membrane, insulation fillers, etc. shall be removed from the work area and properly disposed of off site. None of these materials shall be used in the new work.

B. If inclement weather occurs while a temporary waterstop is in place, the Applicator shall provide the labor necessary to monitor the situation to maintain a watertight condition.

C. If any water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at the Applicator's expense.

3.16 COMPLETION

A. Prior to demobilization from the site, the work shall be reviewed by the Owner's Representative and the Applicator. All defects noted and non-compliances with the Specifications or the recommendations of the manufacturer shall be itemized in a punch list. These items must be corrected immediately by the Applicator to the satisfaction of the Owner's Representative and the manufacturer prior to demobilization.

B. All Warranties referenced in this Specification shall have been submitted and have been accepted at time of contract award.

END OF SECTION

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to comply with the Contract Documents, including, but not limited to, these major items:

A. All metal wall flashings, related flashing, coping and caps.

B. Flashing at curbed openings, and other miscellaneous areas where indicated on the drawings.

C. Flashing flanges for roof drains and overflows.

D. Flashing at parapet walls that receive roofing membrane.

E. Flashing and metal covers at mechanical equipment platforms.

F. Rain Water Leaders, Collectors and Scuppers.

G. Shop and field priming, shop painting, galvanizing, screening, caulking, anchors and anchor straps, clips, etc.

H. Shop drawings of all sheet metal work including expansion joints.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

A. Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces.

B. Report to the Architect all conditions that prevent proper execution of this work.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Shop Drawings: submit: all information required for fabrication, finishing and installation of this work in complete details.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer’s Standard Requirements.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 RECORD DRAWINGS

Provide in accordance with Section 01 77 00 Project Closeout.

1.11 WARRANTY

A. Provide Warranty in accordance with Section 01 78 36 Warranties.

B. Contractor guarantees the work covered by this specification against all defects in material and workmanship for a period of not less than five (5) years from the date the Owner records Notice of Completion.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Galvanized Sheet Metal: Conform to ASTM A525, thickness indicated or specified, but not less than 24-gauge. Zinc coating shall weigh not less than 1-1/2 ounces, or more than 1-1/2 ounces per square foot of surface covered.

B. Solder: Standard Grade-A brand of 50:50 Alloy Lead-Tin, complying with ASTM B32. Name of manufacturer and grade designation shall be cast or die-marked on each bar.

C. Solder Flux: Raw muratic acid for galvanized metal and zinc; resin for tin, lead, and tinned copper; and non-corrosive soldering salts for uncoated copper.

D. Sheet Metal Fasteners: Rivets, nails, sheet metal screws, self-tapping screws, and stove bolts, of the type and size best adapted to the condition of use. Provide fasteners of the type specified or indicated.

1. Use: galvanized steel, cadmium-plated steel or 300 Series alloy stainless steel.

2. Pop rivets may be used for metal-to-metal connections when future disassembly is not required. Open-end type may be used for all applications except where watertight connections are required, in which case, use closed end type.

E. Caulking Compound: Provide as specified under Section 07 90 00. Apply as recommended by the manufacturer; caulking compound of proper consistencies for gun and knife application as necessary.

F. Shop Prime Coat: Rust-Oleum Corporation. Apply #3202 to 1/2 mil wet coating thickness, #3268 to 1-mil dry coating thickness or provide primer as specified under Section 09 90 00.

G. Shop Color Coat: Pre-coat in shop with coating of color to match adjoining surfaces.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 FABRICATION AND ASSEMBLY

A. Workmanship: Fabricate and finish metal work in a first class manner in accordance with best trade practices with all joints and corners accurately machined, filed and fitted, and rigidly framed together and connected. Carefully match components to produce perfect continuity of line and design. Make joints and connections in exterior face metal watertight,

using approved scaling materials and methods of assembly. Fit faces of metal in contact with hairline joints, except as otherwise indicated or required for expansion or fitting. Conceal fastenings, unless otherwise indicated. Conceal required reinforcements within the finished assembly.

B. Expansion and Contraction: Form and fabricate work to adequately provide for thermal expansion and contraction and building movement in the completed work, without over-stressing the materials, breaking connections, or producing wrinkles and distortion in finished surfaces. Finish sheet metal work water and weathertight throughout.

C. Attachment Clips: Where subject to thermal expansion and contraction, attach members with clips to permit movement without damage to the installation, or provide slotted or over-size holes with washers where appearance is not critical, as approved by the Architect.

D. Lock Seams: Make lock seam work flat and true to line; sweat full of solder except where installed to permit expansion and contraction. Lap flat lock seams, and lap seams where soldered, according to pitch but in no case less than 4". Make seams in direction of flow. Fill expansion joints with sealant. Plane surfaces shall be free of buckles. Provide reinforcement as necessary. Cleat and fasten substantially on approximately eight-inch centers. All cap flashing to be flat lock seams.

E. Soldering: Thoroughly clean and tin material prior to soldering. Solder with heavy coppers of blunt design, properly tinned before use. For flat seam work they shall not weight less than ten pounds per pair, and for other work not less than size pounds per pair. Solder slowly with well-heated coppers, heating the seams thoroughly and completely filling them with solder. Finish surfaces neatly, full flowing and smooth. Wash acid flux thoroughly with a soda solution after soldering and completely remove soldering flux on exposed surfaces.

F. Welding: Conform to the requirements of AWS "Standard Code for Arc and Gas Welding". Perform welding in a manner resulting in strong, durable, tight, flush, smooth, and clean joints. Weld sheet steel to produce full and complete fusion welds without inducing locked-in stresses in the metal or surface distortions. Welding on exposed surfaces shall be ground smooth and flush and finished to match adjacent surfaces.

G. Caulking: Where indicated, caulk joints in sheet metal work and between sheet metal work and adjacent construction with polysulfide sealing compound. Apply in accordance with Caulking and Sealants Section.

H. Coping: Shall be attached to top of parapets in strict conformance with the latest written specifications of the Sheet Metal Industry Fund of Los Angeles, and as indicated on the drawings.

I. All sheet metal work shall be examined carefully the Contractor, Owner and Architect and if necessary, tested. The Contractor shall make all repairs to damaged items as a result of this testing, leaving them in a condition satisfactory to the Architect.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 07 71 23

GUTTERS AND DOWNSPOUTS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Provide labor, material, and equipment necessary for furnishing a complete installation of commercial gutter system.

B. Related Work:

1. Division 5 Sections for support framing.
2. Division 6 Sections for nailers and support framing.
3. Division 7 Sections for related roofing materials.

1.03 STANDARDS AND REFERENCES

Comply with the industry standards and references as established by manufacturer.

1.04 QUALITY ASSURANCE

A. Where pre-engineered manufactured products are specified, other field fabricated or shop/field fabricated substitutions will not be accepted. However, where shop/field fabrications are indicated pre-engineered systems will be considered with Architect approval.

B. Obtain all components and related accessories from one single source manufacturer.

C. Follow manufacturer's printed instructions for installing commercial gutter system. Follow primary roofing manufacturer's printed instructions for installing associated roof material for flashing gutter system to roof.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Each type of product specified. Submit manufacturer's detailed technical product data, installation instructions and recommendations, dimensions of individual components, profiles, and finishes

C. Shop Drawings: Show fabrication and installation of commercial gutter system including fully dimensioned roof plans, expansion joint locations, sections and details of components and other related trims.

D. Finish & Color Selection: Furnish manufacturer's technical data for specified finish and color chart showing full range of colors available.

1.07 DELIVERY, STORAGE & HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. All products delivered shall be stored in a clean dry location prior to installation.

C. Products furnished with strippable protective masking shall not be exposed to direct sunlight for more than 30 minutes without removing masking.

D. Do not install finished materials with scars or abrasions.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities

B. Coordinate work of this Section with adjoining work for proper sequencing to ensure protection from inclement weather and to protect materials and their finish against damage.

C. Do not install commercial gutter system during inclement weather. When installing in cold climates, warm adhesives, caulks, and primers to at least 50 degrees Fahrenheit prior to application.

1.09 WARRANTY

Provide manufacturer's standard warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

Provide commercial gutter system, accessories, and drainware as manufactured by Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc. 8370 East Hwy 78, Villa Rica, GA 30180, (800) 334-9823, Online at http://www.saf.com/persys

2.02 TYPE

Provide Perimeter Systems' SMACNA Series Gutter System, Figure 1-2, Style I, size as indicated on Drawings

2.03 MATERIALS & FABRICATION

A. Gutter: Shall be manufactured from 0.040" mill finished aluminum in 10'-0" lengths. Gutter shall be:

1. Manufactured with 1" telescoping and notched end.
2. Factory punched with fastening holes elongated to allow for thermal movement.
3. Gutters shall be press formed on a CNC Press to provide repeated true and accurate profiles.

B. Support Bracket: Shall be manufactured from 0.125" x 1.00" aluminum, factory punched for fasteners.

C. Interior Straps: Shall be manufactured from 0.125" x 1.00" aluminum.

2.04 ACCESSORIES

A. Mitered Corners: Miter shall be precision saw cut with a continuous heliarc weld watertight joint.

B. End Caps: Provide factory end caps at all gutter ends and wall abutments.

C. Liner Expansion Joint: Provide manufacturer's elastomeric expansion joints with cover plates at 40' intervals or as shown on shop drawings.

D. Sealant: Shall be polyurethane or silicon based water-proofing type, compatible with aluminum gutter, downspout, and abutting dissimilar materials for intended application.

2.05 DRAINWARE

A. Downspout & Elbows: Provide downspout Model Number DS-EX, 0.125" thickness, in sizes and locations as indicated on plans. Downspouts shall be manufactured from extruded aluminum, alloy 6063-T5 finished to match gutter fascia mouldings. Downspout elbows shall have heliarc welded joints.

B. Outlets: At all downspout locations provide aluminum outlets to connect liner to downspout.

C. Wall Brackets: Provide Style 1 Wall brackets at 60" maximum spacing (minimum 2 brackets). Brackets shall be manufactured from 0.125" x 1.00" aluminum, finished to match downspout.

2.06 FINISHES

A. General: Apply coatings to exposed aluminum components after fabrication for maximum coating performance and to prevent crazing, abrasion, and damage to finished surfaces.

B. Pretreatment: Aluminum components shall be pretreated with solutions to remove organic and inorganic surface soils, remove residual oxides, followed by a chrome phosphate conversion coating to which organic coatings will firmly adhere.

C. Coating Type: High Performance Coating, two-coat, shop applied, 70% Polyvinylidene Fluoride (PVDF) coating based on Elf Arkema Chemicals, Inc. Kynar 500 or Ausimont U.S.A., Inc. Hylar 5000 resin, meeting AAMA 2605 specification.

D. Color: Select from manufacturer's full range of 56 EZ Mix Colors.

PART 3 – EXECUTION

3.01 EXAMINATION

A. The installer must examine substrates and conditions under which commercial gutter system will be installed. All wood plates and/or fascia boards shall be installed true, straight, and free of splits, cracks, or other irregularities. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Prior to the installation of the commercial gutter system, soffits, extenders, and associated cornice profiles shall be installed.

B. Installer shall thoroughly read and follow manufacturer's installation instructions before proceeding with installation.

3.03 INSTALLATION

A. General: The commercial gutter system shall be installed in strict accordance with manufacturer's printed instructions. Deviations from the instructions are not allowed.

B. Support Brackets: Layout support brackets to provide 1/2" slope in 40 linear feet. Install support brackets with #10 x 2" stainless steel wood screws.

C. Gutter: Install gutter onto support brackets and fasten to substrates with 1-1/2" aluminum or stainless steel nails. Rivet and seal liner joints with high grade exterior sealant as recommended by gutter manufacturer.

D. Expansion Joints: Install elastomeric expansion joints as shown on plans and/or shop drawings. Maximum expansion joint spacing shall be 40' centers.

E. Install interior straps by fully engaging them into gutter's hemmed edge, complete by securely riveting.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 07 72 00

ROOF ACCESSORIES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Provide systems where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Section includes:

1. Roof hatches.
2. Roof Hatch railing safety system.

1.03 STANDARDS AND REFERENCES

Regulatory Requirements:

A. OSHA 29 CFR 1910.23 Walking-Working Surfaces, Ladders.

B. OSHA 29 CFR 1910.25 Walking-Working Surfaces, Stairways.

C. OSHA 29 CFR 1910.28 Walking-Working Surfaces, Duty to have Fall Protection.

D. OSHA 29 CFR 1910.29 Walking-Working Surfaces, Fall Protection Systems.

E. IBC 2015 Section 1015.7 Roof Access.

F. IBC 2015 Section 1011.12 Means of Egress, Stairway to Roof.

G. IBC 2015 Section 1011.13 Means of Egress, Guards.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen 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. Provide units produced by a single manufacturer.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Manufacturer's specifications and technical data including the following.

1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 66 00 Product Storage and Handling Requirements.

B. Deliver units in manufacturer's original packaging, properly labeled for identification.

C. Store and handle roof hatches using means and methods that will prevent damage, deterioration or loss.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Verify drawing dimensions with actual field conditions.

C. Inspect related work and adjacent surfaces.

D. Determine specific locations for personnel access to roof for location of roof hatches.

E. Determine type of stair or ladder needed for roof access - needed to determine size of hatch.

F. For location of automatic smoke vents, refer to building codes for venting requirements.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 WARRANTY

A. Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

B. Provide manufacturer's standard 5-year warranty. Systems shall be free from manufacturing defects in materials and fabrication for a period of 5 years from the date of shipment. Should a product fail to function in normal use within this period, manufacturer shall furnish a replacement or new part at manufacturer's discretion.

PART 2 – PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Basis of Design: Nystrom Building Products: Tel. (800) 547-2635. Website: www.nystrom.com

B. Basis of Design: JL Industries (Activar Inc. Construction Products Group). Tel: (800) 554-6077. Website: www.activarp.cpg.com/jl-industries

C. Or approved equal.

2.02 ALUMINUM ROOF HATCHES

A. Cover and liner: 11-gauge (.090-inch) aluminum cover with 1-inch insulation and 18-gauge (.040-inch) aluminum cover liner.

B. Curb: 11 gauge (.090-inch) aluminum curb with 1-inch rigid fiberboard insulation. Curb to be configured to match roof pitch.

C. Hinges: Tamperproof hinge contained within hatch as part of spring assembly.

D. Latch: Zinc plated steel slam latch with turn handle and inside/outside padlock hasps.

E. Finish: Mill finish

F. Springs: Greased heavy-duty compression springs in telescoping tubes.

G. Hardware: Zinc plated steel hold open arm(s) with rubber handle that automatically locks the door when opened. Furnish hatches with interior padlock hasp and neoprene draft seal.

H. Mounting flange: 3-1/2 inch.

2.03 SAFETY RAILING SYSTEM

A. Top rail, mid rail, and chain or swinging gate, with the hatch curb acting as the toe plate.

B. Test load: 200-pounds.

C. Height: Minimum 42 inches above finished roof deck.

D. Pipe: Galvanized, 1-1/4 inch ID, A53 Grade B seamed pipe or galvanized, 1-5/8 inch OD A500 seamed tube.

E. Flat bar: 2 x 3/8 inch thickness A36 mild steel.

F. Chain system: 3/16-inch proof coil ASTM specification, zinc plated with quick link on fixed end.

G. Pipe ends and tops: Covered or plugged with weather and light resistant material.

H. Bolts and washers: 3/8 x 2-1/2 inch grade Z, zinc plated.

I. Sealant: As recommended by manufacturer.

J. Factory finish: Hot dipped galvanized.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Check openings for correct size and irregularities.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 INSTALLATION

A. Coordinate installation of components of this Section with the installation of roof deck, roof structure, roofing membrane and base flashing.

B. Install roof accessory items and components per manufacturer’s instruction.

C. Securely anchor roof accessories in compliance with manufacturer's instructions.

D. Set units plumb, level, and true to line without warp or rack.

E. Apply bituminous paint on metal surfaces of units in contact with cementitious materials and dissimilar metals on roof units.

F. Set railing brackets in sealant.

G. Put operating components through at least five complete operating cycles, adjusting as required and achieving optimum ease of operation.

3.03 FIELD QUALITY CONTROL

A. Adjust and retest as required until units operate satisfactorily.

B. Close hatches, replace links, and leave units in an operable condition.

C. Clean exposed surfaces per manufacturer’s instructions. Touch up coatings as required.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Section Includes:

1. Through Penetration Firestopping.
2. Fire Resistive Joint Systems.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI/UL 263 - Fire Tests of Building Construction and Materials.
2. ANSI/UL 723 - Surface Burning Characteristics of Building Materials.
3. ANSI/UL 1479 - Standard for Fire Tests of Through-Penetration Firestops.
4. ANSI/UL 2079 - Tests for Fire Resistance of Building Joint Systems.

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

1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Firestops.
4. ASTM E 1399 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
5. ASTM E 1966 - Standard Test Method for Fire Resistive Joint Systems.
6. ASTM E 2174 - Standard Practice for On-Site Inspection of Installed Firestops.
7. ASTM E 2307 - Fire Tests of Perimeter Fire Barrier Systems Using Intermediate Scale, Multi-Story Test Apparatus.
8. ASTM E 2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

C. Factory Mutual (FM) - FM4991 - Standard for Approval of Firestop Contractors.

D. International Code Congress (ICC):

1. International Building Code (IBC).
2. International Residential Code (IRC).
3. International Mechanical Code (IMC)
4. International Fire Code (IFC)
5. International Code Congress Evaluation Service (ICC ES)

E. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code.

2. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
3. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
4. NFPA 101 - Life Safety Code.
5. NFPA 5000 - Building Construction and Safety Code.

F. Underwriters Laboratories (UL) - UL Building Materials Directory:
1. Through-Penetration Firestops Systems (XHEZ).
2. Joint Systems (XHBN).
3. Firestop Devices (XHJI).
4. Forming Materials (XHKU).
5. Wall Opening Protective Materials (CLIV).
6. Fill, Void or Cavity Materials (XHHW).

G. American Society of Sanitary Engineering (ASSE):
1. ASSE Series 9000 – Professional Qualification Standard for Firestop Systems and Device Installers, Inspectors and Surveyors.

H. International Association of Plumbing and Mechanical Officials (IAPMO):
1. Uniform Plumbing Code (UPC).
2. Uniform Mechanical Code (UMC).

I. International Standards Organization (ISO):
1. ISO 6944
2. ISO 10295-1: 2007.
3. ISO 10295-2: 2009.
4. ISO 10295-3:

1.04 PERFORMANCE REQUIREMENTS

A. Provide systems that are listed by at least one the following:
1. Underwriters Laboratories Inc. (UL), in "Fire Resistance Directory".
2. Intertek Testing Service (Formerly known as Omega Point Laboratories), in "Directory of Listed Products".
3. Factory Mutual (FM), in FMRC Approval Guide.
4. Any other qualified independent testing and inspection agency that conducts periodic follow-up inspections and is acceptable to authorities having jurisdiction.

B. Provide firestop products that are flexible enough to allow for pipe vibration in a through penetration application.

C. Provide fire resistive sealants and sprays for construction joint applications that are flexible enough to satisfy the movement criteria per the test standards ASTM E 1399, ASTM E 1966 or ANSI/UL 2079.

D. Provide products with the appropriate flame spread index and smoke develop index, when tested in accordance with ASTM E 84.

E. Provide products that meet the intent of the L rating classification for the movement of smoke per ANSI/UL 1479 for through penetrations and ANSI/UL 2079 for construction joints.

F. Provide products identical to those tested and listed for classification by UL, Intertek or any other qualified independent testing agency.

G. Provide products that bear classification marking of qualified independent testing agency.

H. Where firestop systems not listed by any listing agency are required due to project conditions, submit a substitution proposal with evidence specified.

I. Use only products specifically listed for use in listed systems.

J. Provide products that are compatible with each other, with the substrates forming openings, and with the items, if any, penetrating the firestopping, under the conditions represented by this project, based on testing and field performance demonstrated by manufacturer.

K. Firestopping materials must meet and be acceptable for use by all building codes and NFPA codes cited in this section.

L. Provide products that meet the intent of the state or local guidelines on volatile organic compounds (VOC).

M. Where applicable provide products that meet the intent of the F rating classification for passage of flame per ANSI/UL 1479 for through penetrations.

N. Where applicable provide products that meet the intent of the T rating classification for the transfer of temperature per ANSI/UL 1479 for through penetrations.

O. Provide products that meet the intent of the L rating classification for the movement of smoke per ANSI/UL 1479 for through penetrations and ANSI/UL 2079 for construction joints.

P. Where applicable provide products that meet the intent of the W rating classification for passage of water per ANSI/UL 1479 for through penetrations.

1.05 SUBMITTALS

A. Submit under provisions of the Contract and Division 01 – General Requirements.

B. Shop Drawings: For each firestopping system, provide the following:

1. Listing agency's detailed drawing showing opening, penetrating item(s), and firestopping materials, identified with listing agency's name and number or designation and fire rating achieved.

2. For proposed systems that do not conform strictly to the listing, submit written instructions showing modifications and approved by firestop system manufacturer.

3. Submit under provisions of the International Building Code (IBC) section 107 and 703 requiring a submittal package for fire-resistance ratings and fire tests.

C. Product Certificates: Submit certificates of conformance signed by firestop system manufacturer certifying that materials furnished comply with requirements.

D. Product Data: Furnish manufacturer's product data sheets on each material to be used in firestop systems. Information on manufacturer's product data sheet should include:

1. Product characteristics including compliance with appropriate ASTM/UL/ANSI test standards.

2. Storage and handling requirements and recommendations.

E. Installation Instruction: Furnish manufacturer's installation instructions.

F. Sustainable or LEED Submittals:

1. VOC Content: For sealants and sealant primers, furnish documentation of VOC content.

1.06 QUALITY ASSURANCE

A. General: All through-penetration firestop systems and construction gap fire resistive systems shall be installed with approved methods using materials that have been tested and classified to produce an approved assembly.

B. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of twenty-five (25) years' experience.

1. Products shall be manufactured in a facility that follows ISO 9001 best practices.

C. Installer Qualifications: Firm must be qualified by having experience, staff, and be properly trained to install the specified products, and meets the following criteria:

1. Contractor is a 3M Master Contractor.
2. Contractor is a Certified 3M Trained contractor.
3. Contractor is acceptable to manufacturer.
4. Contractor is acceptable to Authority Having Jurisdiction (AHJ).
5. Contractor has completed the manufacturer's certified product installation training.
6. Contractor must provide a list of completed projects as evidence of experience; include project name and address, owner's name and address, and architect's name and phone number.
7. Certificate: Contractor should provide certificate of qualification.

D. Codes: Where manufacturer's application procedures are in conflict with those of the local Authority Having Jurisdiction, the more strict guidelines will prevail.

E. Pre-installation Meetings: Meetings to agree on firestop requirements, conditions, manufacturer's instructions.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products until ready for installation in manufacturer's original unopened packaging, legibly marked with manufacturer's name and product identification, date of manufacture, lot number, listing agency's classification marking, curing/dry time, mixing instructions (if applicable) and MSDS reference number.

B. Store and handle in such a manner as to prevent deterioration or damage due to moisture, temperature changes, contaminants, and other causes; follow manufacturer's instructions.

C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local Authority Having Jurisdiction.

1.08 PROJECT CONDITIONS

A. Coordinate construction and cutting of openings so that each particular firestop system may be installed in accordance with its listing, including assembly rating, L rating, sizing, sleeves, manufacturer’s published STC rating and penetrating items.

B. Coordinate firestopping of dynamic and static construction joints (top-of-wall, bottom-of-wall, floor-to-floor, floor-to-wall), wall-to-wall, perimeter so that each particular system may be installed in accordance with its listing, including assembly rating, sizing, movement capabilities and manufacturer’s published STC rating.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install firestopping under environmental conditions outside manufacturer's absolute limits.

D. Provide ventilation as required by firestopping manufacturer, including mechanical ventilation if required.

1.09 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

1.01 MANUFACTURERS

A. Basis of Design Manufacturer: 3M Fire Protection Products, which is located at: 3M Center Bldg. 223-2N-21; St. Paul, MN 55144-1000; Toll Free Tel: 800-328-1687; Web: www.3m.com/firestop

1. Acceptable alternates:

a. Hilti Inc. Plano, TX., 1-800-879-8000, www.us.hilti.com

b. Owens Corning Thermafiber, 1-800-294-7076, www.thermafiber.com.

B. Single Source: To maintain control and integrity of the firestop applications a single manufacturer should be used. Specific UL or approved listing agencies systems applicable to each type of firestop condition should be supplied by one manufacturer.

1.02 SCOPE/APPLICATION

A. Provide installed firestop products that limit the spread of fire, heat, smoke, and gasses through otherwise unprotected openings in rated assemblies, including walls, partitions, floors, roof/ceilings, and similar locations, restoring the integrity of the fire rated construction to its original fire rating.

B. Provide firestop systems listed for the specific combination of fire-rated construction, type of penetrating item, annular space requirements, and fire rating, and the following criteria:

1. F-Rating: Equal to or greater than the fire-resistance rating of the assembly in which the firestopping will be installed.

2. T-Rating: In habitable areas where penetrating items are exposed to potential contact with materials on fire side(s) of rated assembly, T-rating must equal its F-rating.

3. L-Rating: L-rating of 1 cfm per linear foot (5.5 cu m/h/m) maximum at ambient temperatures.

4. W-Rating: meets UL Water Leakage Test, W Rating – Class 1 requirements for systems tested and listed in accordance with ANSI/UL 1479.

5. Wall Penetrations: Through penetration systems must be symmetrical, with the same rating from both sides of the wall. Membrane penetrations may be asymmetrical.

6. Testing: Determine ratings in accordance with ASTM E 814 or UL 1479.

C. Provide fire-resistive systems listed for construction gaps per the specific combination of fire-rated construction type, configuration, gap dimensions, and fire rating, and the following criteria:

1. Fire resistance rating must be equal to or greater than that of the assembly in which it is to be installed.

2. Movement capability must be appropriate to the potential movement of the gap, demonstrated by testing in accordance with ASTM E 1399/ASTM E 1966/UL 2079 for minimum of 500 cycles at 10 cycles per minute.

3. L-Rating: L-rating of 1 cfm per linear foot (5.5 cu m/h/m) maximum.

4. Determine ratings in accordance with ASTM E 1966/UL 2079.

1.03 THROUGH PENETRATION FIRESTOP PRODUCTS

A. 3M Fire Barrier Cast-in-Place Devices: Firestopping device for use prior to a concrete pour. Adjustable height with pull tabs, straight edge design for close placement to walls and adjacent devices.

1. Fire Resistance: For use in 1-, 2-, or 3-hour fire-rated systems.

2. Locations: Horizontal assemblies only.

B. 3M Fire Barrier Ultra RC Pack: One piece metal collar assembly encasing intumescent material for firestopping of pipes and cables through rated walls and floors.

1. Fire Resistance: For use in 1- or 2-hour fire-rated systems.

2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

C. 3M Fire Barrier Ultra Plastic Pipe Device: Intumescent device for firestopping of plastic pipe and cables through rated walls and floors.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Configuration: One-piece metal collar, with locking latch and bendable tabs to secure; equipped also for conventional anchoring.
3. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

D. 3M Fire Barrier RC-1 Restricting Collar with either FS 195+ Wrap Strip or 3M Interam Ultra GS Wrap Strip. (See product descriptions below): For firestopping of plastic pipes from 4 inches (102 mm) to 10 inches (254mm) in diameter.

1. Fire Resistance: For use in 1or 2-hour fire-rated systems.
2. Material: 28-gauge steel.
3. Size: 25-foot (7.6 m) roll.
4. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

E. 3M Fire Barrier CP25WB+ Sealant: High-performance, intumescent, water-based sealant. No-sag, fast drying, paintable, red in color. Versatile firestop sealant for pipes (not for use with CPVC), cables, cable tray, blank opening and other penetrations along with mineral wool or other fire-rated assembly products.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
3. STC rating of 54 when tested in STC 54-rated wall assembly.

F. 3M Fire Barrier IC 15WB+ Sealant: General-purpose, intumescent, water-based sealant. No-sag, fast drying, paintable, yellow in color. Economical firestop sealant for pipes, cables, cable tray, blank opening and other penetrations along with mineral wool or other fire-rated assembly products.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
3. STC rating of 54 when tested in STC 54-rated wall assembly.

G. 3M Fire Barrier Sealant FD 150+: Single-part, water-based, acrylic latex sealant. No-sag, low-shrinkage, low VOC. Blue, red or limestone color. Used to firestop for pipe penetrations (not for use with CPVC).

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
3. STC rating of 54 when tested in STC 54-rated wall assembly.

H. 3M Fire Barrier Water Tight Sealant 3000 WT: Single-part, water-tight, intumescent silicone firestop sealant for filling voids in concrete gypsum, metal, plastic, wood and insulation. Light gray color with black flecks. Meets UL Water Leakage Test, W Rating – Class 1 requirements.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
3. STC rating of 53 when tested in STC 54-rated wall assembly.

I. 3M Fire Barrier Water Tight 1000 NS Sealant: Single-part, non-slump firestopping silicone sealant for floor and wall openings. Light gray color. Meets UL Water Leakage Test, W Rating – Class 1 requirements.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

3. STC rating of 56 when tested in STC 56-rated wall assembly.

J. 3M Fire Barrier Water Tight Sealant 1003 SL: Single-part, self-leveling firestopping silicone sealant for floor openings. Light gray color. Meets UL Water Leakage Test, W Rating – Class 1 requirements.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: For horizontal assemblies only.
3. STC rating of 56 when tested in STC 56-rated wall assembly.

K. 3M Fire Barrier Sealant 2000 NS: Single-part, non-slump elastomeric silicone firestop sealant. Sag-resistant, low VOC. Light grey color. Used in mechanical, electrical and plumbing applications to firestop openings and penetrations through fire-rated floor or wall assemblies. Typical penetrants include: metallic pipe, non-metallic pipe (FGG/BM system CPVC compatible), conduit, power and communication cable and telephone or electrical wiring.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire-rated systems.
2. Locations: Vertical and horizontal assemblies.
3. STC-Rating of 56 when tested in STC 56-rated wall assembly.

L. 3M Fire Barrier Sealant 2000+: Single-part, elastomeric silicone firestop sealant. Sag-resistant, low VOC. Light grey color. Used in mechanical, electrical and plumbing applications to firestop openings and penetrations through fire-rated floor or wall assemblies. Typical penetrants include: metallic pipe, non-metallic pipe (FGG/BM system CPVC compatible), conduit, power and communication cable and telephone or electrical wiring.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire-rated systems.
2. Locations: Vertical and horizontal assemblies.
3. STC-Rating of 56 when tested in STC 56-rated wall assembly.

M. 3M Fire Barrier Moldable Putty+: One-part, 100 percent solids intumescent firestop. Remains pliable, flexible and easily re-enterable. Non-toxic synthetic formula. Versatile putty for pipes, cables, cable tray, blank opening and other penetrations along with mineral wool or other fire-rated assembly products.

1. Type: Stick or Pad
2. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
3. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

N. 3M Fire Barrier 2001 Silicone RTV Foam: Two-part, liquid-silicone elastomer, foams in place when mixed. For use sealing large or complex openings such as cable bundles, cable trays and conduit banks.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

O. 3M Fire Barrier Mortar: For sealing openings in concrete and masonry walls and floors. Self-Leveling, non-sag, low VOC.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

P. 3M Fire Barrier Self-Locking Pillow: Self-contained, intumescent firestop pillow with interlocking strips. Meets fire rating without the use of wire mesh. For use in firestopping larger openings

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

Q. 3M Fire Barrier Pillow: Self-contained, intumescent firestop product. Meets fire rating without the use of wire mesh. For use in firestopping larger openings

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

R. 3M Fire Barrier CS-195+ Composite Sheet: Organic/inorganic intumescent elastomeric sheet, bonded on one side to a layer of 28-gauge galvanized steel. Other side reinforced with steel-wire mesh and covered with aluminum foil. Re-enterable. For use in firestopping larger openings

1. Thickness: Nominal 0.3 inch (7.6 mm).
2. Thermal Expansion: 8 - 10 times original size.
3. Tensile Strength (ASTM D412): 93.6 psi (645 kPa)/489 percent.
4. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire-rated systems.
5. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

S. 3M Interam Ultra GS Wrap Strip: Graphite based, flexible, largely inorganic, intumescent mat. For use around non-metallic piping with or with RC-1 collar.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

T. 3M Fire Barrier FS-195+ Wrap/Strip: One-part, organic/inorganic intumescent strip with foil on one side. May be cut to fit irregular shapes. For use around non-metallic piping with or with RC-1 collar.

1. Length: 24 inch (610 mm).
2. Width: 1 or 2 inches.
3. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire-rated systems.
4. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

U. 3M Fire Barrier Pass-Through Devices: One-Piece device for firestopping of cable penetrations through rated walls and floors.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

V. 3M Fire Barrier Tuck-In: Graphite-based, flexible, intumescent wrap strip for use around non-metallic piping. Adhesive closure tab.

1. Fire Resistance: For use in 1-, 2- or 3-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

W. 3M Fire Barrier Putty Sleeve Kit: Device used for firestopping of cable penetrations through fire rated walls and floors.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire-rated systems.
2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

1.04 FIRE RESISTIVE JOINT PRODUCTS

A. 3M Fire Barrier Sealant FD 150+: Single-part, water-based sealant. Sag-resistant, low-shrinkage, low VOC.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire-rated systems.
2. Location: For use at top-of-wall, bottom-of-wall, wall-to-wall and floor-to-floor.
3. Compression/Extension Recovery: +/- 19 percent of original joint width.
4. Meets optional L rating requirements.
5. STC rating of 56 when tested in STC 56-rated wall assembly.

B. 3M Fire Barrier Water Tight Sealant 1000 NS: Single-part, non-slump elastomeric silicone sealant. Sag-resistant, low VOC.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire rated systems.
2. Meets UL Water Leakage Test, W Rating – Class 1 requirements.
3. Location: For use at top-of-wall, bottom-of-wall, wall-to-wall, floor-to-floor, floor-to-wall and perimeter joints.
4. Compression/Extension Recovery: +/- 15 percent of original joint width.
5. STC-Rating of 56 when tested in STC-56-rated wall assembly.

C. 3M Fire Barrier Water Tight Sealant 1003 SL: Single-part, self-leveling elastomeric silicone sealant. Sag-resistant, low VOC.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire rated systems.
2. Meets UL Water Leakage Test, W Rating – Class 1 requirements.
3. Location: For use at top-of-wall, bottom-of-wall, floor-to-wall and floor-to-floor joints.
4. Compression/Extension Recovery: +/- 15 percent of original joint width.
5. STC-Rating of 56 when tested in STC-56-rated wall assembly.

D. 3M Fire Barrier Sealant 2000 NS: Single-part, non-slump elastomeric silicone sealant. Sag-resistant, low VOC.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire rated systems.
2. Service Flexibility: Accommodate vibration from normal building movement.
3. Location: For use at top-of-wall, bottom-of-wall, wall-to-wall, floor-to-wall, floor-to-floor and perimeter joints.
4. Compression/Extension Recovery: +/- 31 percent of original joint width.
5. STC-Rating of 56 when tested in STC 56-rated wall assembly.

E. 3M Fire Barrier Sealant 2000+: Silicone Sealant: Single-part, elastomeric silicone sealant. Sag-resistant, low VOC.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire rated systems.
2. Compression/Extension Recovery: +/- 13 percent of original joint width.
3. Location: For use at top-of-wall, bottom-of-wall, wall-to-wall, floor-to-wall and floor-to-floor joints.

F. 3M FireDam Spray 200: Water-based, paintable, low VOC, freeze/thaw resistant spray applied fire resistive product. Applied with conventional airless spray equipment.

1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire rated systems.
2. Compression/Extension Recovery: +/- 50 percent of joint width.
3. Location: For use at head-of-wall, wall-to-wall, floor-to-floor, bottom-of-wall, floor-to-wall and perimeter joints.
4. STC-Rating of 56 when tested in STC 56-rated wall assembly.

1.05 FIRESTOPPING FOR SINGLE MEMBRANE PENETRATIONS

A. 3M Fire Barrier Moldable Putty+: One-part, 100 percent solids intumescent firestop. Remains pliable, flexible and easily re-enterable. Non-toxic synthetic formula.

1. Type: Pad.
2. Fire Resistance: For use in 1-, 2- or 3-hour fire rated systems.

B. 3M Endothermic Mat E-5A-4: Endothermic heat absorbing mat.

1. Type: Mat.
2. Fire Resistance: For use in 1- or 2-hour fire rated systems.

PART 3 EXECUTION

1.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Conduct tests according to manufacturer's written recommendations to verify that substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt and other foreign substances capable of impairing bond of firestopping.

C. Verify that items penetrating fire rated assemblies are securely attached, including sleeves, supports, hangers, and clips.

D. Verify that openings and adjacent areas are not obstructed by construction that would interfere with installation of firestopping, including ducts, piping, equipment, and other suspended construction.

E. Verify that environmental conditions are safe and suitable for installation of firestopping.

F. If substrate preparation is the responsibility of another installer, notify Architect or Engineer of Record of unsatisfactory preparation before proceeding.

1.02 PREPARATION

A. Prepare substrates in accordance with manufacturer's instructions and recommendations.

B. Install masking and temporary coverings as required to prevent contamination or defacement of adjacent surfaces due to firestopping installation.

1.03 INSTALLATION

A. Install in strict accordance with manufacturer's detailed installation instructions and procedures.

B. Install so that openings are completely filled and material is securely adhered.

C. Where firestopping surface will be exposed to view, finish to a smooth, uniform surface flush with adjacent surfaces.

D. After installation is complete, remove combustible forming materials and accessories that are not part of the listed system.

E. Repair or replace defective installations in accordance with manufacturer’s recommendations, listed systems details and applicable code requirements.

F. At each through penetration or fire-resistive joint system, attach identification labels on both sides in location where label will be visible to anyone seeking to remove penetrating items or firestopping.

G. Clean firestop materials off surfaces adjacent to openings as work progresses, using methods and cleaning materials approved in writing by firestop system manufacturer and which will not damage the surfaces being cleaned.

H. Notify Authority Having Jurisdiction when firestopping installation is ready for inspection; obtain advance approval of anticipated inspection dates and phasing, if any, required to allow subsequent construction to proceed.

I. Do not cover firestopping with other construction until approval of authority having jurisdiction has been received.

1.04 FIELD QUALITY CONTROL

A. Owner will engage an independent testing agency to inspect installed firestopping and to prepare reports indicating whether the installed work complies with the contract documents.

B. Notify testing agency at least 7 days prior to date when firestopping installation will be ready for inspection; obtain advance approval of general schedule and phasing, if any, required to allow subsequent construction to proceed.

1.05 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect fire protection product(s) before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. Install identification Labels for Through Penetration and Construction Joint Systems: Pressure sensitive self-adhesive vinyl labels, preprinted with the following information:

1. The applicable words "Warning - Through Penetration Firestop System - Do not Disturb. Notify Building Management of Any Damage." or "Warning – Construction Gap Fire Resistive System - Do not Disturb. Notify Building Management of Any Damage."
2. Listing agency's system number or designation.
3. System manufacturer's name, address, and phone number.
4. Installer's name, address, and phone number.
5. General contractor's name, address, and phone number (if applicable).
6. Date of installation.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 07 90 00

JOINT PROTECTION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK

Work included: Throughout the work, seal and caulk joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of moisture and passage of air.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

A. Conform to Sealant and Waterproofers Institute requirements for materials and installation.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

C. Use adequate numbers of skilled workmen 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.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Submit product data:

1. For each sealant product indicated provide manufacturer’s technical data, tested physical and performance properties, dimensioned drawings, and other data needed to prove compliance with the specified requirements.

2. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

C. Samples:

1. Samples for Initial Selection: Three color charts showing manufacturer’s standard range of colors available for each product exposed to view.

2. Samples for Verification: Three strips of cured sealants 1/2 inch by 6 inch (13mm diameter by 150 mm.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 66 00 Product Storage and Handling Requirements.

B. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Safety Data Sheets for each products.

C. Store products in a location from freezing, damage, construction activity, precipitation, and direct sunlight per manufacturer’s recommendations.

D. Condition products to approximately 60 degrees F (16 degrees C) to 70 degrees F (21

degrees C) for use per manufacturer's recommendations.

E. Handle products with appropriate precautions and care as stated on Safety Data Sheet.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities

B. Do not use products under conditions of precipitation, or in inclement or freezing weather. Verify that substrates are clean, dry and frost-free. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions per manufacturer's recommendations if application during inclement weather occurs.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with 01 77 00 Project Closeout.

1.10 WARRANTY

A. Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

B. Warranties listed in this Section shall be in addition to, and not a limitation of other rights the owner may have under the contract documents.

C. The guarantee specified herein shall include warranties against leakage, hardening, cracking, crumbling, melting, running, shrinking or staining adjacent surfaces.

D. Contractor Guarantee: Contractor guarantees the work covered by this specification against all defects in material and workmanship for a period of not less than five (5) years from the date of Substantial Completion.

PART 2 – PRODUCTS

2.01 SEALANTS

A. Except as specifically otherwise accepted by the Architect, use only the types of sealants described as follows:

1. One component polyurethane sealant, moisture curing, low modulus, FS TT-S-0023OC, Type II, Class A, ASTM-C-920, Class 50, for vertical and horizontal joints in connection with all building materials. Do not use in traffic areas. Minimum ¼" joint; maximum 1-1/4" x 3/8"d.

    a. Dymonic 100 by Tremco

    b. MasterSeal NP1 by BASF Master Builders

    c. DynaTrol I-XL Hybrid by Pecora Corporation

2. One-part silicone sealant, moisture curing, low modulus, FS TT-S-0023OC, Type II, Class A, FS TT-S-001543A, Class A, for vertical and horizontal joints in connection with aluminum, glass and concrete materials which require greater movement capabilities. Do not use in traffic areas. Minimum joint ¼" x 3/16"d; maximum1" x ½"d.

    a. Spectrem 1 by Tremco

    b. Dowsil 790 by Dow

    c. 890NST Silicone by Pecora Corporation

3. One-part silicone sealant, medium modulus, neutral cure, FS S-0023OC, Type II, Class A, FS TT-S-001543A, Type II, Class A, ASTM C920, Class 50, for vertical and horizontal joints in connection with non-porous surfaces such as aluminum, glass, tile, laminated plastic and concrete. Do not use in traffic areas.

a. Spectrem 2 by Tremco

b. Dowsil 795 by Dow

c. 895NST Silicone by Pecora Corporation

4. Multi-Component polyurethane sealant, FS TT-S-00227E, Type I, Class A, ASTM C920 for horizontal joints in traffic areas. Minimum 3/8" wide, depth to be 3/8" to ½" - use primer.

    a. DynaTrol II-SG or Dynatred by Pecora Corporation

5. One-part translucent silicone sealant, medium modulus, neutral curing, FS TT-S-0023OC, Type II, Class A, FS TT-S-001543A, Type II, Class A, for vertical joints in connection with butt glazing.

    a. Spectrem 2 by Tremco

    b. 895 NST by Pecora

    c. SCS2800 Silglaze II by Momentive

6. One-part mildew resistant silicone sealant meeting requirements of FDA Regulation 21 CFR 177.2600, for vertical and horizontal joints in connection with non-porous applications as sealing around bathroom fixtures, shower-tub enclosures, sinks and urinals.

    a. Tremsil 200 by Tremco

    b. Dowsil 786 by Dow

    c. SCS1700 Sanitary by Momentive

    d. 898NST Silicone or 860 Silicone by Pecora Corporation

7. One-part siliconized acrylic latex polymer caulk, ASTM C834, for interior horizontal and vertical joints in connection with window and door buck perimeters, interior wall surfaces, etc.

    a. Tremflex 834 by Tremco

    b. TremGlaze SA1100 by Tremco

    c. AC-20 + Silicone by Pecora

8. Security Sealants

    a. One part, non-sag, tamper resistant security sealant, FS TT-S-00230C, Type II, Class B, ASTM C920 for doors and windows.

        i. DynaFlex SC by Pecora

        ii. MasterSeal CR 195 by BASF Master Builders.

    b. Multi-component, rigid, high-solids, high modulus epoxy resin security sealant, ASTM C881, Type I and III, Grade 3, Classes B & C.

        i. DynaPoxy EP-1200 by Pecora

        ii. Sikadur -31 BY Sika USA

9. Roof Penetrations: Use asphalt mastic conforming to ASTM D491.

10. For other services, provide products especially formulated for the proposed use and accepted in advance by the Architect.

B. Colors:

1. The Architect will select Colors for each sealant installation to match adjacent finishes

from a standard color list normally available from the specified manufacturers.

2. Should a matching standard color not be available from the accepted manufacturer except at additional charge, the Contractor shall provide such colors at no additional cost to the Owner.

3. In concealed installations, and in partially or fully exposed installations where so accepted by the Architect, use standard gray or black sealant.

2.02 PRIMERS

Use only those primers that are: non-staining, have been tested for durability on the surfaces to be sealed, and are specifically recommended for this installation by the manufacturer of the sealant used.

2.03 BACKUP MATERIALS

A. Use only those backup materials that are specifically recommended for this installation by the manufacturer of the sealant used, which are non-absorbent, and which are non-staining.

B. Acceptable types include:

1. Closed-cell resilient urethane or polyvinyl chloride foam;

2. Closed-cell polyethylene foam;

3. Closed-cell sponge of vinyl or rubber;

4. Polychloroprene tubes or beads;

5. Polyisobutylene extrusions;

6. Oil-less dry jute.

C. Preformed support strips for ceramic tile control joint and expansion joint work: Use polyisobutylene or polychloroprene rubber.

2.04 BOND-PREVENTATIVE MATERIALS

Use only one of the following as best suited for the application, and as recommended by the manufacturer of the sealant used:

1. Polyethylene tape, pressure-sensitive adhesive, with the adhesive required only to hold tape to the construction materials as indicated;

2. Aluminum foil complying with MIL-A-148E;

3. Wax paper complying with Fed. Spec. UU-P-270.

2.05 JOINT PACKING

Shall be installed in all joints to receive sealant. Material shall be a resilient type such as closed cell PVC foam or as recommended by the manufacturer. Oakum or other types of absorptive materials shall not be used as packing material.

2.06 OTHER MATERIALS

A. For masking around joints, provide masking tape complying with Fed. Spec. UU-T-106c.

B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the acceptance of the Architect.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that specified items may be installed in accordance with the approved design.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Concrete and ceramic tile surfaces:

1. Install only on surfaces that are dry, sound, and well brushed, wiping free from dust.
2. At open joints, remove dust by mechanically blown compressed air if so required.
3. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
4. Where surfaces have been treated, remove the surface treatment by sandblasting or wire brushing.
5. Remove laitance and mortar from joint cavities.
6. Where backstop is required, insert the approved backup material into the joint cavity to the depth needed.

B. Steel surfaces:

1. Steel surfaces in contact with sealant:
    a. Sandblast as required to achieve acceptable surface for bonding.
    b. If sandblasting is not practical, or would damage adjacent finish, scrape the metal or wire brush to remove mill scale.
    c. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
2. Remove protective coatings on steel by sandblasting or by using a solvent that leaves no residue.

C. Aluminum surfaces:

1. Remove temporary protective coatings, dirt, oil, and grease.
2. When masking tape is used for protective cover, remove the tape just prior to applying the sealant.
3. Use only such solvents to remove protective coatings as are recommended for that purpose by the manufacturer of the aluminum work, and which are non-staining.

3.03 INSTALLATION OF BACKUP MATERIAL

A. Use only the backup material recommended by the manufacturer of the sealant used, and accepted by the Architect for the particular installation, compressing the backup material 25% to 50% to achieve a positive and secure fit.

B. When using backup of tub or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod backup stock.

C. Interior and exterior joints where no backing has been provided or which is in excess of 3/4" deep shall be packed by this subcontractor with fiberglass or a suitable joint filler to reduce the depth to 1/2" maximum. Maximum movement: the width of the joint shall be at least four times its maximum movement.

3.04 PRIMING

A. Use only the primer recommended by the manufacturer of the sealant, and accepted by the Architect for the particular installation, applying in strict accordance with the manufacturer's recommendations as accepted by the Architect.

B. The priming of joints shall be by brush to reach all surfaces to which compound will be applied. Primer shall be provided on masonry, concrete and wood surfaces as recommended by sealant manufacturer. Primer shall not be applied to surfaces that will be exposed after caulking is completed.

3.05 BOND-BREAKER INSTALLATION

Provide an approved bond-breaker where recommended by the manufacturer of the sealant, and where directed by the Architect, adhering strictly to the installation recommendations as accepted by the Architect.

3.06 INSTALLATION OF SEALANTS

A. Prior to start of installation in each joint, verify the joint type according to details on the Drawings, or as otherwise directed by the Architect, and verify that the required proportion of width of joint to depth of joint has been secured.

B. Equipment:

1. Apply sealant under pressure with power-actuated or hand gun, or by other appropriate means.

2. Use guns with nozzle of proper size, and providing sufficient pressure to completely fill the joints as designed.

C. Thoroughly and complete mask joints where the appearance of sealant on adjacent surfaces would be objectionable.

D. Install the sealant in strict accordance with the manufacturer's recommendations as accepted by the Architect, thoroughly filling joints to the recommended depth.

E. Tool joints to the profile shown on the Drawings, or as otherwise required if such profiles are not shown on the Drawings.

F. Cleaning up:

1. Remove masking tape immediately after joints have been tooled.

2. Clean adjacent surfaces free from sealant as the installation progresses, using solvent or cleaning agent recommended by the manufacturer of the sealant used.

3. The excess material shall be cleaned from the surfaces adjacent to the joint, following the caulking operation and the top of the compound deposit shall be left with a smooth even finish. No material is permitted on the exposed face of aluminum sections.

END OF SECTION

SECTION 08 11 00

METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section "Stile and Rail Wood Doors".
5. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
6. Division 08 Section "Door Hardware".
7. Division 08 Section "Access Control Hardware".
8. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

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

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Maintenance manual must be provided for tornado/hurricane storm shelter impact protective systems.

C. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel 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. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

E. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.

2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

F. Pre-Submittal 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 hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.06 PROJECT CONDITIONS

Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.07 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Door Components

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.03 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
3. Core Construction: Manufacturer’s thermally enhanced QMax core. Where indicated provide doors fabricated as thermal-rated assemblies with a minimum thermal rating of 0.41 BTU/hr-ft2-F.
4. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure

channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.

6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.

7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.

4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.

5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.

6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.

2. Curries Company (CU) - QMax Core - 707 Series.

2.04 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16” positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.

2. Manufacturers Basis of Design:

a. Curries Company (CU) – M CM Series.

b. Curries Company (CU) – Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.

2. Manufacturers Basis of Design:

    a. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.05 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.06 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.

2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.

2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.07 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.08 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.09 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.

2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.

3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.

5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
    1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
    2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
    3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
    4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.010 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.01 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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

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

3.02 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.03 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.

4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.

b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.

c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.05 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION

SECTION 08 11 23

INTERIOR ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section covers Kawneer Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

B. Types of Kawneer Aluminum Storefront Systems include:

1. Trifab® VersaGlaze® 450 Framing System, 2" Sightline -
    a. 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension
    b. Non-thermal
    c. Glass: front, structural silicone or weatherseal glazed
    d. Stick fabrication

1.3 DEFINITIONS

A. For fenestration industry standard terminology and definitions, refer to the Fenestration & Glazing Industry Alliance (FGIA) Glossary (AAMA AG-13).

1.4 PERFORMANCE REQUIREMENTS

A. General Performance:

1. Product to comply with the specified performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction, as determined by testing of aluminum storefront systems representing those indicated for this project.
2. Aluminum storefront systems shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
3. Failure includes any of these events:
    a. Thermal stresses transferring to building structure
    b. Glass breakage
    c. Loosening or weakening of fasteners, attachments, and other components
    d. Failure of operating units

B. Wind Loads:

1. The storefront system shall include anchorage that is capable of withstanding the following wind load design pressures:
    a. Inward: (_____) psf or (_____) Pa
    b. Outward: (_____) psf or (_____) Pa
2. The design pressures are based on the (_____) Building Code, (_____) Edition.

C. Air Leakage:

1. The test specimen shall be tested in accordance with ASTM E 283.
2. Air infiltration rate shall not exceed 0.06 cfm/ft^2 (0.3 l/s · m^2) at a static air pressure differential of 6.2 psf (300 Pa).

D. Water Resistance:

1. The test specimen shall be tested in accordance with ASTM E 331.
2. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.

E. Uniform Load:

1. A static air design load of 20 psf (958 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330.
2. There shall be no deflection in excess of L/175 of the span of any framing member.
3. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

F. Environmental Product Declaration (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.

1.5 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.6 SUBMITTALS

A. Product Data:

1. For each type of aluminum-framed storefront system indicated, include:
   a. Construction details
   b. Material descriptions
   c. Dimensions of individual components and profiles
   d. Hardware
   e. Finishes
   f. Installation instructions

B. Shop Drawings:

1. Plans
2. Elevations
3. Sections
4. Details
5. Hardware
6. Attachments to other work
7. Operational clearances
8. Installation details

C. Samples for Initial Selection:

1. Provide samples for units with factory-applied color finishes.
2. Provide samples of hardware and accessories involving color selection.

D. Samples for Verification:

1. Provide a verification sample for aluminum-framed storefront system and required components.

E. Product Test Reports:

1. Provide test reports for each type of aluminum-framed storefront used in the project.
2. Test reports must be based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency.
3. Test reports must indicate compliance with performance requirements.

F. Fabrication Sample:

1. Provide a fabrication sample of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:
    a. Joinery, including concealed welds
    b. Anchorage
    c. Expansion provisions
    d. Glazing
    e. Flashing and drainage

G. Entrance Door Hardware Schedule:

1. Schedule shall be prepared by or under the supervision of supplier.
2. Schedule shall detail fabrication and assembly of entrance door hardware, including procedures and diagrams.
3. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer must have successfully installed the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications:

1. Manufacturer must be capable of providing aluminum-framed storefront systems that meet or exceed performance the stated performance requirements.
2. Manufacturer must document this performance by the inclusion of test reports and calculations.

C. Source Limitations:

1. Obtain aluminum-framed storefront system through one source from a single manufacturer.

D. Product Options:

1. Drawings indicate size, profiles, and dimensional requirements of aluminum-framed storefront system and are based on the specific system indicated. Refer to Division 01 Product Requirements Section. Do not modify size and dimensional requirements.
2. 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. Pre-installation Conference:

1. Conduct conference at project site to comply with requirements in Division 01 Project Management and Coordination Section.

F. Structural-Sealant Glazing must comply with ASTM C 1401, “Guide for Structural Sealant Glazing” for design and installation of structural-sealant-glazed systems.

G. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

1.8 PROJECT CONDITIONS

A. Field Measurements:

1. Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication.

2. Indicate measurements on shop drawings.

1.9 WARRANTY

A. Submit manufacturer's standard warranty for owner's acceptance.

B. Warranty Period:

1. Two years from Date of Substantial Completion of the project provided however that in no event shall the Limited Warranty begin later than six months from date of shipment by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:

1. Kawneer Company, Inc.

2. Trifab® VersaGlaze® 450 Framing System, 2" Sightline -

a. 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension

b. Non-thermal

c. Glass: front, structural silicone or weatherseal glazed

d. Stick fabrication

B. Or Architect approved equal manufacturer.

2.2 MATERIALS

A. Aluminum Extrusions:

1. Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish

2. Not less than 0.070" (1.8 mm) wall thickness at any location for the main frame

3. Complying with ASTM B221: 6063-T6 alloy and temper

B. Fasteners:

1. Aluminum, nonmagnetic stainless steel or other materials must be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories:

1. Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.

2. Anchors, clips, and accessories shall provide sufficient strength to withstand the design pressure indicated.

D. Reinforcing Members:

1. Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.

2. Reinforcing members must provide sufficient strength to withstand the design pressure indicated.

E. Sealant:

1. For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances:

1. References to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 STOREFRONT FRAMING SYSTEM

A. Brackets and Reinforcements:

1. Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.

B. Fasteners and Accessories:

1. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories must be compatible with adjacent materials.

2. Where exposed, fasteners and accessories shall be stainless steel.

C. Perimeter Anchors:

1. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

D. Packing, Shipping, Handling, and Unloading:

1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

E. Storage and Protection:

1. Store materials so that they are protected from exposure to harmful weather conditions.

2. Handle material and components to avoid damage.

3. Protect material against damage from elements, construction activities, and other hazards before, during, and after installation.

2.4 GLAZING SYSTEMS

A. Glazing to meet requirements in Division 08 Glazing Section.

B. Glazing Gaskets:

1. Manufacturer's standard compression types

2. Replaceable, extruded EPDM rubber

C. Spacers and Setting Blocks:

1. Manufacturer's standard elastomeric type

D. Bond-Breaker Tape:

1. Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants for structural-sealant-glazed systems as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant:

a. ASTM C 1184

b. Single-component neutral-curing silicone formulation that is compatible with the system components with which it comes in contact

c. Specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in the aluminum-framed systems indicated

d. Color: Black

2. Weatherseal sealant:

a. ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O

b. Single-component neutral-curing formulation that is compatible with the structural sealant and other system components with which it comes in contact

c. Recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use

d. Color: Matching structural sealant

2.5 ACCESSORY MATERIALS

A. Joint Sealants:

1. For installation at perimeter of aluminum-framed systems, as specified in Division 07 Joint Sealants Section.

B. Bituminous Paint:

1. Cold-applied asphalt-mastic paint

2. Complies with SSPC-Paint 12 requirements except containing no asbestos

3. Formulated for 30-mil (0.762 mm) thickness per coat

2.6 FABRICATION

A. Fabricate framing member components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations

2. Accurately fitted joints that are flush, hairline, and weatherproof

3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior

4. Physical and thermal isolation of glazing from framing members

5. Accommodations for thermal and mechanical movements of glazing and framing that maintain required glazing edge clearances

6. Provisions for field replacement of glazing

7. Fasteners, anchors, and connection devices that are concealed from view to the greatest extent possible

B. Mechanically Glazed Framing Members:

1. Fabricate for flush glazing without projecting stops.

C. Structural-Sealant-Glazed Framing Members:

1. Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

D. Storefront Framing:

1. Fabricate components for assembly using manufacturer's standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in project according to shop drawings.

2.7 ALUMINUM FINISHES

A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:

1. Kawneer Permanodic® AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating, Color: as indicated in the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. With installer present, examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work:

1. Verify rough opening dimensions.
2. Verify levelness of sill plate.
3. Verify operational clearances.
4. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components for proper water management.
5. Masonry Surfaces:
    a. Masonry surfaces must be visibly dry and free of excess mortar, sand, and other construction debris.
6. Wood Frame Walls:
    a. Wood frame walls must be dry, clean, sound, well nailed, free of voids, and without offsets at joints.
    b. Ensure that nail heads are driven flush with surfaces in opening and within 3" (76.2 mm) of opening.
7. Metal Surfaces:
    a. Metal surfaces must be dry and clean (free of grease, oil, dirt, rust, corrosion, and welding slag).
    b. Ensure that metal surfaces are without sharp edges or offsets at joints.

B. Proceed with installation only after correcting unsatisfactory conditions.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed storefront system, accessories, and other components.

B. Install aluminum-framed storefront system so that components:

1. Are level, plumb, square, and true to line
2. Are without distortion and do not impede thermal movement
3. Are anchored securely in place to structural support
4. Are in proper relation to wall flashing and other adjacent construction

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather-tight construction.

D. Install aluminum-framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront system to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Field Tests:

1. Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured.
2. Conduct tests for air infiltration and water penetration with manufacturer’s representative present.
3. Tests that do not meet the specified performance requirements and units that have deficiencies shall be corrected as part of the contract amount.
4. Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
5. Air Infiltration Tests:
    a. Conduct tests in accordance with ASTM E 783.
    b. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, whichever is greater.
6. Water Infiltration Tests:
    a. Conduct tests in accordance with ASTM E 1105.
    b. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.2 psf (300 Pa).

B. Manufacturer's Field Services:

1. Upon owner’s written request, provide periodic site visit by manufacturer’s field service representative.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjusting: Not applicable.

B. Protection:

1. Protect installed product’s finish surfaces from damage during construction.

C. Cleaning:

1. Clean glass immediately after installation.
    a. Comply with glass manufacturer's written recommendations for final cleaning and maintenance.
    b. Remove non-permanent labels and clean surfaces.
2. Clean aluminum surfaces.
3. Avoid damaging protective coatings and finishes.
4. Remove excess sealants, glazing materials, dirt, and other substances.
5. Repair or replace damaged installed products.
6. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.
7. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 08 14 23.16

PLASTIC-LAMINATE-FACED WOOD DOORS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SECTION INCLUDES

Wood doors non-rated and fire-rated

A. Flush

B. Glazed

C. Positive Pressure rated fire doors

1.03 REFERENCES AND REGULATORY REQUIREMENTS

A. NFPA 252 - Standard Methods for Fire Assemblies.

B. UBC 7-2, 1997

C. UL 10 C - Fire Tests for Door Assemblies - Positive Pressure

D. NFPA 80 - Fire Doors and Windows.

E. Quality Standards:

1. ANSI/WDMA Industry Standard I.S. 1-A-21 (Window and Door Manufacturers Association)
2. ANSI A115. W Series, Wood Door Hardware Standards. (American National Standard Institute)

Door Construction:

Core: Solid particleboard core conforming to ANSI 208.A LD-2 with no added urea-formaldehyde bonding resins for interior. Cores shall be CARB 2 Compliant

Vertical Edges/Stiles: Interior Doors: Decorative laminate edge same pattern/color as faces, glued to SCL backer.

No added urea-formaldehyde in wood components and adhesives.

Top and Bottom Rails: SCL glued to core. No added urea-formaldehyde in wood components and adhesives.

Crossbanding: high-density fiberboard consisting of fibers with no added urea-formaldehyde.

Adhesives: Glue lines for assembly between the plies of face, crossbanding and core are to be Type 1 polyvinyl acetate (PVA).

F. Labeling Agencies

1. Underwriters Laboratories, Inc. (UL) (Neutral pressure and Positive pressure rated doors
2. Intertek Testing Services-Warnock Hersey (ITS-WH) (Ratings for both Neutral pressure and Positive pressure rated doors)

1.04 SUBMITTALS

A. Submit under provisions of ANSI/WDMA I.S. 1-A-21.

B. Shop drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts, special bevels, blocking for hardware in mineral core doors, identify cutouts.

C. Indicate compliance with positive pressure.

D. Product Data: Indicate door core materials, thickness, construction, veneer species.

E. Construction samples: Submit one or more of manufacturer's standard samples demonstrating door construction.

F. Finish samples: illustrating the color of the specified door face materials.

G. Manufacturer's full lifetime warranty

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 QUALITY ASSURANCE

A. Meet or exceed WDMA I.S.1-A Custom Grade.

B. Labeled Doors: Listed and conform to the requirements of:

1. Underwriters Laboratories (UL).

2. Intertek Testing Services-Warnock Hersey (ITS-WH)

1.07 DELIVERY STORAGE AND HANDLING AND SITE CONDITIONS

A. Deliver, store, protect and handle products under provisions of WDMA and manufacturer's care and handling instructions.

B. Accept doors on site in manufacturer's standard packaging. Inspect for damage. Do not store in damp or wet areas. HVAC systems must be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25% or greater than 55%.

C. Doors shall be individually wrapped in Poly-bags.

D. Certain wood species are light sensitive. Protect doors from exposure to natural and artificial light after delivery.

1.08 COORDINATION

A. Coordinate the work with door opening construction, door frame and door hardware installation with a pre-installation conference.

1.09 WARRANTY

A. Provide manufacturer's warranty to the following term:

1. Interior Solid Core Doors: "Full Life of Original Installation" if door(s) do not comply with warranty tolerance standards.

2. Include coverage for delamination, warping, bow, cup and telegraphing of core construction beyond warranty tolerances.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Manufacturer: VT Industries – Heritage Series, 5-ply bonded construction door quality as defined in this section.

B. Or Architect approved equal.

2.02 MATERIALS

A. WORKMANSHIP

Comply with WDMA workmanship for veneer faces, vertical edges, crossbands, horizontal edges and dimensional tolerances. Meeting or exceeding Extra Heavy Duty Performance Level

B. DOOR CONSTRUCTION GRADE

Except as may be otherwise shown on the drawings fabricate the work of this section to WDMA “Custom Grade” for Interior PC-5, Hot Pressed, bonded Particleboard Core assemblies.

C. FLUSH DOOR FACING

1. .050 General Purpose High Pressure Decorative Laminate (HPDL) conforming to NEMA LD-3.
2. Pattern and Color as selected by architect.

2.03 FABRICATION

A. DOOR AND CORE CONSTRUCTION

1. Non-rated:
   - ANSI A208.1-LD-2 Urea-Formaldehyde Free, Particleboard
2. 20-minute fire-rating:
   - Positive Pressure: Category A (concealed intumescent)
   - ANSI A208.1-LD-2, Urea-Formaldehyde Free, Particleboard
3. 45-, 60- or 90-minute mineral core fire-rated:
   - Positive Pressure:
     - Category A (concealed intumescent)
     - Urea-formaldehyde free

B. Optional Lite, Louver and Astragal Details:

1. Lite openings shall be furnished with same species wood lite beads.
2. Louvers in non-rated doors shall be wood.

   Wood louvers shall be manufacturer’s standard construction. Louvers shall be the same species lumber as the door face and be factory installed. Wood louvers shall be V-slat chevron.
3. For pairs of fire doors where no metal meeting edges are desired, specify “No Metal Meeting Edges Accepted.”

C. VERTICAL EDGES (STILES)

1. Non-rated and 20-minute rated shall be matching decorative laminate banded stiles over SCL backer.
2. 20-minute rated pairs (No metal edges or astragal required)

   Smoke seals required by manufacturer to permit positive pressure “S” label per Category H.

   a. Vertical stiles must be fully bonded to the core assembly. Stiles that are attached with wood screws are strictly prohibited.

3. Mineral core door stiles bonded to manufacturer's standard edge for improved screw holding.

    - Single opening edges to be manufactured as required to meet label service listing. Optional veneer banded edge to match face if required.
    - As required by manufacturer to meet Positive Pressure Category A (concealed intumescent). Decorative Laminate banded edge to match face.

D. HORIZONTAL EDGES (RAILS)

Structural composite lumber or hardwood lumber.

1. Tops and Bottoms must be Factory sealed as a part of manufacturer's standard procedure for Factory finishing.

E. ADHESIVES

1. Face Adhesive: Type 1, Urea-Formaldehyde free.

F. INNER BLOCKING FOR MINERAL CORE FIRE DOORS

Supply inner blocking for all surface applied hardware where through bolts are not accepted.

G. MACHINING

Factory fit and machine doors for frame and finish hardware in accordance with hardware and NFPA 80 requirements and dimensions. Do not machine for surface hardware. Apply appropriate fire labels.

2.04 ACCESSORIES

A. LOUVERS

1. Louvers to be furnished by the door manufacturer.

B. GLAZING STOPS

1. Non-Rated:
    - Wood, of the same species/compatible with door species
2. Fire-Rated:
    - Flush beads, veneer wrapped with same species as door facing

Verify compatibility of glazing system with positive pressure requirements.

Adjust top rail on full glass doors to accept hardware so that no hardware is visible in daylight opening.

C. MEETING EDGES FOR PAIRS OF FIRE RATED DOORS

1. No Metal edges or astragals
2. Meet Positive Pressure requirements for Category A (concealed intumescent)

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify substrate opening conditions.

B. Verify that opening sizes and tolerances are acceptable and ready to receive this work.

C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

D. Use three hinges for doors 7’-6” in height or less and one additional hinge for each incremental 30 inches of height over 7’-6”

3.02 INSTALLATION

A. Install fire-rated and non-rated doors in accordance with NFPA 80, Manufacturers’ instructions and to ITS-WH/UL requirements.

B. Trim non-rated door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum 3/4 inch (19-mm).

D. Trim fire door height at bottom edge only, in accordance with fire rating requirements. Allow a fitting clearance of 1/8” at each side and at top of door.

E. Do not trim Positive Pressure rated doors for width.

G. Pilot holes to be factory drilled. Exercise caution when installing hinges to ensure pilot holes are not over-drilled and screws are not over-torqued. Follow Manufacturer’s installation instructions for Positive Pressure doors. Do not use self-drilling or combination wood/metal screws on wood doors.

H. Coordinate installation of doors with installation of frames and hardware

J. Install door louvers and light kits plumb and level.

K. Reseal or refinish any doors that required site alteration.

3.03 GLAZING

ALL Glass and Glazing shall be installed in the factory for all rated and non-rated wood doors.

3.04 WARRANTY TOLERANCES

Conform to WDMA standards and testing methods for warp, cup, bow and telegraphing.

3.05 ADJUSTING

Adjust doors for smooth and balanced door movement.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Non-Rated Architectural wall and ceiling access door.

B. Related hardware and attachments.

C. Design Requirements: Verification: Obtain specific locations and sizes for required access doors and frames from trades, including mechanical and electrical, requiring access to concealed equipment and indicate on submittal schedule.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain access door and panel units, and frames for entire Project from 1 source and 1 single manufacturer.

B. Size Variations: Obtain Architect's acceptance and approval of manufacturer's standard size units that may vary slightly from sizes indicated on Drawings.

C. Coordination: Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies. Coordinate delivery with other Work to avoid delay.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Shop Drawings:

1. Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.

2. Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.

3. General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel units.

C. Product Data: Manufacturer's technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices. Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.

D. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 66 00 Product Storage and Handling Requirements.

B. Package and ship per manufacturer's recommendations.

C. Store per manufacturer's instructions.

D. Store in dry area out of direct sunlight.

1.08 PROJECT CONDITIONS

Comply with the requirements of Section 01 50 00 Construction Facilities.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Nystrom Building Products: 9300 73rd Avenue North Brooklyn Park, MN 55428. Telephone: 800-547-2635. E-Mail: info@nystrom.com. Website: www.nystrom.com

B. Specifications and Drawings are based on manufacturer's literature from Nystrom Building Products. Other manufacturers shall comply with minimum levels of material, color selection, and detailing indicated in Specifications or on Drawings.

2.02 MATERIALS

A. Commercial quality, cold steel sheet with white baked on powder coat finish.

B. Galvanized, bonderized steel with white baked on powder coat finish.

2.03 ACCESS PANELS

A. Flush Access Doors (Model: NW) with Concealed Flanges for drywall (Non-Rated, General-Purpose Access Door)

1. Door: Fabricate from 16-gauge cold rolled sheet steel, with multiple mounting configurations.
2. Door Size: 14"x14" and 24"x24" (see Plans for locations)
3. Frame: Fabricate from 16-gauge cold rolled sheet steel. Provide 1/4 inch mounting holes and easy install tabs.
    a. Wallboard surfaces – Integrated 16-gauge drywall bead and frame.
4. Hinge:
    a. Concealed spring button type, to allow for door removal.
5. Latching/Locking Devices: Cam latch, hex-head wrench operated
6. Finish:
    a. Type: No. 304 stainless steel with No. 4 satin polish finish.

B. Fire-Rated, Flush Access Doors (Model: IW) with Concealed Flanges.

1. Door: Face flush with frame with a core of mineral-fiber insulation enclosed in sheet metal, concealed flange for gypsum board installation, self-closing door. Fabricate from 20-gauge sheet metal, with multiple mounting configurations.
2. Door Size: 14"x14" and 24"x24" (see Plans for locations)

3. Frame: Fabricate from 16-gauge cold rolled sheet steel. Provide 1/4 inch mounting holes and easy install tabs.
    a. Wallboard surfaces – Integrated 16-gauge drywall bead and frame.
4. Hinge:
    a. Concealed hinge.
5. Latching/Locking Devices: Self-closing, self-latching door hardware operated by key.
6. Finish:
    a. Type: No. 304 stainless steel with No. 4 satin polish finish.
7. Fire-Resistance Rating: 1-1/2 hours for walls, 3 hours for ceilings.
8. Temperature-Rise Rating: 250 deg F at the end of 30 minutes
9. Performance Requirement: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency for fire-protection and temperature-rise limit ratings indicated, accordingly to NFPA 252 or UL 10B.

2.04 FABRICATION

A. Manufacture each access panel assembly as an integral unit ready for installation.

B. Framing to include integral anti-flexing technology, with ¼ inch mounting holes, to reduce the twist of frame during installation.

C. Easy Install Tabs integral to framing for multiple installation methods.

D. Furnish number of latches required to hold door in flush, smooth plane when closed.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that rough openings for door and frame are correctly sized and located.

C. Verify mechanical and electrical requirements for ceiling or wall access panels.

D. Correct conditions detrimental to timely and proper completion of the Work.

E. Do not proceed until unsatisfactory conditions are corrected.

F. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

Advise installers of work relating to access panel installation including rough opening dimensions, locations of supports, and anchoring methods. Coordinate delivery with other work to avoid delay.

3.03 INSTALLATION

A. Install access door and frame units per manufacturer's written instructions.

B. Install frames plumb and level in opening. Secure rigidly in place.

C. Position units to provide convenient access to concealed Work requiring access.

3.04 ADJUST AND CLEAN

A. Adjust panel after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or damaged.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section covers Kawneer Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

B. Types of Kawneer Aluminum Storefront Systems include:

1. Trifab® VersaGlaze® 451T Framing System
    a. 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension
    b. Thermal
    c. Front, center, back, multi-plane, structural silicone or weatherseal (type B) glazed
    d. Screw spline, shear block, stick, or punched opening
2. Trifab® VersaGlaze® 451T Framing System – Impact Resistant and Blast Mitigation
    a. 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension
    b. Thermal
    c. Front, center, back, multi-plane, structural silicone or weatherseal (type B) glazed
    d. Impact resistant, blast mitigation glazing
    e. Screw spline, shear block, stick, or punched opening

1.3 DEFINITIONS

A. For fenestration industry standard terminology and definitions, refer to the Fenestration & Glazing Industry Alliance (FGIA) Glossary (AAMA AG-13).

1.4 PERFORMANCE REQUIREMENTS

A. General Performance:

1. Product to comply with the specified performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction, as determined by testing of aluminum storefront systems representing those indicated for this project.
2. Aluminum storefront systems shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
3. Failure includes any of these events:
    a. Thermal stresses transferring to building structure
    b. Glass breakage
    c. Loosening or weakening of fasteners, attachments, and other components
    d. Failure of operating units

B. Wind Loads:

1. The storefront system shall include anchorage that is capable of withstanding the following wind load design pressures:

   a. Inward: (_____) psf or (_____) Pa

   b. Outward: (_____) psf or (_____) Pa

2. The design pressures are based on the (_____) Building Code, (_____) Edition.

C. Air Leakage:

1. The test specimen shall be tested in accordance with ASTM E 283.

2. With interior seal, air leakage rate shall not exceed 0.06 cfm/ft^2 (0.3 l/s · m^2) at a static air pressure differential of 6.2 psf (300 Pa).

3. Without interior seal, air leakage rate shall not exceed 0.06 cfm/ft^2 (0.3 l/s · m^2) at a static air pressure differential of 1.6 psf (75 Pa).

4. CSA A440 Fixed Rating

D. Water Resistance:

1. The test specimen shall be tested in accordance with ASTM E 331.

2. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.

E. Uniform Load:

1. A static air design load of 35 psf (1680 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330.

2. There shall be no deflection in excess of L/175 of the span of any framing member.

3. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

F. Seismic:

1. When tested to AAMA 501.4, system must meet design displacement (elastic) of 0.010 x the story height and ultimate displacement (inelastic) of 1.5 x the design displacement.

G. Thermal Movements:

1. Allow for thermal movements resulting from the following:

   a. 0°F (-18 C) to 180°F (82 C) maximum change (range) in ambient and surface temperatures

   b. 75°F (24 C) test interior ambient air temperature

2. Test performance shows no buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5 for a minimum 3 cycles.

H. Thermal Transmittance (U-factor):

1. Thermal transmittance test results are based upon 1" (25.4 mm) clear high-performance insulating glass [1/4" (e=0.035, #2), 1/2" warm edge spacer and argon fill gas, 1/4"].

2. When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:

   a. Glass to exterior .47 (low-e) or 0.61 (clear) or project specific (____) Btu/hr/ft^2/°F per AAMA 507 or (____) Btu/hr/ft^2/°F per NFRC 100.

b. Glass to center .44 (low-e) or 0.61 (clear) or project specific (____) Btu/hr/ft^2/°F per AAMA 507 or (____) Btu/hr/ft^2/°F per NFRC 100.

c. Glass to interior .41 (low-e) or 0.56 (clear) or project specific (____) Btu/hr/ft^2/°F per AAMA 507 or (____) Btu/hr/ft^2/°F per NFRC 100.

I. Condensation Resistance Factor (CRF):

1. The glass to exterior CRF, when tested to AAMA Specification 1503, shall not be less than 70_{frame} and 69_{glass} (low-e) or 69_{frame} and 58_{glass} (clear)
2. The glass to center CRF, when tested to AAMA Specification 1503, shall not be less than 62_{frame} and 68_{glass} (low-e) or 63_{frame} and 56_{glass} (clear)
3. The glass to interior CRF, when tested to AAMA Specification 1503, shall not be less than 56_{frame} and 67_{glass} (low-e) or 54_{frame} and 58_{glass} (clear)

J. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC):

1. Sound transmission loss test results in accordance with AAMA 1801 are based upon 1" (25.4 mm) clear double laminated insulating glass with PVB interlayer (1/8", 0.030", 1/8", 1/2" AS, 1/8", 0.030", 1/8").
2. The glass to exterior ratings, when tested to ASTM E1425 and ASTM E90, shall not be less than STC 38 and OITC 31.
3. The glass to center ratings, when tested to ASTM E1425 and ASTM E90, shall not be less than STC 37 and OITC 30.
4. The glass to interior ratings, when tested to ASTM E1425 and ASTM E90, shall not be less than STC 38 and OITC 30.

1.5 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.6 SUBMITTALS

A. Product Data:

1. For each type of aluminum-framed storefront system indicated, include:
   a. Construction details
   b. Material descriptions
   c. Dimensions of individual components and profiles
   d. Hardware
   e. Finishes
   f. Installation instructions

B. Shop Drawings:

1. Plans
2. Elevations
3. Sections
4. Details
5. Hardware
6. Attachments to other work
7. Operational clearances

8. Installation details

C. Samples for Initial Selection:

1. Provide samples for units with factory-applied color finishes.
2. Provide samples of hardware and accessories involving color selection.

D. Samples for Verification:

1. Provide a verification sample for aluminum-framed storefront system and required components.

E. Product Test Reports:

1. Provide test reports for each type of aluminum-framed storefront used in the project.
2. Test reports must be based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency.
3. Test reports must indicate compliance with performance requirements.

F. Fabrication Sample:

1. Provide a fabrication sample of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:
    a. Joinery, including concealed welds
    b. Anchorage
    c. Expansion provisions
    d. Glazing
    e. Flashing and drainage

G. Entrance Door Hardware Schedule:

1. Schedule shall be prepared by or under the supervision of supplier.
2. Schedule shall detail fabrication and assembly of entrance door hardware, including procedures and diagrams.
3. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer must have successfully installed the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications:

1. Manufacturer must be capable of providing aluminum-framed storefront systems that meet or exceed performance the stated performance requirements.
2. Manufacturer must document this performance by the inclusion of test reports and calculations.

C. Source Limitations:

1. Obtain aluminum-framed storefront system through one source from a single manufacturer.

D. Product Options:

1. Drawings indicate size, profiles, and dimensional requirements of aluminum-framed storefront system and are based on the specific system indicated. Refer to Division 01 Product Requirements Section. Do not modify size and dimensional requirements.
2. 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. Pre-installation Conference:
1. Conduct conference at project site to comply with requirements in Division 01 Project Management and Coordination Section.

F. Structural-Sealant Glazing must comply with ASTM C 1401, “Guide for Structural Sealant Glazing” for design and installation of structural-sealant-glazed systems.

G. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

1.8 PROJECT CONDITIONS

A. Field Measurements:
1. Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication.
2. Indicate measurements on shop drawings.

1.9 WARRANTY

A. Submit manufacturer's standard warranty for owner's acceptance.

B. Warranty Period:
1. Two years from Date of Substantial Completion of the project provided however that in no event shall the Limited Warranty begin later than six months from date of shipment by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:
1. Kawneer Company, Inc.
2. Trifab® VersaGlaze® 451T Framing System
   a. 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension
   b. Thermal
   c. Front, center, back, multi-plane, structural silicone or weatherseal (type B) glazed
   d. Screw spline, shear block, stick, or punched opening

B. Or Architect approved equal.

2.2 MATERIALS

A. Aluminum Extrusions:
1. Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish
2. Not less than 0.070" (1.8 mm) wall thickness at any location for the main frame
3. Complying with ASTM B221: 6063-T6 alloy and temper

B. Fasteners:

1. Aluminum, nonmagnetic stainless steel or other materials must be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories:

1. Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.

2. Anchors, clips, and accessories shall provide sufficient strength to withstand the design pressure indicated.

D. Reinforcing Members:

1. Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.

2. Reinforcing members must provide sufficient strength to withstand the design pressure indicated.

E. Sealant:

1. For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances:

1. References to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 STOREFRONT FRAMING SYSTEM

A. Thermal Barrier:

1. Kawneer IsoLock® Thermal Break with dual nominal 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.

2. Thermal break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

B. Brackets and Reinforcements:

1. Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.

C. Fasteners and Accessories:

1. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories must be compatible with adjacent materials.

2. Where exposed, fasteners and accessories shall be stainless steel.

D. Perimeter Anchors:

1. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

E. Packing, Shipping, Handling, and Unloading:

1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

F. Storage and Protection:

1. Store materials so that they are protected from exposure to harmful weather conditions.
2. Handle material and components to avoid damage.
3. Protect material against damage from elements, construction activities, and other hazards before, during, and after installation.

2.4 GLAZING SYSTEMS

A. Glazing to meet requirements in Division 08 Glazing Section.

B. Glazing Gaskets:

1. Manufacturer's standard compression types
2. Replaceable, extruded EPDM rubber

C. Spacers and Setting Blocks:

1. Manufacturer's standard elastomeric type

D. Bond-Breaker Tape:

1. Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants for structural-sealant-glazed systems as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant:
   a. ASTM C 1184
   b. Single-component neutral-curing silicone formulation that is compatible with the system components with which it comes in contact
   c. Specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in the aluminum-framed systems indicated
   d. Color: Black
2. Weatherseal sealant:
   a. ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O
   b. Single-component neutral-curing formulation that is compatible with the structural sealant and other system components with which it comes in contact
   c. Recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use
   d. Color: Matching structural sealant

2.5 ENTRANCE DOOR SYSTEMS

A. Refer to Entrance Doors as specified in Division 08 41 13 Aluminum-Framed Entrances and Storefronts Section.

B. Refer to Entrance Door Hardware as specified in Division 08 71 00 Door Hardware Section.

2.6 ACCESSORY MATERIALS

A. Joint Sealants:

1. For installation at perimeter of aluminum-framed systems, as specified in Division 07 Joint Sealants Section.

B. Bituminous Paint:

1. Cold-applied asphalt-mastic paint
2. Complies with SSPC-Paint 12 requirements except containing no asbestos
3. Formulated for 30-mil (0.762 mm) thickness per coat

2.7 FABRICATION

A. Fabricate framing member components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations
   2. Accurately fitted joints that are flush, hairline, and weatherproof
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior
   4. Physical and thermal isolation of glazing from framing members
   5. Accommodations for thermal and mechanical movements of glazing and framing that maintain required glazing edge clearances
   6. Provisions for field replacement of glazing
   7. Fasteners, anchors, and connection devices that are concealed from view to the greatest extent possible

B. Mechanically Glazed Framing Members:
   1. Fabricate for flush glazing without projecting stops.

C. Structural-Sealant-Glazed Framing Members:
   1. Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

D. Storefront Framing:
   1. Fabricate components for assembly using manufacturer's standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in project according to shop drawings.

2.8 ALUMINUM FINISHES

A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:
   1. Kawneer Permanodic® AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating, Color: as indicated in the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. With installer present, examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work:
   1. Verify rough opening dimensions.
   2. Verify levelness of sill plate.
   3. Verify operational clearances.

4. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components for proper water management.
5. Masonry Surfaces:
    a. Masonry surfaces must be visibly dry and free of excess mortar, sand, and other construction debris.
6. Wood Frame Walls:
    a. Wood frame walls must be dry, clean, sound, well nailed, free of voids, and without offsets at joints.
    b. Ensure that nail heads are driven flush with surfaces in opening and within 3" (76.2 mm) of opening.
7. Metal Surfaces:
    a. Metal surfaces must be dry and clean (free of grease, oil, dirt, rust, corrosion, and welding slag).
    b. Ensure that metal surfaces are without sharp edges or offsets at joints.

B. Proceed with installation only after correcting unsatisfactory conditions.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed storefront system, accessories, and other components.

B. Install aluminum-framed storefront system so that components:
1. Are level, plumb, square, and true to line
2. Are without distortion and do not impede thermal movement
3. Are anchored securely in place to structural support
4. Are in proper relation to wall flashing and other adjacent construction

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather-tight construction.

D. Install aluminum-framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront system to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Field Tests:
1. Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured.
2. Conduct tests for air infiltration and water penetration with manufacturer’s representative present.
3. Tests that do not meet the specified performance requirements and units that have deficiencies shall be corrected as part of the contract amount.
4. Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
5. Air Infiltration Tests:
    a. Conduct tests in accordance with ASTM E 783.

b. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, whichever is greater.

6. Water Infiltration Tests:

a. Conduct tests in accordance with ASTM E 1105.

b. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.2 psf (300 Pa).

B. Manufacturer's Field Services:

1. Upon owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjusting: Not applicable.

B. Protection:

1. Protect installed product's finish surfaces from damage during construction.

C. Cleaning:

1. Clean glass immediately after installation.

a. Comply with glass manufacturer's written recommendations for final cleaning and maintenance.

b. Remove non-permanent labels and clean surfaces.

2. Clean aluminum surfaces.

3. Avoid damaging protective coatings and finishes.

4. Remove excess sealants, glazing materials, dirt, and other substances.

5. Repair or replace damaged installed products.

6. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.

7. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Stile and Rail Wood Doors”.
4. Division 08 Section “Sound Control Hollow Metal Door Assemblies”.
5. Division 08 Section “Sound Control Wood Door Assemblies”.
6. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

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

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.03 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Proof of Compliance: (California located Projects): Provide a list of product(s) containing chemicals known to cause cancer or reproductive toxicity as defined by the Office of Environmental Health Hazard Assessment (OEHHA) under Proposition 65 (CA Code of Regulations, Title 27, Section 27001). The list includes the specific chemical(s), if the

chemical will be exposed to consumers, the means of warning, and an illustration of the label.

F. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. California Building Code: Provide hardware that complies with CBC Section 11B.

1. All openings as a part of an accessible route shall comply with CBC Section 11B-404.
2. The clear opening width for a door shall be 32” minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34” and 4” maximum projections into it between 34” and 80” above the finish floor or ground. Door closers and stops shall be permitted to be 78” minimum above the finish floor or ground. CBC Section 11B-404.2.3.
3. Operable hardware on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34” minimum and 44” maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.
4. Hardware (including panic hardware) shall not be provided with “nightlatch” function for any accessible doors or gates unless the following conditions are met:

a. Such hardware has a ‘dogging’ feature and is dogged during the time the facility is open.
b. All ‘dogging’ operation is performed only by employees as their job function (non-public use).

5. The force for pushing or pulling open a door shall be in accordance with CBC Section 11B-404.2.9.
   a. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds (22.2 N) maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds (66.7N). These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
   b. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2N) maximum to comply with CBC Section 11B-309.4.
   c. The 5 pound (22.2 N) maximum force shall be validated for the size of the door used. The Building Materials Listing of the California State Fire Marshal shall indicate that the door hardware meets the 5 pound (22.2 N) force and shall also list the largest door that can be used.
6. Door closing speed shall comply with CBC Section 11B-404.2.8. Closers shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.
7. Floor stops shall not be located in the path of travel and 4” maximum from walls.
8. Thresholds shall comply with CBC Section 11B-404.2.5.

G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
   1. Function of building, purpose of each area and degree of security required.
   2. Plans for existing and future key system expansion.
   3. Requirements for key control storage and software.
   4. Installation of permanent keys, cylinder cores and software.
   5. Address and requirements for delivery of keys.

I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
   1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
   2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
   3. Review sequence of operation narratives for each unique access controlled opening.
   4. Review and finalize construction schedule and verify availability of materials.

5. Review the required inspecting, testing, commissioning, and demonstration procedures

J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.06 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.07 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.02 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.03 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

2.04 FLOOR CLOSERS AND PIVOTS

A. Pivots: ANSI/BHMA A156.4, Grade 1; space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

1. Manufacturers:

a. Norton Rixson (RF).

2.05 DOOR OPERATING TRIM

A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
6. Manufacturers:

a. Rockwood (RO).

2.06 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer’s Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.07 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.08 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.

2.09 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - CLX3300 Series.

2.010 AUXILIARY LOCKS

A. Mortise Deadlocks, Large Case: ANSI/BHMA A156.13 Grade 1 Certified Products Directory (CPD) listed large case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. One piece stainless steel bolts with a 1" throw. Deadlocks to be products of the same source manufacturer and keyway as other locksets.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.

2.011 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.012 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:
    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.

2.013 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

a. Norton Rixson (NO) - 7500 Series.

2.014 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Rockwood (RO).

2.015 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (RF).
b. Rockwood (RO).
c. Sargent Manufacturing (SA).

2.016 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: 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 UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.017 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.018 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.02 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.03 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.04 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.05 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.06 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.07 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.08 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

Hardware Sets

Set: 1.0

Doors: E106B

Description: EXTERIOR AL SGL - TEEN COLLECTION (EXIT ALARM)

1	Offset Pivot Set	147	622	RF	
1	Offset Intermediate Pivot	M19	622	RF	
1	Rim Exit Device, Exit Only - Exit Alarm	ED4200 EO M110 M61	BSP	RU	⚡
1	Mortise Cylinder	(at keyswitch) as req'd, match Owner standard			
1	Conc Overhead Stop (Alum storefront)	6-X36	BSP	RF	
1	Surface Closer - Parallel Rigid Arm	PR7500	BSP	NO	
1	Drop Plate	as req'd	BSP	NO	
1	Door Stop	466-RKW	Black	RO	
1	Gasketing	by Alum. Door/Frame Mfg.			
1	Sweep	315BSPN		PE	
1	Threshold	171BSP or Per Sill Detail		PE	

Notes: - A red LED indicator will illuminate every 30 seconds when the alarm is armed.
- Alarm will sound when the exit device pushpad is depressed.
- Alarm must be manually reset by keyswitch.

Set: 2.0

Doors: E106A

Description: EXTERIOR AL PAIR - LIBRARY

2	Offset Pivot Set	147	622	RF
2	Offset Intermediate Pivot	M19	622	RF
1	Concealed Vert Rod Exit, Storeroom	ED4800 O859ET M110 M52	BSP	RU
1	Concealed Vert Rod Exit, Exit Only	ED4800 EO M110 M52	BSP	RU

2	Offset Door Pull	RM3311-Length as req'd	BSP	RO
1	Rim Cylinder	as req'd, match Owner standard		
2	Mortise Cylinder	(at Cyl. Dogging) as req'd, match Owner standard		
2	Conc Overhead Stop (Alum storefront)	6-X36	BSP	RF
2	Surface Closer - Parallel Rigid Arm	PR7500	BSP	NO
2	Drop Plate	as req'd	BSP	NO
2	Door Stop	466-RKW	Black	RO
1	Gasketing	by Alum. Door/Frame Mfg.		
2	Sweep	315BSPN		PE
1	Threshold	171BSP or Per Sill Detail		PE

Set: 3.0

Doors: E119

Description: EXTERIOR HM PAIR - ELECTRICAL

6	Hinge (heavy weight)	T4A3386 (NRP)	BSP	MK
1	Keyed Removable Mullion	CR910BKM		RU
1	Rim Exit Device, Nightlatch	ED5200 124957ET M110 5CH	BSP	RU
1	Rim Exit Device, Exit Only	ED5200 EO M110 5CH	BSP	RU
1	Rim Cylinder	as req'd, match Owner standard		
1	Mortise Cylinder	(at Mullion) as req'd, match Owner standard		
2	Surface Closer - Parallel Rigid Arm	PR7500	BSP	NO
2	Kick Plate	K1050 10" high CSK BEV	BSP	RO
2	Door Stop	466-RKW	Black	RO
1	Gasketing (Head)	2891BSPS		PE
2	Gasketing (Jambs)	290BSPS		PE
1	Mullion Gasketing	5110BL		PE
1	Threshold	171BSP or Per Sill Detail		PE

Set: 4.0

Doors: E115

Description: EXTERIOR HM SGL - STAFF WORK (KEYPAD)

3	Hinge (heavy weight)	T4A3386 (NRP)	BSP	MK
1	Keypad Lock	match existing		
1	Cylinder	as req'd, match Owner standard		
1	Surface Closer - Tri-pack	7500 mounting as req'd	BSP	NO
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Door Stop	466-RKW	Black	RO
1	Gasketing	303BSPS		PE
1	Sweep	315BSPN		PE
1	Threshold	171BSP or Per Sill Detail		PE

Set: 5.0

Doors: E121

Description: EXTERIOR HM SGL - FIRE

3	Hinge, Full Mortise	TA2314 (NRP)	BSP	MK
1	Storeroom Lock	CLX3357 124D	BSP	RU
1	Cylinder	as req'd, match Owner standard		
1	Surface Closer - Tri-pack	7500 mounting as req'd	BSP	NO
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Door Stop	466-RKW	Black	RO
1	Gasketing	303BSPS		PE
1	Sweep	315BSPN		PE
1	Threshold	171BSP or Per Sill Detail		PE

Set: 6.0

Doors: E122

Description: EXTERIOR HM SGL - MAINTENANCE

3	Hinge (heavy weight)	T4A3386 (NRP)	BSP	MK
1	Storeroom Lock	CLX3357 124D	BSP	RU
1	Cylinder	as req'd, match Owner standard		
1	Surface Closer - Tri-pack	7500 mounting as req'd	BSP	NO
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Door Stop	466-RKW	Black	RO
1	Gasketing	303BSPS		PE
1	Sweep	315BSPN		PE
1	Threshold	171BSP or Per Sill Detail		PE

Set: 7.0

Doors: E120

Description: EXTERIOR HM SGL - ALL GENDER

3	Hinge, Full Mortise	TA2314 (NRP)	BSP	MK
1	Dormitory Lock w/Indicator	ML2065 124X M34 V21 LC	BSP	RU
1	Mortise Cylinder	as req'd, match Owner standard		
1	Surface Closer - Tri-pack	7500 mounting as req'd	BSP	NO
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Door Stop	466-RKW	Black	RO
1	Gasketing	303BSPS		PE
1	Sweep	315BSPN		PE
1	Threshold	171BSP or Per Sill Detail		PE

Set: 8.0

Doors: 108

Description: INTERIOR AL SGL - OPPORTUNITY

1	Continuous Hinge	BSPFM HD1		PE
2	Mortise Deadlock	MS1850S	335	AD
2	Offset Door Pulls	RM3311-12 BTB Mtg	BSP	RO

1	Mortise Cylinder	as req'd, match Owner standard		
1	Conc Overhead Stop (Alum storefront)	6-X36	BSP	RF
1	Surface Closer - Parallel Rigid Arm	PR7500	BSP	NO
1	Gasketing	by Alum. Door/Frame Mfg.		
1	Status Indicator	4089	119	AD

Set: 9.0

Doors: 100

Description: INTERIOR WD SGL - STAFF WORK (KEYPAD LOCK)

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Keypad Lock	match existing		
1	Cylinder	as req'd, match Owner standard		
1	Surface Closer - Tri-pack	7500 mounting as req'd	BSP	NO
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Wall Stop	403	BSP	RO
3	Silencer	608-RKW		RO

Set: 10.0

Doors: 111, 117, 118

Description: INTERIOR WD SGL - JANITOR / STORAGE

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Storeroom Lock	CLX3357 124D	BSP	RU
1	Cylinder	as req'd, match Owner standard		
1	Conc Overhead Stop (hvy duty)	1-X36 (as req'd in lieu of a door Stop)	BSP	RF
1	Surface Closer - Tri-pack	7500 mounting as req'd	BSP	NO
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Wall Stop	403	BSP	RO
3	Silencer	608-RKW		RO

Set: 11.0

Doors: 114

Description: INTERIOR WD SGL - OFFICE

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Entrance Lock	CLX3351 124D	BSP	RU
1	Cylinder	as req'd, match Owner standard		
1	Wall Stop	403	BSP	RO
3	Silencer	608-RKW		RO
1	Coat Hook	RM802	BSP	RO

Set: 12.0

Doors: 101, 102, 103, 105

Description: INTERIOR WD SGL - STUDY / READING ROOM

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Passage Latch	CLX3310 124D	BSP	RU
1	Wall Stop	403	BSP	RO
1	Smoke Gasketing	S88BL		PE

Set: 13.0

Doors: 109, 110

Description: INTERIOR WD SGL - M RR / W RR

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Passage Latch	CLX3310 124D	BSP	RU
1	Surface Closer - Tri-pack	7500 mounting as req'd	BSP	NO
1	Mop Plate	K1050 6" high CSK BEV	US32D	RO
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Wall Stop	403	BSP	RO
3	Silencer	608-RKW		RO

Set: 14.0

Doors: 113

Description: INTERIOR WD SGL - ALL GENDER

3	Hinge, Full Mortise	TA2714 (NRP)	BSP	MK
1	Privacy Lock w/Indicator	ML2030 124X M34 V21	BSP	RU
1	Surface Closer - Tri-pack	7500 mounting as req'd	BSP	NO
1	Mop Plate	K1050 6" high CSK BEV	US32D	RO
1	Kick Plate	K1050 10" high CSK BEV	BSP	RO
1	Wall Stop	403	BSP	RO
3	Silencer	608-RKW		RO
1	Coat Hook	RM802	BSP	RO

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all Material and Labor, as shown on Drawings and as specified herein, including all accessories and hardware for a timely, complete, and proper installation:

A. High-performance architectural glass.

B. High-performance insulating glass.

1.03 STANDARDS AND REFERENCES

A. ANSI Z97.1 – American National Standard for Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test

B. CPSC 16 CFR 1201 – Safety Standard for Architectural Glazing Materials

C. Glazing Publications: Comply with published recommendations of glass product manufacturers and industry organizations, including but not limited to those below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: IGMA TM-3000, Glazing Guidelines for Sealed Insulating Glass Units.

2. GANA Publications: Laminated Glazing Reference Manual; Glazing Manual.

D. ASTM International:

1. ASTM C162 – Standard Terminology of Glass and Glass Products.

2. ASTM C1036 – Standard Specification for Flat Glass.

3. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.

4. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.

5. ASTM C1376 – Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Flat Glass.

6. ASTM E2188 – Standard Test Method for Insulating Glass Unit Performance.

7. ASTM E2189 – Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.

8. ASTM E2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation.

1.04 QUALITY ASSURANCE

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

B. Source Limitation for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

C. Glass Product Testing: Obtain glass test results for product test reports in Submittals Article from a qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program

D. Safety Glazing Labeling: Permanently mark glazing with certification label indicating manufacturer's name, type of glass, glass thickness and safety glazing standard with which glass complies.

E. Installer Qualifications: An experienced installer who has completed glazing similar in material, design and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 23 Submittals.

B. Provide for each glass type:

1. Latest edition of manufacturer's Technical Data including structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.

2. Product Certificates from manufacturer.

3. Product Test Reports for: Tinted Float Glass, Coated Float Glass, and Insulating Glass.

4. Submit two, 12"x12" samples, illustrating glass unit and coloration.

C. Provide data, including VOC content on glazing sealant. Identify colors available.

D. Provide shop drawings: Submit shop drawings showing layout, profiled and product components.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Section 01 60 00 Materials and Equipment.

B. 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.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer's Standard Requirements.

C. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

1.09 WARRANTY

A. Provide Manufacturer's Standard Warranty in accordance with Section 01 78 00 Warranties.

B. Contractor shall guarantee the work covered by this specification against all defects in material and workmanship for a period of not less than FIVE (5) years. Include coverage of sealed glass units from seal failure, interpane dusting or misting, and replacement.

PART 2 – PRODUCTS

2.01 ACCEPTABLE GLASS MANUFACTURERS

A. Insulated, Laminated, and Spandrel Glass: Vitro Architectural Glass (formerly PPG Industries), Tel: (800) 377-5267, Website: www.vitroglazings.com.

B. Security Glazing: Nippon Electric Glass Company, Ltd.; Tel: (800) 426-0279.

C. Fire-Rated Clear Window and/or Door/Sidelight Glazing: SAFTI FIRST, Tel: (888) 653-3333, Website www.safti.com.

D. Spandrel Coatings: ICD High Performance Coatings, Tel: (360) 546-2286, website: www.icdcoatings.com.

2.02 GLASS MATERIALS

A. General Performance Requirement: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

B. GE-1: Exterior Glazing Type 1, Insulated Glass Units.

1. Unit Makeup: Double pane of 1/4” (6mm) outboard lite and 1/4” (6mm) inboard lite with edge seal; 1/2” (12mm) spacer purged with dry hermetic air; total unit thickness of 1 inch.
2. Glass Strength: Tempered as required by codes or as required to meet thermal stress and wind loads.
3. Coating: Low-E Coating on inside of outer layer (#2 surface).
4. Tinting: As indicated on the Drawings.
5. Performance values based on combination of coating and/or tint selected.

C. GE-2: Exterior Glazing Type 1, Insulated Glass Units.

1. Unit Makeup: Double pane of 1/4” (6mm) outboard lite and 1/4” (6mm) inboard lite with edge seal; 1/2” (12mm) spacer purged with dry hermetic air; total unit thickness of 1 inch.
2. Glass Strength: Tempered as required by codes or as required to meet thermal stress and wind loads.
3. Coating: Low-E Coating on inside of outer layer (#2 surface).
4. Tinting: As indicated on the Drawings.
5. Spandrel Coating: As indicated on the Drawings.
6. Performance values based on combination of coating and/or tint selected.

D. GI-1: Interior Glazing Type 1

1. Unit Makeup: Monolithic pane of 1/4” (6mm) lite.
2. Glass Strength: Tempered (Grade B)
3. Style: Clear, Uncoated, Type I (float or plate).
1. Fire protective tested in accordance with NFPA 80, NFPA 252, NFPA 257, UL 9, UL 10B and UL10C.

2.03 GLAZING ACCESSORIES

A. Select appropriate glazing sealants, tapes, gaskets and other glazing materials of proven compatibility with other materials that they contact. These include glass products, insulating glass unit seals and glazing channel substrates under installation and service conditions, as demonstrated by testing and field experience. Provide fire-rated products approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection rating indicated.

B. Glazing Compound: Modified oil type, non-hardening, knife grade consistency.

C. Butyl Sealant: Single component; Shore-A hardness of 10-20; black color; non-skinning.

D. Acrylic Sealant: Single component, solvent curing, cured Shore hardness, non-bleeding.

E. Silicone Sealant: Single component, non-bleeding, non-staining; capable of water immersion without loss of properties.

F. Setting Blocks: Neoprene; 80-90 Shore A durometer hardness; 4 inch minimum long x 1/4 inch thick.

G. Spacer Shims: Neoprene; 40-50 Shore A durometer hardness; 4 inch long on 18 inch centers for wet-glazed systems.

H. Glazing Clips: Manufacturer's standard type.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the area and conditions under which work of this Section will be performed and confirm site conditions are acceptable for installation of the glass.

B. Coordinate work with other trades as needed to assure that proper substrate are provided to receive work of this Section.

C. Verify openings for glazing are correctly sized and within tolerance.

D. Verify surfaces of glazing channels or recesses are clean, square in plane, free of obstructions, and ready for work of this Section.

E. Verify that a functioning weep system is present.

F. Correct conditions detrimental to timely and proper completion of the Work.

G. Do not proceed until unsatisfactory conditions are corrected.

H. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Protect glazing products by handling and storing units according to manufacturer’s recommendations.

B. Clean and prepare glazing channels and other framing members to receive glass.

C. Remove coatings and other harmful materials that will prevent glass and glazing installation required to comply with performance criteria specified.

D. Seal porous glazing channels or recesses.

3.03 EXTERIOR WET METHOD (SEALANT AND SEALANT)

A. Place setting blocks at 1/4 points and install glass pane.

B. Install removable stops with pane centered in space by inserting spacer shims both sides at 18-inch intervals, 1/4 inch below sightline.

C. Fill gap between pane and stops with sealant to depth equal to bite of frame on pane, but not more than 3/8 inch below sightline.

D. Apply sealant to uniform line, flush with sightline. Tool or wipe sealant surface with solvent for smooth appearance. Security Glazing to be sealed with security sealant as recommended by manufacturer.

E. Drain or weep the sill of each opening to the outdoors at three points using 3/8-inch diameter weep holes or the equivalent.

3.04 INTERIOR COMBINATION METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, project 1/16 inch above sightline.

B. Place setting blocks at 1/4 points.

C. Rest glass on setting blocks and push against tape to ensure full contact at perimeter of pane.

D. Install: removable stops, spacer shims between glass, and applied stops at 18-inch intervals 1/4 inch below sightline.

E. Fill gap between pane and applied stop with sealant to depth equal to bite of frame on pane to uniform and level line.

F. Trim protruding tape edge.

3.05 INTERIOR WET METHOD (COMPOUND AND COMPOUND)

A. Install glass resting on setting blocks. Install applied stop and center pane by use of spacer shims at 18-inch centers, kept 1/4 inch below sightline.

B. Locate and secure glass pane using glaziers' clips.

C. Fill gaps between pane and stops with glazing compound until flush with sightline.

3.06 CLEANING

A. After installation, mark pane with an "X" by using plastic tape or removable paste.

B. Remove glazing materials from finish surfaces.

C. Remove labels after work is completed.

D. Clean excess sealant or compound from glass and framing members immediately after application using solvents or cleaners recommended by manufacturers. Final cleaning and polishing shall be done prior to final inspection.

E. Do not use scrapers or other metal tools to clean glass.

F. Remove and replace broken, scratched, chipped or otherwise defective glass with new materials and leave the entire installation in a neat, clean, and acceptable condition.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 09 05 61.13

MOISTURE VAPOR EMISSION CONTROL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Pre-formed moisture suppression membrane installed over concrete subfloor as a floor covering underlayment.

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

C. Coordinate the work of this section and directly related sections with concrete floor construction and repair.

D. Coordinate the work of this section and directly related sections with finish flooring work.

1.03 REFERENCES

ASTM International

A. D2646-05- Standard test Methods for Backing Fabric Characteristics of Pile Yarn Floor Coverings

B. D3273-00- Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

C. D5729-97 (2004)e1 – Standard Test Method for Thickness of Nonwoven Fabrics

D. E-96-05 – Standard Test Methods for Water Vapor Transmission of Materials

E. F 2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

F. F 710 - Standard Practice Preparing Concrete Floors

1.04 QUALITY ASSURANCE

Comply with the Standard requirements established by Manufacturer.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Provide data indicating any product characteristics, performance criteria, and limitations of use.

C. Manufacturer’s Current Instructions.

D. Manufacturer’s warranty registration with concrete subfloor moisture test results and building ambient air temperature and relative humidity test results.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer's Standard Requirements.

1.09 WARRANTY

A. Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

B. Provide Warranty duration based upon requirements of Flooring.

PART 2 – PRODUCTS

2.01 MANUFACTURER

Basis of Design: GCP Applied Technologies Inc. Kovara 95 & MBX (formerly VersaShield 95 & VersaShield MBX). Location: 62 Whittemore Avenue, Cambridge, MA 02140. Phone: 866-333-3726. Website: www.gcpat.com

2.02 MOISTURE SUPPRESSION SYSTEM FOR FLOORING PRODUCTS

A. Product name: Kovara 95 Flooring Underlayment and Kovara MBX Flooring Underlayment.

1. Material: Free-standing, dimensionally stable, 4-ply composite product, engineered as a moisture suppression membrane to be used on concrete floors where high moisture exists.
2. Dimensions: 144 ft. long by 5 ft. wide standard roll.
3. Mold, Mildew & Fungal Resistance, ASTM D3273: 10 rating
4. Moisture Vapor Transmission rate, ASTM E96-05: less than 0.01 g/hr/sq m

B. Accessories: Kovara Double-Sided Seam Tape

1. Application: Joining of moisture suppression underlayment seams.
2. Description: Membrane manufacturer's moisture suppression tape with double-sided pressure sensitive adhesive for use over slabs with a maximum relative humidity of 99.5 percent and maximum pH of 12.
3. Properties: Moisture suppression and adhesion per manufacturer's specifications.
4. Dimensions: 4 inch wide by 100 feet long roll.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify internal RH of the Concrete Sub Floor according to ASTM F-2170.

1. Record readings and submit with manufacturer's warranty registration.
2. Kovara 95: Do not install if relative humidity levels within the concrete exceed 95% Relative Humidity.
3. Kovara MBX: Do not install if relative humidity levels within the concrete exceed 99% Relative Humidity.

3.02 PREPARATION

New or Remedial Installation - Concrete Sub Floor:

A. Prepare floor according to Kovara 95 or Kovara MBX manufacturer's instructions including removal of existing materials on concrete surface, grinding protrusions flat, and filling low spots with water-resistant cementitious patching or leveling compound. Patch cracks greater than 1/8-in. width using VersaShield manufacturer's approved crack mending compound.

B. Remove debris and excessive dust from the surface.

3.03 UNDERLAYMENT INSTALLATION

A. Install moisture suppression membrane with smooth film side facing concrete slab.

B. Install in accordance with membrane manufacturer's current written installation instructions.

C. If any jobsite condition interferes with compliance with manufacturer's instructions, contact manufacturer and obtain written job-specific procedures. Notify architect or owner's representative as required in the Quality Section of this project manual describing the interfering jobsite condition and manufacturer's job-specific instructions.

3.04 FLOORING INSTALLATION

A. Adhesives - Apply adhesive to mineral-coated surface of moisture suppression membrane. Use only water-based adhesives. Do not use solvent-based adhesives.

B. Protection - Protect moisture suppression membrane from damage during flooring installation. Do not tear, rip, puncture, or delaminate membrane when applying trowel-on adhesive. Repair damaged areas according to membrane manufacturer's instructions before flooring installation. Provide continuous, intact moisture suppression membrane under entire designated flooring area.

C. Install flooring according to flooring manufacturer's instructions

1. Laminate or Engineered Wood: Install according to manufacturer's instructions for floating floors.

2. Broadloom Carpet or Carpet Tiles: Adhere directly to moisture suppression membrane using carpet manufacturer's recommended adhesive.

3. Vinyl Tile: Adhere directly to moisture suppression membrane using tile manufacturer's recommended adhesive.

4. Ceramic Tile: Adhere only to approved surfaces - concrete, plywood, precast flooring, gypcrete, radiant heated floors, existing well-bonded vinyl, VCT, LVT, LVP, metal floors, and chemically treated or contaminated surfaces.

D. Not approved for unitary back direct glue wide width carpet, linoleum, rubber tile, sheet vinyl, mechanically fastened solid wood.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 09 21 13

PLASTER ASSEMBLIES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section

1.02 SCOPE OF WORK

Supply and install all Lath and Plaster Work as shown on the Drawings and as specified herein, for a complete and proper installation.

1.03 REFERENCE STANDARDS

Comply with all applicable requirements of the California Lathing and Plastering Contractor's Association "Reference Specifications" except where more stringent requirements are indicated herein or in local building codes.

1.04 QUALITY ASSURANCE

A. In all Work under this Section, coordinate with all other trades whose work connects with, is affected or concealed by lathing and plastering. Before proceeding, make certain all required inspections have been made. Do all cutting and patching required to accommodate the work of other trades.

B. Inspect surfaces to receive lath and plaster before starting Work and do not start until surfaces are acceptable. Starting Work under this Section implies acceptance of surfaces.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Prove in accordance with Section 01 33 00 Submittal Procedures.

B. Submit Product Data and color samples and manufacturers application data.

C. Make (2) samples, at least one-foot square, of selected specified plaster system.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Deliver all manufactured materials in original packages bearing manufacturer's name and brand. Use only one brand of each material throughout job. Store materials in dry areas.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer's Standard Requirements.

1.09 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 LATH

Paperbacked Lath: K-Lath Corporation: "Aqua K-Lath", or as approved by Architect, 16 gauge wires spaced 1-1/2 inches o.c. vertically and welded to 16 gauge wires spaced 2 inches o.c. horizontally, with perforated Kraft paper to insure plaster embedment and Type I Class D waterproof building paper laminated to back side.

2.02 ACCESSORIES

A. Corner Bead: #1X Type, Keene or equal, expanded metal flanges integral with nose bead of solid metal, galvanized.

B. Corner Lath: As specified for expanded metal, three (3) inch legs bent to a 105-degree corner, - "Cornemaster #30" by Keene, or equal.

C. Casing Beads: #66 Type, Western, or equal, expanded metal flange, galvanized, depth as required by plaster thickness, weighing approximately 200# per 1000 lineal feet for 3/4-inch and 7/8-inch types.

D. Expansion Joints: #15 by Keene or equal. Cut lath passing under expansion joints. Install where indicated on Drawings, with the following minimum conditions:

1. No length should be greater than 18 feet in either direction
2. No panel shall exceed a maximum of 144 square-feet for vertical applications.
3. No panel shall exceed a maximum of 100 square-feet for horizontal, curved or angular sections.
4. No length-to-width ratio should exceed 2.5 to 1 in any given panel.

E. Bonding Agent: As recommended for application over smooth monolithic concrete shells. Concrete shells shall be cleaned with bonding agent applied prior to plastering interior.

F. Wire: Soft, annealed, galvanized steel, 8-gauge for hangers, 16-gauge for channel ties and 18-gauge for lath ties.

G. Nails: Concrete nails, case hardened steel, 3/4 inch long.

H. Weep Screed: by Keene or equal. 1-1/4” ground, galvanized.

I. Building Paper: 15#, asphalt impregnated. Install over Weather Barrier specified in Section 07 25 00 and shown on the Drawings.

J. Miscellaneous Items: Furnish all miscellaneous components not specified herein but shown on the Drawings and any other items required to complete the installation.

K. Water: Clean and free of deleterious matter.

2.03 PORTLAND CEMENT PLASTER

A. Portland Cement: Conforming to ASTM C-150, Type 1.

B. Sand for Cement Plaster: Conforming to ASTM C926.

C. Hydrated Lime: Conforming to ASTM C-206, Type S.

D. Quick Lime: Conforming to ASTM C-5.

E. Exterior Cement Plaster:

1. Scratch Coat: One part Portland Cement, four (4) parts sand and hydrated lime equal to 25% volume of cement.
2. Brown Coat: One part Portland Cement, five parts sand and hydrated lime equal to 25% of the volume of cement.
3. Finish Coat: Portland Cement-Lime: one part standard Portland Cement, not more than 1/2 part dry hydrated lime (or an equivalent amount of lime putty) and not more

than one part #20 mesh, and one part #16 mesh silica sand. Submit finish sample(s) for Architect's approval.

4. Thickness: 7/8 inch thick, measured from back of lath.
5. Finish coat to contain integral color. Submit samples to Architect for approval based upon colors indicated on Drawings.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and condition under which work of this Section will be performed.

B. Verify that specified items may be installed in accordance with the approved design.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 GENERAL

A. Coordinate work with other trades as needed to assure that proper substrate are provided to receive work of this Section.

B. Provide ventilation to properly dry plaster during and subsequent to application. In glazed areas, accomplish by keeping windows open sufficiently to provide air circulation; in enclosed areas lacing normal ventilation, mechanically remove moisture-laden air.

3.03 LATHING

A. Apply lath with long dimension at right angles to supports; lap side and ends as recommended by manufacturer. Stagger vertical laps. Make no vertical joints at any corner; bend lath around all corners, internal and external.

B. Attach lath to studs by fasteners at spacings required by local building codes. All attachments to be corrosion resistant.

C. Install all accessories to plumb, true and level lines, and backing plates as located by the trade furnishing these items.

D. Install beads, corner laths, control joints, reglets, screeds, and like items, using single lengths wherever possible. Provide corner beads at all exterior corners shown, mitering or coping as required, and fastening at six (6) inches o.c., both sides. Provide casing beads wherever interior plaster angles are shown and wherever one or both abutting surfaces are metal lathed, except corner laths are not required where metal lath is continuous around corner at junctions of walls, or where ceiling lath turns down a wall. Tie outer edges only to adjoining lath at six (6) inches o.c. or stub nail to any concrete. Install access panels supplied by other trades.

E. Start installation at bottom of wall, working up and from right to left. Apply lath with long dimension at right angles to supports; lap sides and ends as recommended by manufacturer. Stagger vertical laps. Make no vertical joints at any corner; bend lath around all corners, internal and external.

F. Attach lath to metal and/or wood studs by means of tie wire and nails respectively at spacings as required by Local Building Codes. All attachments shall be corrosion resistant.

G. Install corner beads at all external corners. Use single length except where standard length is not sufficient. Miter or cope as required; fasten with tie wire at six (6) inches o.c., both sides.

H. Install at interior angles and sheer one or both abutting surfaces are metal lath. Corner laths are not required where metal lath is continued around corner at junction of walls and where ceiling lath turns down wall unless otherwise noted on drawings. The outer edges only to adjoining lath at six (6) inches o.c., or stub nail to concrete.

3.04 PLASTERING

A. Do not apply plaster below 55 degrees F temperature. Apply no plaster to frosty surfaces. Dampen any surfaces on which suction must be reduced with fog-spray. Maintain all screeds plumb and true.

B. Except when had mixing small batches is approved, use approved mechanical mixers. Clean mixers, mixing boxes and tools after mixing each batch. Thoroughly mix with water until uniform in color and consistency. Retempering not permitted. Discard plaster, which has begun to stiffen. Mix in strict accordance with manufacturer's printed directions.

C. Except in the case of specifically formulated plasters, which require only water added job site, proportion by volume as specified.

D. Scratch coat: Apply with sufficient material and pressure to shove material through metal lath and form a good key; 3/8 inch minimum thickness, score in horizontal direction with metal scorer with clipped teeth to provide good mechanical key for second coat. Dampen concrete and concrete block surfaces to reduce suction prior to application.

E. Brown coat: Apply not sooner than 48 hours after application of scratch coat; properly dampen scratch coat; apply sufficient pressure to force plaster into scratches and build out to within 1/8 inch to screeds; for, float and darby to true, plumb surfaces and corners; leave rough for finish coat.

F. Curing: Keep Brown coat moist for at least 48 hours; commence moistening as soon as plaster has hardened sufficiently so to prevent injury; apply water in a fine fog spray; avoid soaking; curing shall proceed over holidays, Saturdays and Sundays if necessary. If atmospheric conditions are hot and dry, curing time shall be extended as necessary at no additional cost to Owner. Allow plaster base coats to cure for a minimum of fourteen (14) days before applying finish coat.

G. Finish coats Apply to partially dry base coat, or to a thoroughly dry base coat that has been evenly wetted by brushing or spraying; avoid use of excessive water. Trowel all finish surfaces of plaster to perfectly true and even surface without scratches, ridges, voids, cracks, etc. Fill fissures or breaks in brown coat and existing plaster before application of finish coat. Make coats uniform in thickness with average thickness about 1/8 inch; minimum thickness anywhere: 1/16 inch.

3.05 CLEANING AND PATCHING

A. A clean floor of droppings immediately after each coat is applied. At any exterior locations, remove droppings or splashes from all concrete, masonry or other finish surfaces.

B. Patch after all other Work, except painting, has been completed. Cut out damaged or broken plaster to straight lines with clean, sharp edges. Cut out cracks to width of at least one (1) inch. Fill areas to be patched with base materials, and then give a finish coat of same material as adjoining plaster. Patched areas shall match adjoining work in finish and texture. Joining shall be flush and smooth so joints between patch and existing plaster are not noticeable.

C. At completion of Work, remove excess plaster from beads, screeds, etc., and leave Work clean and ready for painting. Promptly remove plaster, rubbish, surplus material, scaffolding and other equipment from job site. Leave areas broom clean.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all Gypsum Board Products, as shown on Drawings and as specified herein, including all accessories and labor for a timely, complete, and proper installation

A. Fire-Resistance Rated Gypsum Board

B. Mold and Moisture Resistant Gypsum Board

C. Fire-Resistance, Mold and Moisture Resistant Gypsum Board

D. Cement Board

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

A. Comply with the Standard requirements established by Manufacturer.

B. Abuse Resistant Gypsum Board Performance Criteria:

1. Classification:

a. Surface Abrasion: Level 1-3

b. Surface Indention: Level 1

c. Soft Body Impact: Level 1-2

2. Wall Assembly Fire-Resistance Rating: locations per the drawings.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

Provide in accordance with Section 01 33 00 Submittal Procedures.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

Comply with the requirements of Sections 01 50 00 Construction Facilities.

1.09 WARRANTY

Provide Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 - PRODUCTS

2.01 MANUFACTURER / PRODUCTS

Basis of Design: Products of National Gypsum Company

2.02 FIRE-RESISTANCE RATED GYPSUM BOARD

A. Basis of Design: Gold Bond® BRAND Fire-Shield C Gypsum Board.

B. Panel Physical Characteristics:

1. Core: Enhanced fire-resistance rated gypsum core
2. Surface paper: 100% recycled content paper on front, back and long edges
3. Long Edges: Square or Tapered at Contractor's discretion.
4. Overall thickness: 5/8 inch.
5. Panel complies with Type X requirements of ASTM C 1396 Standard Specification for Gypsum Board

2.03 MOLD AND MOISTURE RESISTANT GYPSUM BOARD

A. Basis of Design: Gold Bond® BRAND XP® Gypsum Board

B. Panel Physical Characteristics

1. Core: Mold and moisture resistant gypsum core.
2. Surface paper: 100% recycled content moisture/mold/mildew resistant paper on front, back, and long edges.
3. Long Edges: Square or Tapered at Contractor's discretion.
4. Overall thickness: 5/8 inch.
5. Panel complies with requirements of ASTM C 1396 Standard Specification for Gypsum Board.
6. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

2.04 FIRE-RESISTANCE RATED GYPSUM BOARD WITH ENHANCED MOLD AND MILDEW RESISTANCE

A. Basis of Design: Gold Bond® BRAND XP® Fire-Shield® C Gypsum Board

B. Type C, Panel Physical Characteristics

1. Core: Mold and moisture resistant, with enhanced fire-resistance rated gypsum core
2. Surface paper: 100% recycled content moisture/mold/mildew paper on front, back and long edges
3. Long Edges: Square or Tapered at Contractor's discretion.
4. Overall thickness: 5/8 inch.
5. Panel complies with requirements Type X of ASTM C 1396 Standard Specification for Gypsum Board
6. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

2.05 CEMENT BOARD

A. Cement Backerboard

1. Basis of Design: PermaBase® BRAND Cement Board
2. Panel Physical Characteristics

a. Core: Cementitious, water-durable

b. Surface: Fiberglass mesh on front and back

c. Long Edges: Tapered

d. Overall Thickness: 5/8 inch.

e. Panel complies with requirements of ASTM C 1325 Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units and ANSI A118.9

f. Density: 72 lbs. per cu. ft.

g. Water Absorption: Not greater than 8% when tested for 24 hours in accordance with ASTM C 473 Standard Test Methods for Physical Testing of Gypsum Panel Products

B. Cement Board Underlayment

1. Basis of Design: PermaBase® BRAND Cement Board

2. Panel Physical Characteristics

a. Core: Cementitious, water-durable

b. Surface: Fiberglass mesh on front and back

c. Long Edges: Tapered

d. Overall Thickness: 1/4 inch

e. Panel complies with requirements of ASTM C 1325 and ANSI A118.9

f. Density: 72 lbs per cu. ft.

g. Water Absorption: Not greater than 8% when tested for 24 hours in accordance with ASTM C 473 Standard Test Methods for Physical Testing of Gypsum Panel Products

2.06 ACCESSORY PRODUCTS

A. Acoustical sealant

1. Conform to ASTM C 919 Standard Practice for Use of Sealants in Acoustical Applications

2. Products/Manufacturer

a. Grabber Acoustical Sealant GSC

b. STI SpecSeal Smoke N Sound Caulk

c. BOSS 824 Acoustical Sound Sealant

B. Firestopping

1. Conform to ASTM E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

2. Products/Manufacturer

a. STI SpecSeal SSP Putty Pads

b. BOSS 818 Fire Rated Putty Pads

C. Fasteners for use with 5/8-inch thick tile backer panels: As recommended by Manufacturer.

D. Fasteners for use with Cement Board:

1. PermaBase Cement Board Hi-Lo thread screws (No. 8).

2. Wafer head, corrosion-resistant.
3. Overall Thickness: As recommended by Manufacturer.
4. For use with wood framing and complying with ASTM C 1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

E. Joint Treatment

1. Tape - As recommended by Manufacturer:
    a. Paper Tape: 2-1/16 inches wide.
    b. Paper Tape: 2 inches wide with metal strips laminated along the center crease to form inside and outside corners.
    c. Fiberglass Tape: Nominal 2 inches wide self-adhering tape.
    d. Alkali-resistant Fiberglass Tape: Nominal 2 inches wide polymer coated alkali-resistant mesh tape.
2. Drying Type Compound - As recommended by Manufacturer:
    a. Ready Mix vinyl base compound.
    b. Ready Mix vinyl base compound formulated for enhanced mold and mildew resistance.
    c. Ready Mix vinyl base compound formulated to reduce airborne dust during sanding.
    d. Ready Mix vinyl base topping compound for finish coating.
    e. Ready Mix vinyl base compound for embedding joint tape, corner beads or other accessories.
    f. Field Mix vinyl base compound.
3. Setting Compound - As recommended by Manufacturer:
    a. Field mixed hardening compound.
    b. Field mixed hardening compound for fire resistance rated construction and penetrations.
4. Joint Sealant: Conform to ASTM C920 Standard Specification for Elastomeric Joint Sealants.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive gypsum products to verify conditions.

B. Report conditions contrary to contract requirements that would prevent a proper installation.

C. Do not proceed with the installation until unsatisfactory conditions have been corrected.

D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the conditions.

E. Installation indicates acceptance of the conditions with regard to conditions existing at the time of installation.

3.02 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840, GA-216 or GA-214.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panel not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 to 3/8 inch (6 to 9 mm) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 to ½ inch (6 to 12 mm) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.03 INSTALLATION, INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: Vertical or horizontal surfaces, unless otherwise indicated.

2. Type X: Where required for fire-resistance-rated assembly.

3. Type C: Where required for specific fire-resistance-rated assembly indicated.

4. Ceiling Type: Ceiling surfaces.

5. Moisture and Mold-Resistant Type: Areas with limited exposure to water.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On furring members, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.04 INSTALLATION, CEMENT BOARD PANELS

A. Install in accordance with manufacturer recommendation and ANSI A108.11.

B. Install where tile finish is indicated in the Drawings.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.05 INSTALLATION, TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings and if not shown according to ASTM C 840 or GA-216 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations

1. Cornerbead: Use at outside corners, unless otherwise indicated. Install standard 90 degree cornerbeads where corner guards and chair rails are to be installed.

2. LC-Bead: Use at exposed panel edges.

3.06 FINISHING GYPSUM BOARD

Provide a Level 4 Finish, with a light orange-peel texture. All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compounds

shall be smooth and free from tool marks and ridges. The prepared surface shall be coated with Sheet Rock Brand First Coat Primer, or equal, prior to the application of the light orange-peel texture.

3.07 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 09 30 00

TILING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all materials and labor, as shown on Drawings and as specified herein, including all accessories and hardware for a timely, complete, and proper installation.

A. Porcelain and Ceramic Tile

B. Floor and Wall Glazed.

C. Wall Glazed.

D. Trim and Accessories.

E. Setting Materials.

1.03 STANDARDS AND REFERENCES

A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Certificate of grade: Submit for approval, with each delivery, manufacturer's grade certificate in conformance with Tile Manufacturers Association, certifying grade, type and quality of tile furnished.

C. Dynamic Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ANSI 137.1.

D. Tile delivered in sealed cartons identified with grade certificate.

E. Cartons of tile kept dry until tiles are removed, tile prevent from staining.

F. All tile free from chips, cracks, scratches, pits or other defects.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products of this section with minimum ten years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum of five years' documented experience.

C. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.

D. Performance Requirements: Dynamic Coefficient of Friction (DCOF): Provide floor tiles at interior level spaces with a wet dynamic coefficient of friction value of 0.42 or greater when tested in accordance with ANSI A137.1-2012 standard for ceramic tile.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Manufacturer’s Specifications, catalog cuts, and other data needed to prove compliance with the specified requirements of tile, sealants, grout, trim, fasteners, adhesives and sealers.

2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.

4. Installation methods.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Selection Samples: Samples of actual tiles for selection.

E. Samples: Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.

F. Manufacturer's Certificate:

1. Certify that products meet or exceed specified requirements.

2. For each shipment, type and composition of tile provide a Master Grade Certificate signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.

G. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Locate mock-ups on site in locations and size directed by Architect.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

4. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of Work.

5. Obtain Architect's acceptance of mock-ups before start of final unit of Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements of ANSI A137.1 for labeling sealed tile packages.

C. Prevent damage or contamination to materials by water, freezing, foreign matter and other causes.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

C. Environmental: Install mortar, set and grout tile when surfaces and ambient temperature is minimum 50 degrees F (10 degrees C) and maximum 90 degrees F (32 degrees C). Consult with manufacturer for specific requirements.

D. Do not install mortar, set or grout tile exterior when inclement weather conditions are expected within 48 hours after work is completed unless properly protected.

E. Protection: Protect adjacent work surfaces during tile work. Close rooms or spaces to traffic of all types until mortar and grout have set.

F. Safety: Observe the manufacturer's safety instructions including those pertaining to ventilation.

1.09 OPERATION AND MAINTENANCE DATA

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.10 EXTRA MATERIALS

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Provide for Owner's use a minimum of 2 percent, but not less than one box, of the each of the sizes and colors of tile specified, boxed and clearly labeled.

1.11 WARRANTY

Provide Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2– PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:

1. Emser Stone and Tile, www.emser.com – Contact: Lori Fisher (Architectural Sales Representative) at (760) 834-2095, lorifisher@emser.com.
2. Daltile, www.daltile.com – Contact: Christina Regan (Architectural Sales Representative) at (909) 844-7186, Christina.regan@daltile.com.
3. Arizona Tile, www.arizonatile.com – Contact: Phil York (Architectural Sales Representative) at (760) 321-2005, pyork@arizonatile.com.

B. Tile: Standard grade, meeting the simplified Practice Recommendations F61-61, also Fed. Spec. SS-T-308B and ANSI A-137.1. Cartons grade sealed.

2.02 TILE

A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:

1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.

3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

B. Material:

1. Furnish: size(s), color(s), pattern(s) and shape(s) as indicated on the drawings.
2. Trim Units: Matching bullnose, cove/inside finger cove, radius cap, sink rail, sink rail incorner/outcorner, cement bullnose, cove base, fabric bullnose, grooved bullnose, jolly shapes in sizes coordinated with field tile
3. Provide standard accessory shapes as required and as accepted by Architect.
4. Use appropriate trim shapes to conform to drawings.
5. Metal trims shall have a clear anodized finish – protected as to resist discoloration from adhesives and grouts.
6. Floor Tile: Shall meet the static coefficient of friction (COF) prescribed by ADAAG – 0.6 for level floors and 0.8 for ramps.

2.03 TRIM AND ACCESSORIES

Non-Ceramic Trim: Satin natural anodized extruded aluminum, stainless steel, brass, etc., style and dimensions to suit application, for setting using tile mortar or adhesive; use in the following locations:

A. Product: as indicated on the drawings.

B. Open edges of floor tile.

C. Transition between floor finishes of different heights.

D. Thresholds at door openings.

E. Expansion and control joints, floor and wall.

2.04 SETTING MATERIALS

A. Membranes: Liquid applied waterproof/crack isolation membrane (For Cracks Up To 1/8”):

1. Basis: Custom Building Products RedGard waterproof/crack isolation membrane.
2. Acceptable Products: Laticrete International Hydro Ban Floor and Wall Waterproofing & Crack Isolation & MAPEI Mapelastic AquaDefense.

B. Bonding Materials:

1. Bonded Mortar Bed Installations: Where indicated on the drawings, and elsewhere as required for mortar bed or brown coat as the substrate for tile work; work to conform to ANSI A108.1.
    a. Portland cement: ASTM C 150, Type 1.
    b. Sand: ASTM C 144.
    c. Water: Potable, fresh.
    d. Setting bed reinforcing mesh: 2-inch by 2-inch by 16/16, 3-inch by 3-inch by 13/13 or 1-1/2-inch by 2-inch by 16/13 wire complying with ASTM A 82 or A 185.
    e. Latex modified dry-set mortar: The following or equal with physical properties equaling or exceeding those of the products specified.

f. Mortar Bed Bonding Mortar; Custom Building Products VersaBond mortar bed bonding mortar.

2. Medium Bed/Thin Set (Non Slumping) Mortar:

a. Basis: Custom Building Products ProLite polymer modified thin set/medium bed mortar.

b. Acceptable Products: Laticrete International 255 MultiMax or MAPEI Large Floor Tile Mortar

C. Grout:

1. Portland cement grout at walls:

a. Basis: Custom Building Products Polyblend Sanded Grout, ANSI A118.7 for joints 1/8 inch to 1/2 inch.

b. Or equivalent, architect approved product by Laticrete International

2. Epoxy grout at floors:

a. Basis: Custom Building Products CEG-Lite Epoxy Grout, ANSI A118.7 for joints 1/8 inch to 1/2 inch.

b. Or equivalent, architect approved product by Laticrete International

D. Silicone Sealant: 100% Silicone Caulk by Custom Building Products or equal; color as indicated in drawings.

E. Tile and Grout Sealer: Aqua Mix, Inc., Santa Fe Springs, CA

F. Reinforcing – provide according to manufacturer requirements:

1. Mesh: 2 by 2 inch (50 by 50 mm) size weave of 16/16 wire size; welded fabric, galvanized.

2. Metal Lath: ÅSTM C847, Flat expanded diamond mesh, not less than 2.5 lbs/SY, galvanized finish.

G. Cementitious Backer Board: Refer to Section 09 29 00 for Cement Backer Board.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.

C. Verify that required floor-mounted utilities are in correct location.

D. According to Section 07 05 00, verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Report any conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

F. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the conditions. Installation indicates acceptance of substrates with regard to

conditions existing at the time of installation.

3.02 PREPARATION

A. General

1. Coordinate work with other trades as needed to assure that proper substrate are provided to receive work of this Section.
2. Before tiling, confirm variations of surface to be tiled fall within maximum variations shown below:
    a. Cement Mortar Bed: ¼" in 8' for walls, ¼" in 10' for floors.
    b. Epoxy Adhesive: 1/8" in 8' for walls, 1/8" in 10' for floors.
    c. Organic Adhesive: 1/8" in 8' for walls, 1/8" in 8' for floors
3. Surfaces shall be clean and free of dust, oil, grease, paint, tar, wax, curing compound, primer, sealer, form release agent, laitance, loosely bonded topping, loose particles or any deleterious substance and debris which may prevent or reduce adhesion.
4. Patch any deep abrasions to the existing mortar bed substrate prior to skim coating and installing the new crack isolation membrane

B. Concrete Surface Preparation

1. All concrete substrates shall be at least 28 days old, completely cured and free of hydrostatic conditions, and/or moisture problems.
2. New concrete surfaces for dry-set mortar, medium-bed mortar or thick-bed mortar installations shall be wood floated or broom finished. Concrete walls should be bush-hammered or heavily sandblasted. On grade or below grade concrete slabs must be installed over an effective vapor barrier and be exempt from hydrostatic pressures.
3. Over excessively dry porous concrete, keep the concrete substrate continuously moist for at least 24 hours before work begins when using dry-set mortars or medium-bed mortars. Remove all excess water or standing water allowing the surface to become almost dry before installing the leveling coat, dry-set mortar or medium-bed dry-set mortar.
4. For minor repairs and smoothing up to 1/2 inch (12 mm), use Skim Coat & Patch Cement Underlayment or Speed Finish Patching & Finishing Compound.
5. For leveling of large areas use LevelLite Self-Leveling Underlayment for pours up to 2 inches (51 mm) thick, LevelQuik Rapid Setting Self-Leveling Underlayment for pours up to 1 inch (25 mm) thick or Extended Setting Self-Leveling Underlayment for pours up to 1 inch (25 mm) thick.
6. Custom Float Bedding Mortar mixed with water and Acrylic Mortar Admix to build-up or level a concrete substrate requiring a topping between 1/2 inch (12 mm) and 2 inch (50 mm) average thickness (see data sheet for details).

3.03 INSTALLATION – GENERAL

A. Comply with current TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Except as otherwise may be specified herein, all tile work shall conform with Standard Specifications A-108.1, A-108.4, A-108.5, A-108.6, A-108.9, A-108.10 issued by the American National Standards Institute.

C. All tile shall be cut for proper fitting around work in place. Exposed edges of cuts shall be rubbed smooth with an abrasive stone. All tile shall be ground and carefully fitted at intersections against trim finish between fixtures and accessories. Tile shall be carefully fitted around outlets, pipes, fixtures, and fittings so that the plates, escutcheons, or collars all overlap the cut.

D. Tile shall be kept free of stains before placing. Temporary guide strips shall be set with mortar or spot tiles shall be placed to fit the exact plans of each finish wall line. Mortar bed for interior glazed wall tile shall be not less than 3/8" thick and not more than 1/2" thick.

E. Pattern of tile shall be accurately laid out and established working from center of each wall or space to assure equal size tiles on ends. Patterns shall be as noted on the drawings.

F. All joints shall be grouted full, flush and smooth with the specified grout in accordance with the manufacturer's instructions.

G. All walls shall be checked for plumb and all angles checked for square before tile work is started.

3.04 LIQUID MEMBRANE INSTALLATION

A. Pre-treat Penetrations: Pack any gaps around pipes, lights or other penetrations with a compressible backer rod and suitable waterproof sealant. Apply a liberal coat of liquid around penetration opening. Embed pieces of 6" (15 cm) wide fabric into liquid. Cover with a second layer of liquid. After curing, seal flashing with a waterproof sealant.

B. Expansion Joints: Cracks in excess of 1/8" (3 mm) should be treated as expansion joints. Carry these types of joints through any subsequent finishing material. Clean the joint and install open or closed cell backer rod to the proper depth as outlined in EJ 171 in the Tile Council Handbook. Next, compress a sealant as specified by the architect into the joint, coating the sides and leaving it flush with the surface. After the sealant is dry, place bond breaker tape over joint. Apply a minimum 3/64" (1.2 mm) of liquid over the joint and substrate. Install the tile work onto the membrane but do not bridge the joint. After the tile work is set properly, fill the joint with any specified color sealant, following the architect’s and manufacturer’s instructions.

C. Pre-treat Drains:

1. Drains should have a clamping ring with open weep holes for thin-set application. Cut a square of reinforcing fabric approximately 38" x 38" (96 x 96 cm). In the center of the fabric cut a hole that matches the diameter of the drain throat. Apply a liberal coat of liquid to the bottom flange. Drain should be fully supported without movement and even with plane of substrate.

2. Center the circular cutout over the drain throat and embed the fabric into the liquid making sure it does not obstruct the drainage hole. Then apply an additional coat of liquid. Wet coat thickness should be 20 - 30 mils thick.

3. After curing, apply a waterproof sealant bead where the fabric cutout meets the drain throat. Clamp upper flange onto membrane and tighten. Caulk with a silicone caulk around flange where membrane and upper flange make contact. A toilet flange can be handled in much the same manner.

3.05 SETTING MATERIALS INSTALLATION

A. Specified medium bed setting materials may be installed up to 3/4 of an inch thick on horizontal surfaces.

B. Apply mortar or adhesive with notched trowel using scraping motion to work material into good contact with the wall surface to be covered. Maintain 95 percent coverage on back of Tile and fully bed all corners.

C. When installing natural stone Tiles, trowel a sufficient quantity of mortar adhesive onto back of each Tile.

D. Maintain 95 percent coverage on back of the Tile and fully bed all corners.

E. Apply only as much mortar or adhesive as can be covered within allowable windows as recommended by mortar or adhesive manufacturer or while surface is still tacky.

F. Set Tiles in place and rub or beat with small beating block.

G. Lightly beat or rap Tile to ensure proper bond and also to level surface of Tile.

H. The setting materials must be free of voids to create a continuous, solid bond.

I. Align Tile to show uniform joints and allow for setting until firm.

J. Clean excess mortar or adhesive from surface of Tile with wet cheesecloth while mortar is fresh.

3.06 GROUT INSTALLATION

A. Allow tile to set for a minimum of 48 hours prior to grouting. Remove all spacers, ropes, glue and foreign material prior to grouting.

B. Follow grout manufacturer's recommendations as to grouting procedures and precautions.

1. Force maximum amount of grout into joints in accordance with pertinent recommendations in ANSI 108.10.

2. Fill-joints of cushion edged tile to depth of cushion; fill square edged tile flush with surface.

3. Provide hard finished grout which is smooth and without voids, pinholes or low spots.

4. Seal grout with specified penetrating sealer 48-72 hours after grout application.

3.07 JOINT INSTALLATION

A. Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

B. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

C. Joints must be carried through all layers of installation materials including tile, setting bed, mortar bed and reinforcing wire. Joints should be every 20 to 25 feet in both directions for interior installations and 8 to 12 feet in both directions for exterior installations. (Refer to TCA Handbook, EJ171 and ANSI AN-3.8 for details on placements, size and specifications of materials).

3.08 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane, unless otherwise indicated.

1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.

2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F132, bonded.

3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F114, with cleavage membrane.

B. Cleavage Membrane: Lap edges and ends.

C. Waterproofing Membrane: Install as specified in ANSI A108.13.

D. Mortar Bed Thickness: 1-1/4 to 2 inch (32 to 51 mm) maximum, unless otherwise indicated.

3.09 INSTALLATION – SHOWERS

A. At tiled shower receptors install in accordance with TCA Handbook Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. Grout with standard grout as specified above.

C. Seal joints between tile work and other work with sealant specified in Section 07900.

3.10 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCA Handbook Method W244, using membrane at toilet rooms.

B. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.

C. Over wood studs without backer install in accordance with TCA Handbook Method W231, mortar bed, with membrane where indicated.

D. Over metal studs without backer install in accordance with TCA Handbook Method W241, mortar bed, with membrane where indicated.

3.11 CLEANING

Clean and seal all tile and grout surfaces.

3.12 PROTECTION OF FINISHED WORK

A. Do not permit traffic over finished floor surface for 72 hours after installation.

B. Cover floors with kraft paper and protect from dirt and residue from other trades.

C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all Acoustical Ceiling Work, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

A. Have applicators approved by manufacturer of material or system being installed.

B. Work hereunder requires coordination with trades who's Work connects with, is affected, or concealed by acoustical units. Before proceeding with Work, make certain all required inspections have been made.

C. Examine sub-surfaces to receive Work. Commencement of Work will be construed as acceptance of all sub-surfaces.

D. Comply with all applicable requirements of Acoustical Materials Association, Bulletin "Architectural Acoustical Materials".

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Submit complete layout of all systems including attachments, intersections of members and edge conditions.

C. Samples: submit 2 samples of each type of unit specified herein.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Deliver all manufactured materials in original containers bearing manufacturer's name and brand. Use only one brand for each type of unit throughout job. Store materials within building in locations directed.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer's Standard Requirements.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 EXTRA MATERIALS

Comply with the requirements of Section 01 77 00 Project Closeout.

1.11 RECORD DRAWINGS

Provide in accordance with Section 01 77 00 Project Closeout.

1.12 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 SUSPENSION GRID

A. Ceiling Suspension Materials: Comply with ASTM C635, as applicable to the type of suspension system required for the type of ceiling units indicated. Coordinate with other work supported by or penetrating through the ceilings.

B. Manufacturer, Type, Location, and Pattern: as indicated on the drawings.

C. Edge Mouldings: Manufacturer's standard channel moulding for edges and penetrations of ceiling, with a single flange of moulding exposed, white baked enamel finish, unless otherwise indicated.

2.02 ACOUSTICAL TILE

A. Manufacturer, Type, Location, and Pattern: as indicated on the drawings.

B. Substitutions: As approved by Architect.

2.03 EXTRA STOCK

Order additional 3% of each type, with one box minimum, of acoustical unit specified, for maintenance use, at no additional cost to Owner.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installer must examine the conditions under which the acoustical ceiling work is to be performed and notify the Contractor in writing of any unsatisfactory conditions. This installer shall make sure all unsatisfactory conditions have been corrected in a manner acceptable to the installer before proceeding with Work.

B. Provide all materials and accessories for complete installation per Drawings and manufacturer's printed instructions and recommendations.

C. Install units to sub-surfaces from setout points and to pattern shown on Drawings. Verify location of Work of other trades so their items occur within a whole unit or at joints as shown.

D. Install units in place fitting snugly. Provide spacers or hold-down clips where shown or required.

E. After installation, clean any soiled surfaces. Replace any damaged units at no additional cost to the Owner.

F. Arrange acoustical units in the manner shown by reflected ceiling plans. Consult with Architect pertaining to any adjustments.

3.02 SUPPORT SYSTEMS FOR SUSPENDED CEILING

A. General: Ceilings shall not support material or building components other than grills, insulation batts or light fixtures. Duct work, plumbing and like work shall have its own support system and shall not use the ceiling system or suspension wires.

B. Vertical Support System: Suspension wires shall be a minimum of 12-gauge galvanized wire attached to the main runner at 4 ft. maximum spacing in both directions. Each wire shall be anchored to the structure above with a device capable of supporting a minimum of 75 pounds. Wires supporting fixtures shall be capable of supporting four times the fixture weight. Suspension wires shall not hang more than 1 in 6 out of plumb unless counter sloping wires are provided. Wires shall not attach to or bond around interfering material such as ductwork. Trapeze or equivalent devices shall be used where obstructions interfere with direct suspension.

C. Horizontal Support System: The lateral support system for ceilings shall be shown in detail shop Drawings. Provisions shall be made for possible deferential movement between ceilings and sidewalls. Terminal ends of each main and each cross runner shall be wire supported; wall trim angles shall not provide primary support for runners. Lateral support of ceilings shall not be provided by the angle trim and runner shall not be riveted to wall trim.

D. Light Fixture Support: All recessed or drop-in light fixtures shall be supported directly from the fixture housing to the structure above with a minimum of two 12 gauge wires; leveling and positioning of fixture may be provided by the ceiling grid. Fixture support wires may be slightly loose to allow fixture to seat in heavy-duty grid system only.

E. Secure wire hangers by looping and wire tying either directly to structures or to inserts, eye-screws or other devices which are secure and appropriate for the substrate, and which will not deteriorate or fail with age or elevated temperatures.

3.03 CLEANING AND PROTECTION

A. Clean exposed surfaces of acoustical ceilings, including trim, edge mouldings and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

B. The installer shall advise the Contractor of required protection for the acoustical ceilings, including temperature and humidity limitations and dust control, so that the Work will be without damage and deterioration at the time of acceptance by the Owner.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 09 65 00

RESILIENT FLOORING AND BASE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Supply and install all Resilient Flooring and Base, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation.

B. Work includes, but not limited to these major items:

1. Resilient tile flooring.
2. Floor substrate surface.
3. Rubber base.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

Conform to applicable code for flame rating requirements of 75 or less in accordance with ASTM E84.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Provide product data on specified products, describing physical and performance characteristics.

C. Submit two samples, illustrating color and pattern for each floor material or base, substituted for those indicated in the Drawings.

D. Submit manufacturer's installation instructions. When approved by the Architect, will become the basis for accepting or rejecting actual installation procedure used on the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

1.09 OPERATION AND MAINTENANCE DATA

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Submit cleaning and maintenance data maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.10 EXTRA MATERIALS

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Provide 5% of each pattern and color of flooring and of base specified.

1.11 WARRANTY

A. Provide Warranty in accordance with Section 01 78 36 Warranties.

B. Duration: Manufacturer's 10-Year Commercial Limited Warranty.

PART 2 – PRODUCTS

2.01 VINYL COMPOSITION TILE

Manufacturer(s), Type(s), Location(s), Color(s), and Pattern(s) as indicated on drawings.

2.02 RESILIENT SHEET

Manufacturer(s), Type(s), Location(s), Color(s), and Pattern(s) as indicated on drawings.

2.03 RESILIENT PLANK/TILE

Manufacturer(s), Type(s), Location(s), Color(s), and Pattern(s) as indicated on drawings.

2.04 BASE MATERIALS

Manufacturer(s), Type(s), Location(s), Color(s), and Pattern(s) as indicated on drawings.

2.05 FLOORING TRANSITIONS

Manufacturer(s), Type(s), Location(s), Color(s), and Pattern(s) as indicated on drawings.

2.06 OTHER ACCESSORIES

A. Subfloor Filler: Latex cement underlayment as recommended by flooring material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Sealer and Wax: Types recommended by flooring manufacturer.

D. Provide other materials, not specifically described but required for a complete and proper installation as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that surfaces are smooth and flat with maximum variation of 1/8 inch in 10 ft. and are ready to receive work.

C. According to Section 07 05 00, verify that concrete floors are dry to the maximum moisture content of 2.5% (two and one half percent); and exhibit negative alkalinity, carbonization, or dusting. Higher moisture content will be as accepted by manufacturer in their written warranty.

D. Correct conditions detrimental to timely and proper completion of the Work.

E. Do not proceed until unsatisfactory conditions are corrected.

F. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to leave smooth, flat, hard surface.

C. Prohibit traffic from area until filler is cured.

D. Vacuum clean substrate.

E. Maintain the temperature of the space to receive the flooring and the materials to be installed at a minimum of 65 degrees F and maximum of 100 degrees F for at least 48 hours prior to, during, and 48 hours after installation. Maintain a minimum temperature of 55 degrees F thereafter.

F. Install flooring after all other trades, including painting, have been completed.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, conventional full-spread system.

B. Spread only enough adhesive to permit installation of materials before initial set.

C. Set flooring in place; press with heavy roller to attain full adhesion.

D. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.

E. Install edge strips at unprotected or exposed edges, and where flooring terminates.

F. Scribe flooring to walls, columns, permanent cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION -- BASE MATERIAL

A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.

B. Miter internal corners. At external corners, "V" cut back of base strip to 2/3 of thickness and fold.

C. Install base on solid backing. Bond tight to wall and floor surfaces.

D. Scribe and fit to doorframes and other interruptions.

3.05 PROTECTION

Prohibit traffic on floor finish for 48 hours after installation.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 09 68 00

CARPETING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Furnish all Materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to comply with the Contract Documents, including, but not limited to, these major items:

A. Direct glue down carpet with backing.

B. Metal edge trim and backing for carpet coved wall base if indicated on the drawings.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

Comply with the Standard requirements established by Manufacturer.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Submit the following:

1. Product data on specified products, describing physical and performance characteristics: sizes, patterns, colors available, and method of installation.
2. Samples illustrating color and pattern for each carpet material specified if substituting from color board.
3. Manufacturer's installation instructions. When approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on this Work.
4. Acceptance of conditions of testing of Flooring Substrate for requirements prior to installation according to Section 07 05 00.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Maintain minimum 72 degrees F ambient temperature plus/minus 5 degrees with relative humidity not exceeding 65% three days prior to, during, and 72 hours after installation of materials.

1.09 OPERATION AND MAINTENANCE DATA

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Submit operation and maintenance data maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning and shampooing.

1.10 EXTRA MATERIALS

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Provide an extra 5% of carpeting of each color specified.

1.11 WARRANTY

A. Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

B. Provide Manufacturer's Lifetime Commercial Limited Warranty.

PART 2 – PRODUCTS

2.01 CARPET

Manufacturer(s), Type(s), Location(s), Pattern(s), and Color(s) as indicated on drawings.

2.02 FLOORING TRANSITIONS

Manufacturer(s), Type(s), Location(s), Finishes(s), as indicated on drawings.

2.03 OTHER ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by carpet manufacturer.

B. Primers and Adhesives: Waterproof; of types recommended by carpet manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Verify that substrate surfaces are smooth and flat with maximum variation of 1/8 inch in 10 ft. and are ready to receive work. Have all previous adhesives removed.

D. Concrete Slab Testing:

1. Alkalinity: Test the concrete for alkalinity prior to beginning the installation. Check the concrete for surface pH at several locations. A reading below 5.0 or above 9.0 requires corrective measures. Specific information on the correct method of neutralizing low or high pH is available through Shaw Technical Services Department.

2. Moisture: Check the concrete for moisture at several locations using the anhydrous calcium test kits. The moisture transmission rate must not exceed 5.0 pounds per 1000 square-feet per 24-hours. Do not begin the installation if an unacceptable moisture level is detected. Do not use other methods of moisture testing as they are not reliable. If excessive moisture is present, advise the Construction Manager.

E. Do not proceed until unsatisfactory conditions are corrected.

F. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to leave smooth, flat, hard surface.

C. Prohibit traffic until filler is cured.

D. Vacuum floor surface.

3.03 INSTALLATION

A. Apply carpet and adhesive in accordance with manufacturers' instructions. Direct glue-down.

B. Lay out rolls of carpet.

C. Verify carpet match before cutting to ensure minimal variation between dye lots.

D. Locate seams in area of least traffic. Carpet shall be installed in full lengths wherever possible.

E. Fit seams straight, not crowded or peaked, free of gaps.

F. Lay carpet on floors with run of pile in same direction as anticipated traffic. Lay carpet so that seams perpendicular to a wall do not occur at door openings in that wall.

G. Do not change run of pile in any room where carpet is continuous through a wall opening into another room. Locate change of color or pattern between rooms under door centerline.

H. Cut and fit carpet around interruptions.

I. Fit carpet tight to intersection with vertical surfaces without gaps.

J. All seams shall be beaded and sealed with "seam sealer". The seam sealer shall be applied to the cut edge of the carpet at the level of the carpet backing.

K. No stretching will be permitted.

L. Unroll carpet face up and cut the lengths required with pile-lay runs in the same direction. Check starting wall for squareness and allow for off-square walls. Strike chalk line the entire length of area where seam falls.

M. Place two lengths in proper position for installing; trim salvage, and line up seam edge with chalk line. Lay carpet perfectly flat and tension free.

N. Roll both widths back 3' from seam area the entire length of carpet.

O. Spread adhesive from approximate center towards each end.

P. When sufficient floor area has been covered with adhesive, drop or roll first width into place. Apply coating of edge sealer to seam edge of first width. Follow this procedure on each succeeding width at seam. Drop or roll second width into position and fit the seam in tightly using knee-kicker if necessary. Brush or roll looseness and air bubbles away from seam.

Q. Fold or roll the remaining portion of the first width from the wall. Apply adhesive to the floor and drop or roll carpet into place.

R. Roll or fold back dry portion of second width towards seam; spread adhesive and place carpet 3' from where next seam will fall.

S. Brush or roll out looseness and air bubbles as carpet is put into place. Repeat above procedure on continuing widths. Trim carpet at wall using razor blade knife or suitable wall trimmer.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

3.05 PROTECTION

A. Prohibit traffic from carpet areas for 24 hours after installation.

B. Cover with non-staining building paper, firmly fastened down to protect floor surfaces.

C. Near completion of the project, remove paper, clean and vacuum carpet.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Supply and install all Painting, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation.

B. Section Includes: Painting and finishing of all interior and exterior items and surfaces, unless otherwise indicated or listed under exclusions below:

1. Paint all exposed surfaces, except as otherwise indicated, whether or not colors are designated.
2. Include field painting of exposed exterior and interior structural steel, plumbing, mechanical and electrical work, except as indicated below.
3. Paint exterior plaster where indicated on Drawings.

C. Work Included:

The intent and requirements of this section is that all work, items and surfaces which are normally painted and finished in a building of this type and quality, shall be so included in this contract, whether or not said work, item or surface is specifically called out and included in the schedules and notes on the drawings, or is, or is not, specifically mentioned in these specifications.

D. The following general categories of work and items that are included under other sections, shall not be a part of this section:

1. Shop prime painting of structural and miscellaneous iron or steel.
2. Shop prime painting of hollow metal work.
3. Shop finished work and items.
4. Any drywall or plaster permanently concealed from view.
5. Any factory finished equipment and other materials with a complete factory applied finish.
6. Finish hardware except where primed for paint finish.
7. Any glass, plastics, floor tiles and sheet vinyl coved or vinyl top set bases.
8. Plumbing fixtures: Toilet room accessories.
9. Lighting fixtures except as noted on drawings or specified.
10. Any acoustical surfaces; unless otherwise specified.

E. The Room Finish Schedules indicated on the drawings, indicates the location of interior room surfaces to be painted or finished. The schedule indications are general and do not necessarily define the detail requirements. Include all detailed refinements and further instructions as may be given for the required complete finishing of all spaces and rooms.

1.03 STANDARDS AND REFERENCES

A. Regulatory Requirements: Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this Specification, comply with the more stringent provisions.

B. Regulatory changes may affect the formulation, availability, or use of specified coatings. Confirm availability of coatings to be used prior to job going out to bid and before start of painting project.

C. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the South Coast Air Quality Management District (SCAQMD). Field Sample: When and as directed by the Architect, apply one complete coating system for each color, gloss and texture required. When approved, the sample panel areas will be deemed incorporated into the Work and will serve as the standards by which the subsequent Work of this Section will be judged.

1.04 QUALITY ASSURANCE

Use adequate numbers of skilled workmen 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.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Materials List: Submit complete lists of materials proposed for use, giving the manufacturer's name, catalog number, and catalog cut for each item when applicable. When required, provide a list of paint and coating materials proposed for use, which equates such materials with the design-basis products specified.

C. Samples: Submit, on 8-1/2 inch by 11 inch hardboard, samples of each color, gloss, texture and material selected by the Architect from standard colors available for the coatings required. For natural and stained finishes, provide sample on each type and quality of wood used on the project.

D. Manufacturer's Instructions: Submit the manufacturer's current recommended methods of installation, including relevant limitations, safety and environmental cautions, application rates, and composition analysis.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Storage and Protection: Use all means necessary to protect the materials of this Section before, during, and after installation.

C. Deliver materials to job site in new, original, and unopened containers bearing manufacturer's name and trade name. Store where directed in accordance with manufacturer's instructions.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Do not apply exterior materials during fog, rain or mist, or when inclement weather is expected within the dry time specified by the manufacturer. No exterior or interior painting shall be done until the surfaces are thoroughly dry and cured. Do not apply paint when temperature is below 50° F. Avoid painting surfaces when exposed to direct sunlight.

1.09 OPERATION AND MAINTENANCE DATA

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Coating Maintenance Manual: Provide a S-W Custodian or similar coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.10 EXTRA MATERIALS

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Provide 5% with a minimum of one gallon of each color and product used.

1.11 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Sherwin-Williams. Architectural representative: Rocky Berlangal; Phone (657)269-0922 or Email rocky.m.berlanga@sherwin.com.

B. Acceptable Manufacturers: Dunn Edwards, Vista Paint or Architect approved equal.

2.02 MATERIALS

A. Paints: Provide Ready-Mixed, except field catalyzed coatings. Pigments shall be fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixture. Paints shall have good flowing and brushing properties and be capable of drying or curing free of streaks and sags.

B. Accessory Materials: Linseed oil, shellac, solvents, and other materials not specified but required to achieve required finishes shall be of high quality and approved by manufacturer.

C. Colors shall be selected from color chip samples provided by manufacturer of paint system approved for use. Match approved samples for color, texture and coverage.

2.03 MIXES

Mix, prepare, and store painting and finishing materials in accordance with manufacturer's directions.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Examine surfaces to be painted before beginning painting work. Work of other trades that has been left or installed in a condition not suitable to receive paint, stain, other specified finish shall be repaired or corrected by the applicable trade before painting. Painting of defective or unsuitable surface implies acceptance of the surfaces.

C. Do not proceed with surface preparation or coating application until conditions are suitable. Special attention should be made to all smooth and especially Level 5 Drywall Finish areas. In those instances, a test patch to ensure proper surface adhesion should be undertaken.

D. Beware of a condition known as "critical lighting". This condition causes shadows that accentuate even the slightest surface variations. A pigmented sealer will provide tooth for succeeding decorative coating, but "does not" equalize smoothness or surface texture. Any corrective action to gypsum board/drywall must be done by the drywall contractor prior to decorating.

E. Notify the Construction Manager and Architect in writing of any conditions detrimental to the proper and timely completion of the installation.

F. Correct conditions detrimental to timely and proper completion of the Work.

G. Do not proceed until unsatisfactory conditions are corrected.

H. Beginning of installation means acceptance of conditions.

3.02 PROTECTION

A. Protect previously installed work and materials, which may be affected by Work of this Section.

1. Protect prefinished surfaces, lawns, shrubbery and adjacent surfaces against paint and damage.

2. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or splatter from fouling surfaces not being painted.

3. Protect surfaces, equipment, and fixtures from damage resulting from use of fixed, movable and hanging scaffolding, planking, and staging.

B. Provide WET PAINT signs, barricades, and other devices required to protect newly finished surfaces. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.03 PREPARATION

A. Perform preparation and cleaning procedures in strict accordance with coating manufacturer's instructions for each substrate condition.

B. Concrete and masonry surfaces shall be dry, clean, and free of dirt, efflorescence, encrustation, and other foreign matter. Glazed surfaces on concrete shall be roughened or etched to uniform texture.

C. Ferrous metal shall be cleaned per SSPC-SP1. All welds, loosely adhered rust, and debris must be power tool cleaned per SSPC-SP3. Prime within 3 hours after preparation.

D. Clean per SSPC-SP1 to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, power tool clean per SSPC-SP3 to remove these treatments.

E. Remove dust, grit and foreign matter from wood surfaces. Sand surfaces and dust clean. Spot coat knots, pitch streaks, and sappy section with pigmented stain sealer when surfaces are to be painted. Fill nail holes, cracks and other defects after priming and spot prime repairs when fully cured.

F. Remove hardware and accessories, machined surfaces, plates, lighting fixtures and similar items in place and not-to-be-finish painted, or provide surface-applied protection. Reinstall removed items upon completion of work in each area.

G. Existing surfaces to be recoated shall be thoroughly cleaned and de-glossed by sanding or other means prior to painting. Patched and bare areas shall be spot primed with same primer as specified for new work.

H. Thoroughly backpaint all surfaces of exterior and interior finish lumber and millwork, including doors and window frames, trim, cabinetwork, etc., which will be concealed after installation. Backpaint items to be painted or enameled with the priming coat. Use a clear sealer for backpriming where transparent finish is required.

I. Bar and covered pipes, ducts, hangers, exposed steel and ironwork, and primed metal surfaces of equipment installed under mechanical and electrical work shall be cleaned prior to priming.

J. Preparation of other surfaces shall be performed following specific recommendations of the coatings manufacturer.

K. Bond breakers and curing agents must be removed and the surface cleaned before primers, sealers or finish paints can be applied.

L. All drywall surfaces must be completely dry and dust free before painting. Skim coated drywall must be sealed with an alkyd based sealer or a waterborne sealer recommended by the paint manufacturer for this surface. Use the appropriate light or medium tack masking tape.

M. Do not apply initial coating until moisture content of surface is within limitations recommended by the paint manufacturer.

N. Do not paint over Underwriters's labels, fusible links or sprinkler heads.

3.04 APPLICATION

A. Apply painting and finishing materials in accordance with the manufacturer's submittals, as approved. Use applicators and techniques best suited for the material and surfaces to which applied.

1. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.
2. All undercoats shall be tinted slightly to approximate the color of the finish coat.

B. Apply each material at not less than the manufacturer's recommended spreading rate:

Provide a total dry film thickness of not less than 1.2 mils for each required coat.

C. Apply prime coat to surface, which is required to be painted or finished.

D. Finish exterior doors on tops, bottoms, and edges same as exterior faces, after fitting.

E. Sand lightly and dust clean between succeeding coats.

3.05 CLEANING, TOUCH-UP AND REFINISHING

A. Carefully remove all spattering, spots and blemishes caused by work under this section from surfaces throughout the project.

B. Upon completion of painting work remove all rubbish, paint cans, and accumulated materials resulting from work in each space or room. All areas shall be left in a clean, orderly condition.

C. Runs, sags, misses, holidays, stains and other defects in the painted surfaces, including inadequate coverage and mil thickness shall be satisfactorily touched up, or refinished, or repainted as necessary.

3.06 FINISH SCHEDULE

A. Apply the following finishes to the surfaces specified and/or as on the finish schedule on the Drawings. Apply all materials in accordance with manufacturer's instructions on properly prepared surfaces and foundation coats. All intermediate undercoats must be tinted to approximate the final color.

Architect will issue a color schedule prior to start of painting to designate the various colors and locations required for the work.

B. Exterior Systems:

1. Stucco & Plaster
   a. Flat – 100% Acrylic

First Coat	Loxon Primer LX2W50
Second Coat	A-100 Exterior Latex Flat A6 Series
Third Coat	A-100 Exterior Latex Flat A6 Series

   b. Semi-transparent Stain

First Coat	Loxon Vertical Semi-transparent Stain LX31T75
Second Coat	Loxon Vertical Semi-transparent Stain LX31T75
Third Coat	Loxon Vertical Semi-transparent Stain LX31T75

2. Concrete Tilt-Up
   a. Flat – 100% Acrylic

First Coat	Loxon Primer LX2W50
Second Coat	A-100 Exterior Latex Flat A6 Series
Third Coat	A-100 Exterior Latex Flat A6 Series

   b. Semi-transparent Stain

First Coat	Loxon Vertical Semi-transparent Stain LX31T75
Second Coat	Loxon Vertical Semi-transparent Stain LX31T75
Third Coat	Loxon Vertical Semi-transparent Stain LX31T75

3. Brick Masonry
   a. Flat – 100% Acrylic

First Coat	Loxon Primer LX2W50

Second Coat	A-100 Exterior Latex Flat A6 Series
Third Coat	A-100 Exterior Latex Flat A6 Series

4. Concrete Block
   a. Flat – 100% Acrylic

First Coat	PrepRite Block Filler B25W25
Second Coat	A-100 Exterior Latex Flat A6 Series
Third Coat	A-100 Exterior Latex Flat A6 Series

   b. Satin – 100% Acrylic

First Coat	PrepRite Block Filler B25W25
Second Coat	A-100 Exterior Latex Satin A82 Series
Third Coat	A-100 Exterior Latex Satin A82 Series

   c. Gloss – 100% Acrylic

First Coat	PrepRite Block Filler B25W25
Second Coat	A-100 Exterior Latex Gloss A8 Series
Third Coat	A-100 Exterior Latex Gloss A8 Series

   d. High Gloss, High Performance – Acrylic/Urethane

First Coat	Heavy Duty Block Filler B42W46
Second Coat	Macropoxy 646-100 B58Series
Third Coat	Acrolon 100 WB Polyurethane B65 Series (Coat to Cover)

   e. Semi-transparent Stain

First Coat	Loxon Vertical Semi-transparent Stain LX31T75
Second Coat	Loxon Vertical Semi-transparent Stain LX31T75
Third Coat	Loxon Vertical Semi-transparent Stain LX31T75

5. Ferrous Metal
   a. Flat – Acrylic

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	A-100 Exterior Latex Flat A6 Series
Third Coat	A-100 Exterior Latex Flat A6 Series

   b. Semi-Gloss – Acrylic

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	Solo Acrylic Latex Semigloss A76 Series
Third Coat	Solo Acrylic Latex Semigloss A76 Series

   c. Gloss – Acrylic

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	Solo Acrylic Latex Gloss A77 Series
Third Coat	Solo Acrylic Latex Gloss A77 Series

   d. Gloss – Rust Preventative Acrylic

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	ProIndustrial Acrylic Gloss B66-600 Series
Third Coat	ProIndustrial Acrylic Gloss B66-600 Series

   e. Gloss, Industrial High Performance – Inorganic Zinc/Epoxy/Acrylic

First Coat	ZincClad III HS-100 B69 Series
Second Coat	Macropoxy 646-100 B58 Series
Third Coat	ProIndustrial Acrylic Gloss B66-600 Series (Coat to Cover)

   f. Low Sheen, Industrial High Performance – Epoxy Primer/Epoxy/Acrylic (VOC compliant in SCAQMD)

First Coat	Macropoxy 646-100 B58 Series

Second Coat	Macropoxy 646-100 B58 Series
Third Coat	ProIndustrial Acrylic Eg-shel B66-660 Series (Coat to cover)

g. High Gloss, Industrial High Performance – Inorganic Zinc/Epoxy/Urethane (VOC compliant in SCAQMD)

First Coat	ZincClad III HS-100 B69 Series
Second Coat	Macropoxy 646-100 B58 Series
Third Coat	Acrolon 100 WB Polyurethane B65 Series (Coat to Cover)

h. High Gloss, Industrial High Performance – Epoxy Primer/Epoxy/Urethane (VOC compliant in SCAQMD)

First Coat	Macropoxy 646-100 B58 Series
Second Coat	Acrolon 100 WB Polyurethane B65 Series
Third Coat	Acrolon 100 WB Polyurethane B65 Series

6. Galvanized Metal

a. Flat – Acrylic

Pretreatment	GLL Clean n Etch
First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	A-100 Exterior Latex Flat A6 Series
Third Coat	A-100 Exterior Latex Flat A6 Series

b. Semi-Gloss – Acrylic

Pretreatment	GLL Clean n Etch
First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	Solo Acrylic Latex Semigloss A76 Series
Third Coat	Solo Acrylic Latex Semigloss A76 Series

c. Gloss – Acrylic

Pretreatment	GLL Clean n Etch
First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	Solo Acrylic Latex Gloss A77 Series
Third Coat	Solo Acrylic Latex Gloss A77 Series

d. Gloss – Rust Preventative Acrylic

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	ProIndustrial Acrylic Gloss B66-600 Series
Third Coat	ProIndustrial Acrylic Gloss B66-600 Series

e. Low Sheen, Industrial High Performance – Epoxy Primer/Acrylic (VOC compliant in SCAQMD)

First Coat	Macropoxy 646-100 B58 Series
Second Coat	ProIndustrial Acrylic Eg-shel B66-660
Third Coat	ProIndustrial Acrylic Eg-shel B66-660

f. High Gloss, Industrial High Performance – Epoxy Primer/Urethane

First Coat	Macropoxy 646-100 B58 Series
Second Coat	Acrolon 100 WB Polyurethane B65 Series
Third Coat	Acrolon 100 WB Polyurethane B65 Series

7. Wood – Paint Finish

a. Semi-Gloss – Acrylic

First Coat	PrepRite ProBlock Primer B51W8020
Second Coat	Solo Acrylic Latex Semigloss A76 Series
Third Coat	Solo Acrylic Latex Semigloss A76 Series

b. Gloss – Acrylic

First Coat	PrepRite ProBlock Primer B51W8020

Second Coat	Solo Acrylic Latex Gloss A77 Series
Third Coat	Solo Acrylic Latex Gloss A77 Series

8. Wood – Stain Finish – Opaque:

Two Coats	WoodScapes Water-based Solid Stain A15

9. Wood – Stain Finish – Semi-Transparent:

Two Coats	WoodScapes Ext Semi-transparent Stain A15T

C. Interior Systems:

1. Gypsum Board
   a. Flat – Acrylic

First Coat	PVA Primer B28W8000
Second Coat	ProMar 200 Zero VOC Flat B30-2600
Third Coat	ProMar 200 Zero VOC Flat B30-2600

   b. Low Sheen – Acrylic

First Coat	PVA Primer B28W8000
Second Coat	ProMar 200 Zero VOC Low Sheen B24-2600
Third Coat	ProMar 200 Zero VOC Low Sheen B24-2600

   c. Eggshell – Acrylic

First Coat	PVA Primer B28W8000
Second Coat	ProMar 200 Zero VOC Eg-shel B20-2600
Third Coat	ProMar 200 Zero VOC Eg-shel B20-2600

   d. Semi-Gloss - Acrylic

First Coat	PVA Primer B28W8000
Second Coat	ProMar 200 Zero VOC Semigloss B31-2600
Third Coat	ProMar 200 Zero VOC Semigloss B31-2600

   e. Gloss – Acrylic

First Coat	PVA Primer B28W8000
Second Coat	ProMar 200 Zero VOC Gloss B21-12650
Third Coat	ProMar 200 Zero VOC Gloss B21-12650

   f. Gloss– Industrial High Performance – Waterborne Epoxy

First Coat	ProMar 200 Zero VOC Primer B28W2600
Second Coat	WB Catalyzed Epoxy Gloss B73 Series
Third Coat	WB Catalyzed Epoxy Gloss B73 Series

   g. High Gloss – Industrial High Performance – Waterborne Epoxy/Urethane

First Coat	Macropoxy 646-100 B58 Series
Second Coat	Acrolon 100 WB Polyurethane B65 Series
Third Coat	Acrolon 100 WB Polyurethane B65 Series

2. Concrete & Plaster:
   a. Flat – Acrylic Copolymer

First Coat	Loxon Primer LX2W50
Second Coat	ProMar 200 Zero VOC Flat B30-2600
Third Coat	ProMar 200 Zero VOC Flat B30-2600

   b. Low Sheen – Acrylic Copolymer

First Coat	Loxon Primer LX2W50
Second Coat	ProMar 200 Zero VOC Low Sheen B24-2600
Third Coat	ProMar 200 Zero VOC Low Sheen B24-2600

   c. Eggshell –Acrylic Copolymer

First Coat Loxon Primer LX2W50
Second Coat ProMar 200 Zero VOC Eg-shel B20-2600
Third Coat ProMar 200 Zero VOC Eg-shel B20-2600

d. Semi-Gloss –Acrylic Copolymer
First Coat Loxon Primer LX2W50
Second Coat ProMar 200 Zero VOC Semigloss B31-2600
Third Coat ProMar 200 Zero VOC Semigloss B31-2600

e. Gloss – 100% Acrylic
First Coat Loxon Primer LX2W50
Second Coat ProMar 200 Zero VOC Gloss B21-12650
Third Coat ProMar 200 Zero VOC Gloss B21-12650

f. Gloss – Industrial High Performance - Waterborne Epoxy
First Coat Loxon Primer LX2W50
Second Coat WB Catalyzed Epoxy Gloss B73 Series
Third Coat WB Catalyzed Epoxy Gloss B73 Series

g. High Gloss- Industrial High Performance - Epoxy/Urethane
First Coat Macropoxy 646-100 B58 Series
Second Coat Acrolon 100 WB Polyurethane B65 Series
Third Coat Acrolon 100 WB Polyurethane B65 Series

3. Brick
a. Flat – Acrylic Copolymer
First Coat Loxon Primer LX2W50
Second Coat ProMar 200 Zero VOC Flat B30-2600
Third Coat ProMar 200 Zero VOC Flat B30-2600

b. Low Sheen – Acrylic Copolymer
First Coat Loxon Primer LX2W50
Second Coat ProMar 200 Zero VOC Low Sheen B24-2600
Third Coat ProMar 200 Zero VOC Low Sheen B24-2600

c. Eggshell –Acrylic Copolymer
First Coat Loxon Primer LX2W50
Second Coat ProMar 200 Zero VOC Eg-shel B20-2600
Third Coat ProMar 200 Zero VOC Eg-shel B20-2600

d. Semi-Gloss –Acrylic Copolymer
First Coat Loxon Primer LX2W50
Second Coat ProMar 200 Zero VOC Semigloss B31-2600
Third Coat ProMar 200 Zero VOC Semigloss B31-2600

e. Gloss – 100% Acrylic
First Coat Loxon Primer LX2W50
Second Coat ProMar 200 Zero VOC Gloss B21-12650
Third Coat ProMar 200 Zero VOC Gloss B21-12650

f. Gloss – Industrial High Performance - Waterborne Epoxy
First Coat Loxon Primer LX2W50
Second Coat WB Catalyzed Epoxy Gloss B73 Series
Third Coat WB Catalyzed Epoxy Gloss B73 Series

g. High Gloss- Industrial High Performance - Epoxy/Urethane
First Coat Macropoxy 646-100 B58 Series
Second Coat Acrolon 100 WB Polyurethane B65 Series
Third Coat Acrolon 100 WB Polyurethane B65 Series

4. Concrete Block
   a. Flat – Acrylic Copolymer

First Coat	PrepRite Block Filler B25W25
Second Coat	ProMar 200 Zero VOC Flat B30-2600
Third Coat	ProMar 200 Zero VOC Flat B30-2600

   b. Low Sheen – Acrylic Copolymer

First Coat	PrepRite Block Filler B25W25
Second Coat	ProMar 200 Zero VOC Low Sheen B24-2600
Third Coat	ProMar 200 Zero VOC Low Sheen B24-2600

   c. Eggshell –Acrylic Copolymer

First Coat	PrepRite Block Filler B25W25
Second Coat	ProMar 200 Zero VOC Eg-shel B20-2600
Third Coat	ProMar 200 Zero VOC Eg-shel B20-2600

   d. Semi-Gloss –Acrylic Copolymer

First Coat	PrepRite Block Filler B25W25
Second Coat	ProMar 200 Zero VOC Semigloss B31-2600
Third Coat	ProMar 200 Zero VOC Semigloss B31-2600

   e. Gloss – 100% Acrylic

First Coat	PrepRite Block Filler B25W25
Second Coat	ProMar 200 Zero VOC Gloss B21-12650
Third Coat	ProMar 200 Zero VOC Gloss B21-12650

   f. Gloss – Industrial High Performance - Waterborne Epoxy

First Coat	PrepRite Block Filler B25W25
Second Coat	WB Catalyzed Epoxy Gloss B73 Series
Third Coat	WB Catalyzed Epoxy Gloss B73 Series

   g. High Gloss- Industrial High Performance – Acrylic/Urethane

First Coat	Heavy Duty Block Filler B42W46
Second Coat	Macropoxy 646-100 B58 Series
Third Coat	Acrolon 100 WB Polyurethane B65 Series

5. Ferrous Metal
   a. Flat – Acrylic Copolymer

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	ProMar 200 Zero VOC Flat B30-2600
Third Coat	ProMar 200 Zero VOC Flat B30-2600

   b. Low Sheen –Acrylic Copolymer

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	ProMar 200 Zero VOC Low Sheen B24-2600
Third Coat	ProMar 200 Zero VOC Low Sheen B24-2600

   c. Eggshell –Acrylic Copolymer

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	ProMar 200 Zero VOC Eg-shel B20-2600
Third Coat	ProMar 200 Zero VOC Eg-shel B20-2600

   d. Semi-Gloss – Acrylic Primer/ Acrylic Copolymer

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	ProMar 200 Zero VOC Semigloss B31-2600
Third Coat	ProMar 200 Zero VOC Semigloss B31-2600

   e. Semi-Gloss –Rust Preventative Acrylic

First Coat	ProCryl Universal Acrylic Metal Primer B66-310

Second Coat	ProIndustrial Acrylic SemiGloss
Third Coat	ProIndustrial Acrylic SemiGloss

f. Gloss – Acrylic Primer /100% Acrylic

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	Solo Acrylic Latex Gloss A77 Series
Third Coat	Solo Acrylic Latex Gloss A77 Series

g. Gloss –Rust Preventative Acrylic

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	ProIndustrial Acrylic Gloss
Third Coat	ProIndustrial Acrylic Gloss

h. Gloss – Industrial High Performance - Waterborne Epoxy

First Coat	ProCryl Universal Acrylic Metal Primer B66-310
Second Coat	WB Catalyzed Epoxy Gloss B73 Series
Third Coat	WB Catalyzed Epoxy Gloss B73 Series

i. High Gloss – Industrial High Performance - Epoxy/Urethane

First Coat	Macropoxy 646-100 B58 Series
Second Coat	Acrolon 100 WB Polyurethane B65 Series
Third Coat	Acrolon 100 WB Polyurethane B65 Series

6. Wood – Paint Finish

a. Flat – Acrylic Copolymer

First Coat	PrepRite ProBlock Primer B51W8020
Second Coat	ProMar 200 Zero VOC Flat B30-2600
Third Coat	ProMar 200 Zero VOC Flat B30-2600

b. Low Sheen – Acrylic Copolymer

First Coat	PrepRite ProBlock Primer B51W8020
Second Coat	ProMar 200 Zero VOC Low Sheen B24-2600
Third Coat	ProMar 200 Zero VOC Low Sheen B24-2600

c. Eggshell – Acrylic Copolymer

First Coat	PrepRite ProBlock Primer B51W8020
Second Coat	ProMar 200 Zero VOC Eg-shel B20-2600
Third Coat	ProMar 200 Zero VOC Eg-shel B20-2600

d. Semi-Gloss – 100% Acrylic

First Coat	PrepRite ProBlock Primer B51W20
Second Coat	Solo Acrylic Latex Semigloss A76 Series
Third Coat	Solo Acrylic Latex Semigloss A76 Series

e. Semi-Gloss – Alkyd – Class A Fire Retardant

First Coat	Please contact your Sherwin-Williams representative for
Second Coat	fire retardant wood finish information.
Third Coat	

f. Gloss – 100% Acrylic

First Coat	PrepRite ProBlock Primer B51W8020
Second Coat	Solo Acrylic Latex Gloss A77 Series
Third Coat	Solo Acrylic Latex Gloss A77 Series

7. Wood – Stain & Lacquer

(VOC Rule in SCAQMD is 275 g/L for field-applied coatings)

a. Flat

First Coat	SherWood BAC Wiping Stain S64
Filler	Jasco Paste Wood Filler

Second Coat	KemAqua Lacquer Sanding Sealer T65F520
Third Coat	KemAqua Dull Rub Clear Lacquer T75F528
Fourth Coat	KemAqua Dull Rub Clear Lacquer T75F528

b. Semi-Gloss

First Coat	SherWood BAC Wiping Stain S64
Filler	Jasco Paste Wood Filler
Second Coat	KemAqua Lacquer Sanding Sealer T65F520
Third Coat	KemAqua Semigloss Clear Lacquer T75F526
Fourth Coat	KemAqua Semigloss Clear Lacquer T75F526

c. Gloss

First Coat	SherWood BAC Wiping Stain S64
Filler	Jasco Paste Wood Filler
Second Coat	KemAqua Lacquer Sanding Sealer T65F520
Third Coat	KemAqua Gloss Clear Lacquer T75C525
Fourth Coat	KemAqua Gloss Clear Lacquer T75C525

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all exterior and interior signage, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete and proper installation.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

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.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 Submital Procedures.

B. Provide:

1. Shop Drawings: Provide shop drawings for review and approval prior to commencement of fabrication.

2. Samples: Provide to illustrate full size sample sign, of type, style and color specified including method of attachment.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Package signs, labeled in name groups.

C. Store adhesive tape at ambient room temperatures.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Do not install signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation of signs.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 EXTRA MATERIALS

Provide in accordance with Section 01 77 00 Project Closeout.

1.11 RECORD DRAWINGS

Provide in accordance with Section 01 77 00 Project Closeout.

1.12 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MATERIALS – EXTERIOR BUILDING SIGNAGE

A. Basis of Design: A.R.K. Ramos Architectural Signage Systems; Oklahoma City, OK 73109; Tel: (800) 725-7266. Website: www.arkramos.com

B. Letters and/or Numbers – Font/Size/Finish/Color: as indicated in Drawings.

C. Material: Aluminum Channel Letter

D. Mounting: Brackets, PPM-1 bracket sleeved stud.

1. Set in adhesive in masonry.
2. Attach to support in framed wall.

2.02 MATERIALS – ROOM IDENTIFICATION SIGNAGE

A. Refer to Signage Plan for types and locations.

B. Material: 1/8" thick ES Plastic.

C. Size and color: As indicated in Drawings

D. Graphics: Vinyl die-cut. Font to be 3/4" Helvetic Medium, All Caps.

E. All signage to have 1/2" radius corners

F. Mounting: Adhesive

G. All signs installed on glass shall have a full-size backing plate adhered to the opposite side of the glass of the same color as the sign.

2.03 MATERIALS – INTERIOR ADA SIGNAGE

A. Types and locations: As indicated in Drawings, conforming to requirements of the California Building Code.

B. Material: 1/8" thick ES Plastic.

C. Text and font, size and color: As indicated in Drawings

D. Graphics: To be vinyl die-cut.

E. All signs to have 1/2" Radius corners

F. Mounting: Adhesive

G. All signs installed on glass shall have a full size backing plate adhered to the opposite side of the glass of the same color as the sign.

2.04 DEDICATION PLAQUE

Refer to Drawings for location, size, text, and material details.

2.05 ACCESSORIES

A. Mounting Hardware: Chrome screws; base sleeve and studs per manufacturer's recommendations.

B. Tape Mount: Double sided tape, permanent adhesive.

C. Adhesive: Silastic adhesive as recommended by manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify adequate support for Building Signs. Coordinate footings with other trades.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs after doors and surfaces are finished, in locations indicated.

1. Furnish and install all anchorage devices required to install the item and its appurtenances complete. Provide anchorage in ample time when required to be built in by other trades.

2. All wall-mounted items shall be securely fastened to solid backing or blocking.

C. Center plastic signs on doors, level.

D. Anchor all components firmly into position for long life under hard use.

E. Clean and polish.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 10 21 13

TOILET PARTITIONS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Supply and install all toilet compartments, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation.

B. Section includes, but is not limited to:

1. Toilet Partitions
2. Urinal Privacy Screens

C. Related Sections

1. 05 50 00 Metal Fabrications
2. 06 10 00 Rough Carpentry
3. 10 28 13 Toilet Accessories

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

E. Pre-Installation Meeting: Convene minimum two weeks prior to starting work of this section.

F. Sequencing: Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Submit under provisions of Section 01 33 00 Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:

1. Plans, elevations, details of construction and attachment to adjacent construction.
2. Show anchorage locations and accessory items.
3. Verify dimensions with field measurements prior to final production of toilet compartments.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.08 PROJECT CONDITIONS

Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 EXTRA MATERIALS

Provide in accordance with Section 01 77 00 Project Closeout.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard 25-year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Bobrick Washroom Equipment, Inc., 6901 Tujunga Ave., North Hollywood, CA 91605-6213; Tel: 818-764-1000; Fax: 818-765-2700; Email: info@bobrick.com; Web: www.bobrick.com

B. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc. www.bobrick.com. Location of manufacturing shall be the United States.

2.02 COMPACT LAMINATE (SOLID PHENOLIC), MOISTURE RESISTANT SUBSTRATE (Dura Line Series)

A. Compact Laminate (Solid Phenolic) Toilet Partitions: Bobrick Dura Line Series.

1. Design Type: Standard Height
2. Privacy Style Partitions: No sightlines with gap-free interlocking doors and stiles routed 0.300 inches (7.6 mm) from the edge to allow for 0.175 inch (4.4 mm) overlap to prevent line-of-sight into the toilet compartment. Privacy strips fastened or adhered onto the partition material are not acceptable.
3. Mounting Configuration:

a. Floor-mounted, overhead-braced with satin finish, extruded anodized aluminum headrails, 0.065 inch (1.65 mm) thick with anti-grip profile.

B. Compact Laminate (Solid Phenolic) Urinal Screens: Bobrick Dura LineSeries.

1. Mounting Configuration:

a. Floor-to-ceiling.

C. Materials: Solidly fused plastic laminate with matte-finish melamine surfaces; integrally bonded colored face sheets and black phenolic-resin core.

D. Edges: Black; brown edges not acceptable.

E. Color: As indicated on Drawings.

F. Fire Resistance:

1. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class A / Uniform Building Code: Class I.

a. Flame Spread Index (ASTM E 84): 15-25 for panels, stiles and doors.

b. Smoke Developed Index (ASTM E 84): 25 - 105 for panels, 20-90 for stiles.

G. Finished Thickness:

1. Stiles and Doors: 3/4 inch (19 mm).

2. Panels and Screens: 1/2 inch (13 mm).

H. Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.

1. Leveling Devices: 7 gauge, 3/16 inches (5 mm) thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch (10 mm) diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.

2. Stile Shoes: One-piece, 22 gauge (0.8 mm), 18-8, Type 304 stainless steel, 4 inch (102 mm) height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch (19 mm) or 1 inch (25 mm) stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

I. Wall Posts: Pre-drilled for door hardware, 18-8, Type 304, 16 gauge (1.6 mm) stainless steel with satin finish; 1 inch (25 mm) x 1-1/2 inches (38 mm) x 58 inches high (1473 mm).

J. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 05 50 00 - Metal Fabrications.

K. Hardware:

1. Compliance: Operating force of less than 5 lb. (2.25 kg).

2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on inswing doors.

3. Materials: 18-8, Type 304, heavy-gauge stainless steel with satin finish.

4. Doorstops: Prevents in-swinging doors from swinging out beyond stile; on outswing doors, doorstop prevents door from swinging in beyond stile.

5. Fastening: Hardware is secured to door and stile with pin-in-head Torx stainless steel machine screws. Hinges, latch and optional door stops secured to door with pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners for hinges, latch and optional door stops secured directly into core not acceptable.

a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb (680 kg) per insert.

6. Clothes Hooks: Projecting no more than 1-1/8 inch (29 mm) from face of door.
7. Door Latch: Track of door latch prevents inswing doors from swinging out beyond stile; on outswing doors, door keeper prevents door from swinging in beyond stile; 16 gauge (1.6 mm) sliding door latch, 14 gauge (2 mm) keeper.
8. Locking: Door locked from inside by sliding door latch into keeper.
9. Hinge Type: Full-Height Institutional Hinge
10. Mounting Brackets: Full-Height

PART 3 - PRODUCTS

3.01 PREPARATION

A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.

1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.

B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.02 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:

1. Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
2. Verify location does not interfere with door swings or use of fixtures.
3. Use fasteners and anchors suitable for substrate and project conditions
4. Install units rigid, straight, plumb, and level.
5. Conceal evidence of drilling, cutting, and fitting to room finish.
6. Test for proper operation.

3.03 ADJUSTING, CLEANING AND PROTECTION

A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.

B. Touch-up, repair or replace damaged products.

C. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK

Supply and install all Toilet Accessories, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation.

1.03 STANDARDS AND REFERENCES

A. Comply with the Industry Standards and References as established by Manufacturer.

B. Regulatory: Conform to Title 24 and City codes for installing work in conformance with ANSI A117.1

1.04 QUALITY ASSURANCE

A. Comply with the Standard requirements established by Manufacturer.

B. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Submit in accordance with Section 01 33 00 Submittal Procedures.

B. Provide, within 35 days of Notice to Proceed, product data on accessories describing size, finish, details of function, attachment methods.

C. Submit shop drawings, manufacturer's literature and brochures, and catalog cuts, showing complete details of all manufactured and fabricated items. Do not purchase items until the shop drawings have been approved. See Section "Samples and Shop Drawings" for number and manner of submittals.

1.07 DELIVERY, STORAGE, AND HANDLING

Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Materials must be acclimated in an environment of 65-75ºF (18-24ºC) for at least 24 hours prior to beginning the installation.

C. Installation areas must be enclosed and weatherproofed before installation commences.

1.09 OPERATION AND MAINTENANCE DATA

Submit in accordance with Section 01 77 00 Project Closeout.

1.10 EXTRA MATERIALS

A. Submit in accordance with Section 01 77 00 Project Closeout.

B. Supply two (2) keys for each accessory to Owner. Master Key all accessories.

1.11 WARRANTY

Provide Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

Bobrick Washroom Equipment, Inc.; Bradley Corporation or Architect approved equal.

2.02 MATERIALS

A. Stainless Steel Sheet: ASTM A167, Type 304.

B. Tubing: ASTM A269, stainless steel.

C. Fasteners, Screws, and Bolts: Hot dip galvanized as recommended by manufacturer.

D. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

E. Factory Finishing: Stainless Steel, No. 4 satin luster finish.

2.03 PRODUCTS

As indicated on the Toilet Accessories Schedule in the Drawings.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide complete information, diagrams, templates, and instructions for the installation of all items, in sufficient time so that all backing, blocking, framing and formwork can be properly installed, and so that the work of other trades will not be delayed.

C. Verify exact location of accessories for installation.

3.03 INSTALLATION

A. Install the work of this Section in strict accordance with the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

1. Furnish and install all anchorage devices required to install the item and its appurtenances complete. Provide anchorage in ample time when required to be built in by other trades.

2. All wall-mounted items shall be securely fastened to solid backing or blocking.

B. Install fixtures, accessories and items in accordance with manufacturer's instructions.

C. Install plumb and level, securely and rigidly anchored to substrate.

END OF SECTION

SECTION 10 41 00

EMERGENCY ACCESS CABINETS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all Emergency Access Cabinets (also known as Knox Boxes), as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation.

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer.

1.04 QUALITY ASSURANCE

Comply with the Standard requirements established by Manufacturer.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Provide Manufacturer's descriptive and technical data and installation details.

C. Confirm acceptance of local Fire Marshall.

1.07 DELIVERY, STORAGE AND HANDLING

Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer’s Standard Requirements.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with 01 77 00 Project Closeout.

1.10 EXTRA MATERIALS

Not required.

1.11 RECORD DRAWINGS

Not required.

1.12 WARRANTY

Provide Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MATERIAL

A. Basis of Design: Knox Company

1. Construction: Heavy-duty, high security
2. Door: 5/8 inch solid steel with gasket
3. Size: 9 1/2 inches high x 9 1/2 inches wide x 5 inches deep
4. Mounting: Recessed
5. Finish: Aluminum Finish

B. Model

1. Model #4400 at Doors
2. Model #3770 at Gates
3. Vehicular Gate Key Control Switch: Know #3502

C. Fastenings: Non-ferrous, type to suit installation conditions

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that specified items may be installed in accordance with the approved design.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 INSTALLATION

A. Install lock boxes at locations indicated in accordance with manufacturer's instructions.

B. Securely fasten in place with sides plumb and level.

C. Exposed surfaces shall be free from scratches, tool marks, and other damage and defects.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all Fire Extinguishers and Cabinets, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation

1.03 STANDARDS AND REFERENCES

Comply with the Industry Standards and References as established by Manufacturer

1.04 QUALITY ASSURANCE

A. Conform to NFPA 10 requirements for extinguishers.

B. Provide fire extinguishers, cabinets, and accessories by single manufacturer.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Submit in accordance with Section 01 33 00 Submittal Procedures.

B. Submit the following:

1. Physical dimensions, operational features, color and finish, wall-mounting brackets with mounted measurements, anchorage details, rough-in measurements, location, and details.
2. Manufacturer's installation instructions.
3. Manufacturer's operation and maintenance data.
4. Include test, refill or recharge schedules, procedure, and re-certification requirements.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 66 00 Product Storage and Handling Requirements.

B. Do not install extinguishers when ambient temperatures may cause freezing.

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Section 01 50 00 Construction Facilities.

B. Comply with Manufacturer’s Standard Requirements.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 WARRANTY

Provide Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MANUFACTURER

Basis of Design: Larsen's Manufacturing Company, 7421 Commerce Lane, N.E. Minneapolis, MN. 55432. Website: www.larsensmfg.com. Phone: 1-800-527-7367.

2.02 EXTINGUISHERS

Multi-Purpose Chemical Type: Larsen's Steel tank, Model MP 5, with pressure gage, and UL Rating 2A-10B:C or approved equal.

2.03 CABINETS

Typical Extinguisher Cabinet:

A. Provide Larsen's 2409-5R Vertical Duo Door Panel cabinet.

B. Primer finish.

2.04 ACCESSORIES

A. Mounting Hardware: Appropriate to cabinet - see manufacturer's installation instructions.

B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.05 FABRICATION

A. Form body of cabinet with tight inside corners and seams.

B. Pre-drill holes for anchorage.

C. Form perimeter trim and door stiles by welding, filling, and grinding smooth.

D. Hinge doors for 180 degree opening.

E. Glaze doors with resilient channel gasket glazing.

2.06 FINISHES

A. Extinguisher: Red enamel.

B. Cabinet Trim and Door: Primed to be painted to match adjacent surface.

C. Cabinet Interior: Enamel white.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that rough openings for cabinet are correctly sized and located.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 INSTALLATION

A. Install cabinets plumb and level in wall openings so that there is 54 inches from finished floor to door handle.

B. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

SECTION 11 31 13

APPLIANCES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK SUMMARY

Supply and install all Appliances, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation.

1.03 STANDARDS AND REFERENCES

A. ANSI A117-1 – Guidelines for Accessible and Useable Buildings and Facilities.

B. EPA – Energy Star Appliances.

C. Public Law 101-336 – Americans with Disabilities Act.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with referenced standards and the Americans with Disabilities Act as applicable for fixtures for the disabled.

B. Energy Rating: Provide appliances with the EPA Energy Star label where applicable.

C. Coordinate rough-in requirements with adjacent construction. Coordinate components and fittings to ensure compatible parts are installed.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Model number and selected options for each appliance.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.
5. List of maintenance parts.

1.07 DELIVERY, STORAGE, AND HANDLING

Store products in manufacturer's unopened packaging until ready for installation.

1.08 PROJECT CONDITIONS

Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 OPERATION AND MAINTENANCE DATA

Provide in accordance with Section 01 77 00 Project Closeout.

1.10 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 MATERIALS

A. As indicated in the Drawings.

B. Or Owner approved equal.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Do not begin installation until substrates have been properly prepared. Coordinate rough-in with appliance sized and utility requirements.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Do not proceed until unsatisfactory conditions are corrected.

F. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

Assemble appliances and trim and install in accordance with manufacturer's instructions and the following:

A. Securely mount to substrate

B. Install appliances plumb and level and in proper relationship to adjacent construction.

C. Connect appliances to building utility, supply and waste systems as applicable.

D. Test for proper orientation and drainage. Adjust until proper operation is achieved.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 APPLIANCE DATA SHEETS

Refer to the manufacturer's data sheets as attached to this Section for required features and additional requirements.

END OF SECTION

SECTION 12 20 00

WINDOW TREATMENT

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.2 SCOPE OF WORK SUMMARY

A. Manually operated, roll-up fabric interior window shades including mounting and operating hardware.

B. Motorized, roll-up fabric interior window shades including motor operator, controls, and mounting hardware.

1.3 STANDARDS AND REFERENCES

A. NFPA 70 - National Electrical Code.

B. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

C. GREENGUARD Environmental Institute Gold.

D. US Green Building Council.

E. ANSI/WCMA A100.1-2018

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years documented experience in manufacturing products comparable to those specified in this section. Manufacturers that do not meet the required experience requirements must submit life cycle test data showing minimum 2000 complete operational cycles for each year of warranty showing no failure and that shade remains fit for use as a operable shade).

B. NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use.

C. Mock-Up: Provide a mock-up of one of each type roller shade assembly specified for evaluation of mounting, appearance and accessories.

1. Locate mock-up in window(s) designated by Architect.

2. Do not proceed with remaining work until mock-up is accepted by Architect.

1.5 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00 Submittal Procedures:

B. Product Data: Manufacturer's data sheets on each product specified, including:

1. Preparation instructions and recommendations.

2. Installation and maintenance instructions.

3. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.

4. NFPA Flame-Test: Passes NFPA 701 including certification from manufacturer that

the fabrics sourced for this project comply with the test data provided.

5. Storage and handling requirements and recommendations.

6. Mounting details and installation methods.

7. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric, and color, and include opening sizes and key to typical mounting details.

E. Selection Samples: For each finish product specified, two complete sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, two complete sets of shade components, unassembled, demonstrating compliance with specified requirements. Shade fabric sample and aluminum finish sample as selected, representing actual product, color, and patterns. Mark face of material to indicate interior faces.

G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

H. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

I. Warranty: Properly executed manufacturer’s warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.

B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.

C. Label containers and shades according to Window Shade Schedule.

D. Store products in manufacturer's unopened packaging until ready for installation.

1.8 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

A. Install roller shades after finish work and ambient temperature, humidity and ventilation conditions are maintained at levels recommended for project upon completion.

1.10 WARRANTY

A. Hardware and Shade Fabric: Draper standard twenty-five year limited warranty.

B. Motors and Controls: Draper standard five-year limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Draper Inc., which is located at: 411 S. Pearl Street P. O. Box 425; Spiceland, IN 47385-0425; Toll Free Tel: 800-238-7999; Tel: 765-987-7999; Fax: 866-637-5611; Kathy Greenway 714 396 9732

B. Or Architect approved equal.

2.2 MANUALLY OPERATED WINDOW SHADES

A. Heavy-Duty Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation; Clutch-Operated FlexShade NEXD as manufactured by Draper, Inc.

1. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.

a. Spring-Assist Clutch: Adjustment-free system includes spring-assist components to reduce lifting forces required to raise the shade. Manufacturer shall provide estimated torque for shade unit. Spring-assist is recommended on estimated non-spring-assist torque above 6 lb-in; required on shades with an estimated torque higher than 15 lb-in.

b. Bead Chain Hold Down: Spring-Loaded Tensioner complying with ANSI/WCMA A100.1-2018 safety standard.

c. Idler end: Height adjustable idler end allows fine leveling adjustments after installation-min plus or minus 1/8 inch without shimming brackets. Contains at least two entry points for the idler end. Safety engagement feature requires idler end pin to have a minimum engagement in bracket, ensuring that the idler end cannot fall out of the bracket due to lack of pin engagement.

2. Single Roller Configuration:

a. Mounting:

1) Endcaps and fascia.

b. Fascia: L shaped aluminum extrusion to conceal shade roller and hardware.

1) Attachment: Snaps onto endcaps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands. Notching of fascia to provide for chain clearance is NOT acceptable. Fascia height to match throughout space unless specifically approved in advance by the Architect

2) Selected from Manufacturers standard range.

c. Roller Tube: Fabricated from extruded aluminum, galvanized steel, or enameled steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size. Minimum roller diameter 1.5 inches. Tube diameters less than 1.5 inches shall not be acceptable unless manufacturer provides deflection analysis showing deflection limited to <= width (inches) /700 at 1.5X design load.

1) Fabric to tube attachments: Spline fabric/roller attachment system to allow shade fabric to be removed from roller without having to remove roller from brackets.

d. Shade slat:

1) Closed pocket elliptical slat: 1 inch (25 mm) aluminum elliptical slat inside of a 1-5/8-inch (41 mm) pocket with heat sealed ends.

3. Rollers: Extruded aluminum roller tube of appropriate diameter to support shade fabric with minimal deflection.

a. Minimum Roller Tube Diameter: 1.5 inches (32 mm). Tube diameters less than 1.5 inches shall not be acceptable unless manufacturer provides deflection analysis showing deflection limited to <= width (inches) /700 at 1.5X design load.

b. Fabric Connection to Roller Tube: Spline fabric/roller attachment system to allow shade fabric to be removed from roller without having to remove roller from brackets.

c. Fabric Length: 6 inches (152 mm) greater than window height minimum.

d. Hembar: Extruded aluminum, finished to match fascia.

2.3 MANUALLY OPERATED WINDOW SHADES Dual

A. Heavy-Duty Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation; Clutch-Operated FlexShade NEXD as manufactured by Draper, Inc.

1. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.

a. Spring-Assist Clutch: Adjustment-free system includes spring-assist components to reduce lifting forces required to raise the shade. Manufacturer shall provide estimated torque for shade unit. Spring-assist is recommended on estimated non-spring-assist torque above 6 lb-in; required on shades with an estimated torque higher than 15 lb-in.

b. Bead Chain Hold Down: Spring-Loaded Tensioner complying with ANSI/WCMA A100.1-2018 safety standard.

c. Idler end: Height adjustable idler end allows fine leveling adjustments after installation-min plus or minus 1/8 inch without shimming brackets. Contains at least two entry points for the idler end. Safety engagement feature requires idler end pin to have a minimum engagement in bracket, ensuring that the idler end cannot fall out of the bracket due to lack of pin engagement.

2. Dual Roller Configuration / Mounting:

a. Dual roller fascia. Endcaps with fascia designed for surface mounting of dual roller window shades.

1) Endcaps: 1028 steel stamping.

2) Fascia: L-shaped cover of extruded aluminum, .060 wall. Assembly snaps onto endcaps without exposed fasteners.

3) Size: 4-3/4 inches deep x 7 inches high x length required by window opening.

4) Finish: Selected from Manufacturers standard range.

b. Shade slat:

1) Closed pocket elliptical slat: 1 inch (25 mm) aluminum elliptical slat inside of a 1-5/8-inch (41 mm) pocket with heat sealed ends.

3. Rollers: Extruded aluminum roller tube of appropriate diameter to support shade fabric

with minimal deflection.

a. Minimum Roller Tube Diameter: 1.5 inches (32 mm). Tube diameters less than 1.5 inches shall not be acceptable unless manufacturer provides deflection analysis showing deflection limited to <= width (inches) /700 at 1.5X design load.

b. Fabric Connection to Roller Tube: Spline fabric/roller attachment system to allow shade fabric to be removed from roller without having to remove roller from brackets.

c. Fabric Length: 6 inches (152 mm) greater than window height minimum.

Hembar: Extruded aluminum, finished to match fascia

2.4 MOTORIZED WINDOW SHADES

A. Shade Motor and Control System

1. FlexShade Recharge. Lithium-Ion battery powered motor with built-in radio receiver. Includes Ion Lithium batteries. No external wiring required. Tubular motor and batteries concealed inside each shade roller tube.

a. 12V Power Adapter.

b. Recharge Motor Cable Extender - 96 inches.

c. Individual Control, Group Control and Individual and Group Control:

1) Five channel wireless wall switch for radio motor control.

B. Roller: Fabricated from extruded aluminum or steel. Wall thickness and material selected by manufacturer to accommodate shade size. Provide with roller idler assembly of molded nylon and zinc-plated steel pin. Sliding pin to allow easy installation and removal of roller. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric

2.5 FREE HANGING SHADE (ABOVE DOOR WINDOW)

A. Fabric selection either Infinity2 3% or black out

1. Architect to select fabric

2. Wall mount

3. Window section above doors

4. Shade is not operable

2.6 FABRIC

A. Light-Filtering Fabrics

1. Thermoplastic Olefin

a. Basketweave

1) SheerWeave Infinity2 3%: sustainable window treatment fabric eco-friendly basketweave. Core yarn and coating are PVC-free, lead-free and 100 percent recyclable. Fire classification: ASTM E-84 (Class I), NFPA 701-2004 TM#1 (small scale), NFPA 101 (Class A Rating) and CAN/ULC-S 109-03 Large, UL GREENGUARD, GREENGUARD Gold. 3 percent open. Average Fabric Thickness: .031 inch (.79 mm) Average Fabric Weight: 13.69 ounces per square yard.

B. Room Darkening Fabrics

1. Opaque

a. Polyester

1) SheerWeave Series SW7000 Blackout by Phifer: PVC-free polyester with acrylic foamed backing. Fire rating: California U.S. Title 19 (small scale), BS 5867 Part 2 Type B Performance, IBC Section 803.1.1 (Class A Rating), NFPA 101 (Class A Rating), NFPA 701 TM#1 (small scale), CAN/ULC-S 109 (large and small scale), CAN/CGSB2-4. 162-M80. Bacteria and fungal resistance: ASTM G21, AATCC 174-1998 Part II and III. E/nvironmental certification: Certified to UL GREENGUARD and GREENGUARD Gold standards for low chemical emissions into indoor air during product usage. Safe use: RoHS/Directive 2002/95/EC, US Consumer Product Safety Commission Section 101 and ANSI/WCMA A 100.1-2007 for lead content. Draper shades made with this fabric are GreenSpec listed. Opaque, .030 inches thick, 13.92 oz/square yard.

C. Color and pattern: As indicated in Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.

B. Coordinate requirements for power supply conduit, and wiring required for window shade motors and controls.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install roller shades level, plumb, square, and true. Allow proper clearances for window operation hardware.

C. Shade pockets:

1. Install shade pockets prior to installation of suspended ceiling system. Attach to supporting structure with screws through top of pocket at 24 inches (610 mm) minimum centers.

2. Install shade pockets in conjunction with installation of suspended ceiling system. Attach to supporting structure with screws through top of pocket at 24 inches (610 mm) minimum centers.

3. Install corner pieces securely and in alignment with pockets.

4. Install pocket ends securely and in alignment with pockets.

5. After interior construction is essentially complete, install shade and operating mechanism in pocket.

D. Install the following items to conceal roller and operating mechanism. Do not use exposed fasteners.

1. Fascias.

3.4 TESTING AND DEMONSTRATION

A. Test motorized window shades to verify that controls, limit switches, interface to other building systems, and other operating components are functional. Correct deficiencies.

B. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.

1. Chain and clutch.

2. Motorized operating mechanism.

C. Demonstrate operation of shades to Owner's designated representatives.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 SCHEDULES

A. Manually Operated Shades:

1. Shade Type SM-1 Single Roller

a. Mounting Type:

2. Shade Type SM-2 Dual Roller

a. Mounting Type:

B. Motorized Shades:

1. Shade Type MS-1 Single Roller

a. Configuration/Mounting:

2. Shade Type MS-2 Dual Roller

a. Configuration/Mounting:

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 12 48 13

ENTRANCE FLOOR MATS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Supply and install all Entrance floor mats and frames, as shown on Drawings and as specified herein, including all materials and labor for a timely, complete, and proper installation

B. Section includes, but is not limited to: Entrance floor mats and frames, including fibered roll good entrance systems

1.03 STANDARDS AND REFERENCES

A. ASTM International

1. ASTM D 2859 Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
2. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

B. Other referenced documents

1. NFPA: National Fire Protection Association
2. Consumer Products Safety Commission (CPSC) FF 1-70: Pill Test
3. Department of Commerce (DOC) FF 1-70: Pill Test
4. AAATCC: American Association of Textile Chemists and Colorists
5. LEED-NC v. 3

1.04 QUALITY ASSURANCE

A. Installer: Installer shall be highly experienced in performing work of this section, having previous done fiber roll goods installation work similar to that required for this project.

B. Testing Agency: Agency(ies) shall be independent and qualified to perform the specified product tests.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00 Submittal Procedures.

B. Product Data: For specified products, submit latest edition of product supplier's technical specifications data (available from www.matsinc.com).

C. Test and Evaluation Reports:

1. Product test reports: As required by Conditions of the Contract and Division 1 Regulatory Requirements Section, submit test certificates from an independent test laboratory showing compliance with specified performance characteristics and physical properties.

2. Compatibility and adhesion test reports: Submit test reports confirming adhesive's effectiveness with the product(s) specified.

D. Shop Drawings: Submit shop drawings showing layout, profiles, and product components.

E. Samples: Submit selection and verification samples showing the required finishes, colors, designs, and textures for flooring, as well as samples of adhesives and applicable accessories such as nosing, frames, etc.

F. Preinstallation Meetings: Meet to confirm project requirements, substrate conditions, manufacturer's installation instructions and warranty requirements in compliance with Division 1 requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Section 01 66 00 Product Storage and Handling Requirements.

B. Delivery and Acceptance Requirements: Comply with the product supplier's ordering and lead time requirements to avoid construction delays, and to allow material to acclimatize as required in the specified product's installation instructions. Accept delivery of materials only if they are in unopened, undamaged packaging that bears the name and brand of the manufacturer/product supplier, project identification, and shipping and handling instructions.

C. Storage and Handling Requirements: Store material -- including any adhesive and accessories -- in the original packaging (as delivered) in areas that are enclosed and weather tight with the permanent HVAC system set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation. In addition, comply with storage and handling requirements listed on product packaging, and described in the latest edition of the product's installation instructions (available from www.matsinc.com).

1.08 PROJECT CONDITIONS

A. Comply with the requirements of Sections 01 50 00 Construction Facilities.

B. Coordination: Install entrance matting after finishing operations, including painting and ceiling operations, have been completed.

C. Ambient site Conditions: The permanent HVAC system shall be operational and set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation, during the time of installation, and for 48 hours after installation has been completed. Thereafter, minimum temperature shall be 55°F.

1.09 OPERATION AND MAINTENANCE DATA

A. Provide in accordance with Section 01 77 00 Project Closeout.

B. Manufacturer Instructions: For specified products, submit latest editions of product supplier's installation and cleaning & maintenance instructions (available from www.matsinc.com).

1.10 WARRANTY

A. Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

B. Warranty documentation: For specified products and accessories, submit product supplier's warranty documents (available from www.matsinc.com).

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Supplier: Mats Inc., 37 Shuman Avenue, Stoughton, MA 02072; telephone: 1.800.MATS.INC (1.800.628.7462); fax: 1.781.344.1537; email: info@matsinc.com; website: www.matsinc.com.

B. Product: 3M™ Nomad™ Z-Web Medium Traffic Scraper Matting 6250

Construction:	Nonwoven continuous vinyl filaments with vinyl foam backing
Width:	3’
Length:	approximately 60’
Thickness:	7/16”
Weight:	126.82 ounces/square yard
Colors:	Brown

C. Performance: Physical properties of the entrance matting shall conform to the following minimums:

Safety	
Surface flammability	ASTM D2859: Pass (equal to CPSC FF 1-70)
Flammability	NFPA 253: 0.81 watts/cm^2
Performance	
Fungal growth	ASTM G21: inhibiting to fungal growth
Chemical resistance	AATCC 134: resistant to most chemicals
Electrostatic propensity	AATCC 134: 1.6 kV

2.02 ACCESSORY PRODUCTS

A. Matting Tape: 3M Stay-in-Place Matting Tape 130

B. Other: 3M Matting Adhesive

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verification of Conditions: Subfloors shall be clean and dry. Inspect all substrates and subfloors for proper tolerances.

C. Notify the Construction Manager and Architect in writing of any conditions detrimental to the proper and timely completion of the installation.

D. Correct conditions detrimental to timely and proper complete of the Work.

E. Do not proceed until unsatisfactory conditions are corrected.

F. Beginning of installation means acceptance of conditions.

3.02 SURFACE PREPARATION

A. Preinstallation Measurements: Verify actual measurement by field measuring before any onsite cutting, if applicable. To avoid construction delays, coordinate field measurements based upon construction progress.

B. Concrete subfloors: Where concrete subfloors are present, all work required to put the concrete subfloor in acceptable condition shall be the responsibility of the general contractor. See the state requirements for the project location.

3.03 INSTALLATION

A. Follow Division 01 relevant guidelines, and the latest edition of the manufacturer’s installation instructions (available from www.matsinc.com)

B. Interface with Other Work: If transitions are required to and/or from the specified entrance matting, contact Mats Inc. for suitable transition material.

C. Sizes: Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where possible, verify sizes by field measurement before shop fabrication.

D. Accessory selection: Where indicated for recessed or wall-to-wall applications provide aluminum framework as recommended by manufacturer. Where indicated for surface-mounted applications, provide tapered vinyl moldings with flanges sewn to back of mat on all four sides with mitered corners.

3.04 CLEANING

A. General: Clean up job site, including sweeping or dust mopping the floor to remove all dirt or grit, and put all waste in general contractor's dumpster. Follow overall cleaning guidelines described in Division 01.

B. Initial Maintenance: Conduct a full initial maintenance following the latest edition of the manufacturer's maintenance instructions (available from www.matsinc.com). Instruct owner's cleaning staff in proper maintenance procedures.

3.05 CLOSEOUT ACTIVITIES

Follow state requirements and Part 01 – Closeout Submittals requirements for these activities.

END OF SECTION

SECTION 22 00 10

BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Basic Plumbing Requirements specifically applicable to Division 22 Sections, in addition to Division 01 - General Requirements.

1.02 DESCRIPTION

A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

1.03 REFERENCES

A. Section 23 08 01 - Commissioning of Building Systems

1.04 WORK INCLUDED

A. The complete Plumbing systems (including Fire Protection systems), including but not limited to these major items.

1. Coordinate work of this Section with related trades.
2. Verify applicable dimensions and location of existing utilities at the jobsite.
3. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
4. Soil waste and vent system inside and outside the building including connections to fixtures, equipment, sewer connections, clean-outs.
5. Water piping systems inside and outside the building, including connections to fixtures, equipment, water meters and vaults; pressure regulating stations, backflow preventers.
6. Interruptible and non-interruptible fuel gas systems inside and outside the building, including connections, gas meters, earthquake valves, and pressure regulating stations.
7. Plumbing fixtures, carriers, fittings, trim, hose bibs, wall hydrants, and accessories.
8. Installation and connection of Owner furnished equipment.
9. Natural gas piping system including connections to equipment and site.
10. Water heating systems, including water heating equipment, circulating pumps, connections.
11. Shop drawings.
12. Equipment identification.
13. Equipment and systems adjustments and balancing.
14. Written operating and maintenance instructions.
15. Record drawings.
16. Guarantee

1.05 WORK SPECIFIED ELSEWHERE

A. Concrete, Rough Carpentry, Joint Sealants, Sheet Metal, Flashing and Trim, access doors and Frames, Door Hardware, Paints and Coatings, Mechanical and Electrical.

1.06 SITE INSPECTION

A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

1.07 ORDINANCES, REGULATIONS AND CODES

A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.

1. AFI - Air Filter Institute
2. AMCA - Air Moving & Conditioning Association
3. ARI - Air Conditioning & Refrigeration Institute
4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
5. ASME - American Society of Mechanical Engineers
6. ASTM - American Society of Testing Materials
7. AWSC - American Welding Society Code
8. ANSI - American National Standards Institute
9. CBC - California Building Code
10. CCR - California Code of Regulations
11. CEC - California Electrical Code
12. CFC - California Fire Codes
13. CMC - California Mechanical Code
14. CPC - California Plumbing Code
15. FIA - Factory Insurance Association
16. NAFM - National Association of Fan Manufacturers
17. NEMA - National Electrical Manufacturer's Association
18. NFPA - National Fire Protection Association
19. ORS - Office of Regulatory Services
20. SCAQMD - South Coast Air Quality Management District
21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
22. UFC - Uniform Fire Code
23. UL - Underwriter's Laboratories
24. UPC - Uniform Plumbing Code

B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.

C. Codes and Standards:

1. IBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).
3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
4. Uniform Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).
5. National Fire Protection Associations - National Fire Code.

D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.

E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.

F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

1.08 PERMITS, FEES AND INSPECTIONS

A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

1.09 DRAWINGS AND SPECIFICATIONS

A. The Architect's decision will be final on interpretation of the Drawings and Specifications.

B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.

C. Piping and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.

D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supersede the specification in the event of a conflict.

E. Alternate support or seismic detail proposed by contractor shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

1.10 SUBMITTALS

A. Before starting work, the Contractor shall furnish for the review of the Architect and Engineer. Provide Shop Drawings and Submittals with Itemized Equipment Lists, complete in all details that they propose to install. All items shall be submitted at the same time.

B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.

C. Variations or deviations on submitted items from that specified must be clearly tagged and / or identified.

D. Submittals shall include, but not necessarily be limited to the following which are mandatory:

1. Draw Equipment Layouts to ¼” scale, including equipment, piping accessories, and showing clearances for operating and servicing.
2. Schedule of pipe, fittings, valves, with manufacturer and catalog number.

3. Specialties, valves, gauges and thermometers of all types.
4. Foundations, supports, hangers, inserts.
5. Earthquake supports and calculations.
6. Insulation.
7. Shop fabrication drawings and installation drawings of piping layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of piping to finish floor level.
8. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades.
9. Automatic control system diagrams.
10. Access panels.
11. Clean-outs
12. Fixture carriers.
13. Hangers, inserts, supports, anchors.
14. Hose bibs.
15. Hot water circulators.
16. Pipe, fittings and specialties.
17. Pipe isolators.
18. Plumbing fixtures, fittings, trim, drains and receptors.
19. Pressure regulators.
20. Roof flashing.
21. Sleeves, escutcheons, caulking, waterproofing, fireproofing.
22. Strainers
23. Water hammer arrestors.
24. Water heating equipment.
25. Expansion joints, guides and anchors.
26. Shop fabrications drawings and calculations.
27. Special and miscellaneous products furnished under this section and not listed herein.

1.11 RECORD DRAWINGS AND MANUALS

A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.

B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.

C. Final Record Drawings: Conform to Division 1 requirements.

D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.

E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.

F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.

G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:

1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
2. Specifications
3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
4. Grouting requirements.
5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
6. Start-up and beginning operation procedures.
7. Operational procedures.
8. Shutdown procedures.
9. Maintenance and calibration procedures
10. Parts lists
11. Name, address and telephone number of each manufacturer's local representative.

H. “As-Built” drawings of ductwork and piping, including all elbows, transitions, damper and valve locations shall be provided prior to commencement of air and water balance.

1.12 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

1.13 SEISMIC DESIGN

A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:

1. In accordance with Title 24, 2022 CBC Chapter 16A, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.
2. For equipment weighing 400 pounds or more anchorage details and appropriate design calculations shall be submitted as part of the mechanical and electrical drawings. “Deferred Approval” items will not be permitted unless specifically approved by the plan check supervisor.
    a. Exception: Attachments of equipment weighting less than 400 pounds and supported directly on the floor or roof structure, furniture, or temporary or movable equipment and equipment weighing less than 20 pounds that is supported by vibration isolation devices suspended from the roof, wall or floor, need not be detailed on the plans provided the following notes are included on the mechanical and electrical plans.
3. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2022 CBC Chapter 16A. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

1.14 SUBSTITUTIONS AND CHANGES

A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.

B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.

C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.

D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. Design West Engineers will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on Design West Engineer's hourly rate for engineering services.

E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with Division 01.

1.15 SUBMITTAL REVIEWS

A. The Architect will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

1.16 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

A. Immediately after award of the Contract and after the final review of submittals by the Architect and / or Engineer, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time to meet construction schedule. The contractor shall deliver to the Architect and Owner a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

1.17 LOCATIONS AND ACCESSIBILITY

A. Drawings show piping diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping and make offsets during progress of work as required to meet structural and other interferences as reviewed by Architect and / or Engineer. Install piping to best suit field conditions after coordinating with other trades. Run exposed piping parallel to,

or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.

B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.

C. Installation at valves, thermometers, gauges, clean outs, controls, steam and water specialties, access doors or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessible located with reference to the finished building.

D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.

E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.

F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.

G. Provide sheaves and belts if required, to Test, Adjust and Balance Agency, to allow air moving equipment to meet flow requirements specified at no additional cost to the Owner.

1.18 COORDINATION OF TRADES

A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.

B. No extras will be allowed for changes made necessary by interference or coordination between trades.

C. Submit Composite Coordination Drawings in accordance with Special Conditions. Include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural interferences. Coordinate these Composite Coordination Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Division 01. Do not start installation of work involved under Composite Coordination Drawings until the Architect and Engineer reviews applicable submittal. Discrepancies between the Drawings and Composite Coordination Drawings shall be specifically noted and identified on the Composite Coordination Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Coordination Drawings.

1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub base and support.

2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.

3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.

4. Concrete: Conform to Concrete Section of the Specifications.

1.19 GUARANTEES

A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.

B. Guarantee included in this section to cover:

1. Faulty or inadequate design of equipment or material installed
2. Improper assembly or erection
3. Defective workmanship or material
4. Incorrect or inadequate operation or other failure

C. The Contractor shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise

D. Furnish the parts and labor to replace any items found to be defective in the refrigeration equipment with the guarantee period

E. In addition to other guarantees, furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.

F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty and proof of shipment date or purchase date per terms of warranty to the Owner, who shall be named as beneficiary.

1.20 PROTECTION OF EQUIPMENT AND MATERIALS

A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

1.21 CLOSING-IN OF UN-INSPECTED WORK

A. Contractor shall not allow or cause any of the work, specifically piping, to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, shall at their own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

1.22 BUILDING FOOTING CLEARANCES

A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

1.23 DAMAGE BY LEAKS

A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

1.24 EQUIPMENT LABELS

A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

1.25 EXCAVATION, TRENCHING AND BACK FILLING

A. Excavating, trenching and back filling for utilities within the building area shall be done in conformity with Division 31 - Site work. Piping shall be installed promptly after excavation in order to keep the trenches open as short a time as possible.

B. Excavating, trenching and back filling for utilities outside the building area shall be done in conformity with Division 31 - Earth work.

C. Any existing underground piping and conduit that is encountered shall be properly shored and protected from damage. Active piping shall be left intact and undamaged.

1.26 PRELIMINARY OPERATION

A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

1.27 MAINTAINING EXISTING SERVICES

A. The premises and existing building at the site will be in use at the time the work of this Section is in progress. Contractor shall conduct his work so as to cause no inconvenience or danger to the personnel on the premises.

B. He shall maintain continuity of service to the existing mechanical systems, except for designated intervals during which connections can be made. The scheduling of the shut down period shall be at a time directed by the Architect.

C. In some instances, it may be necessary to defer work in certain areas and locations until such time as existing facilities can be relocated or rearranged by the Owner. Therefore, whenever it becomes necessary for the Contractor to perform work under this contract in areas in which the Owner's work is being performed. This contractor shall advise the Architect relative to this requirement and shall follow closely the directive issued by the Architect insofar as time and procedure are concerned. Allow Owner 72 hours prior notice.

D. This contractor shall include in his bid all premium time to which he may be subjected for performing work in such procedure and at such time as may be necessary to cause the least interference with the function of the Owner.

1.28 ELECTRICAL WORK

A. Coordinate with Division 26 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.

B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, he shall pay additional electrical costs.

C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 26.

D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.

E. All interconnecting power wiring and conduits shall be provided by Division 26.

F. Control wiring shall be provided by Division 22, unless otherwise indicated on the drawings.

G. Conduit for control wiring shall be provided by Division 26.

END OF SECTION

SECTION 22 05 13

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

D. Three phase electric motors.

1.02 RELATED REQUIREMENTS

A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators 2021.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

E. Operation Data: Include instructions for safe operating procedures.

F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for _____ use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

B. Comply with applicable electrical code.

C. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide five-year manufacturer warranty for motors larger than 20 horsepower.

PART 2 - PRODUCTS

3.01 MANUFACTURERS

A. Baldor Electric Company/ABB Group; _____: www.baldor.com/#sle.

B. Leeson Electric Corporation; _____: www.leeson.com/#sle.

C. Regal-Beloit Corporation (Century); _____: www.centuryelectricmotor.com/#sle.

D. _____.

E. Substitutions: See Section 01 60 00 - Product Requirements.

3.02 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 26 05 83 for required electrical characteristics.

B. Electrical Service:

1. Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz.
2. Motors Larger than 1/2 Horsepower: _____ volts, three phase, 60 Hz.

C. Nominal Efficiency:

1. Open Motor with Two Poles: 82.5.
2. Open Motor with Four Poles: 82.5.
3. Open Motor with Six poles: 50.0.
4. Enclosed Motor with Two Poles: 75.5.
5. Enclosed Motor with Four Poles: 82.5.
6. Enclosed Motor with Six Poles: 50.0.

D. Construction:

1. Open drip-proof type except where specifically noted otherwise.
2. Design for continuous operation in 104 degrees F environment.
3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
4. Motors with frame sizes 254T and larger: Energy efficient type.

E. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

F. Wiring Terminations:

1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

3.03 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

B. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.

C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.

D. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.

E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

3.04 SINGLE PHASE POWER - SPLIT PHASE MOTORS

3.05 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

3.06 SINGLE PHASE POWER - CAPACITOR START MOTORS

PART 3 - EXECUTION

4.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 05 16

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion joints and compensators.

1.02 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2022.

1.03 SUBMITTALS

A. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

PART 2 - PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Manufacturers:

1. Mercer Rubber Company; _____: www.mercer-rubber.com/#sle.

2. The Metraflex Company; _____: www.metraflex.com/#sle.

2.02 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

A. Manufacturers:

1. Mercer Rubber Company; _____: www.mercer-rubber.com/#sle.

2. The Metraflex Company; _____: www.metraflex.com/#sle.

2.03 EXPANSION JOINTS - STAINLESS STEEL BELLOWS TYPE

A. Manufacturers:

1. Mercer Rubber Company; _____: www.mercer-rubber.com/#sle.

2.04 EXPANSION JOINTS - EXTERNAL RING CONTROLLED STAINLESS STEEL BELLOWS TYPE

A. Manufacturers:

1. Mercer Rubber Company; _____: www.mercer-rubber.com/#sle.

2.05 EXPANSION JOINTS - SINGLE SPHERE, FLEXIBLE CONNECTOR

A. Manufacturers:

1. Mercer Rubber Company; _____: www.mercer-rubber.com/#sle.

2. The Metraflex Company; _____: www.metraflex.com/#sle.

B. Body Construction: Nylon-reinforced rubber tube.

C. End Connections: Carbon steel flanges.

D. Cover and Tube Elastomer: EPDM and EPDM.

E. Maximum Elongation: 3/8 inch.

F. Maximum Angular Movement: 15 degrees.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

END OF SECTION

SECTION 22 05 17

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.02 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.01 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.02 SLEEVE-SEAL SYSTEMS

A. Manufactures: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:

1. Advance Products & Systems, Inc
2. CALPICO, Inc
3. Metraflex Company
4. Pipeline Seal and Insulator, Inc
5. Proco Products, Inc

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.03 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Comply with requirements for fire stopping specified in Section 078413 "Penetration Fire stopping."

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.03 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller than NPS 6 (DN 150): Cast-iron wall sleeves.

b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:
    a. Piping Smaller than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system.
        1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
    b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system.
        1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs-on-Grade:
    a. Piping Smaller than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system.
        1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
    b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system.
        1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
4. Concrete Slabs above Grade:
    a. Piping Smaller than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
    b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves.
5. Interior Partitions:
    a. Piping Smaller than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
    b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.02 SUBMITTALS

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

PART 2 - PRODUCTS

2.01 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.02 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.

h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.

i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.

j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with rough-brass finish.

k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.02 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 05 19

METERS AND GAUGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges.

B. Thermometers.

C. Pressure-temperature test plugs.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments 2022.

B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi 2004 (Reaffirmed 2017).

C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers 2014 (Reapproved 2020).

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers 2014 (Reapproved 2021).

E. UL 393 - Indicating Pressure Gauges for Fire-Protection Service Current Edition, Including All Revisions.

F. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

C. Project Record Documents: Record actual locations of components and instrumentation.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements. for additional provisions.

2. Extra Pressure Gauges: One of each type and size.

PART 2 - PRODUCTS

2.01 PRESSURE GAUGES

A. Manufacturers:

1. Ashcroft, Inc; _____: www.ashcroft.com/#sle.

2. Dwyer Instruments, Inc; _____: www.dwyer-inst.com/#sle.

3. Moeller Instrument Company, Inc; _____: www.moellerinstrument.com/#sle.

4. Omega Engineering a subsidiary of Spectris, Plc; [_____]: www.omega.com/#sle.

5. Weksler Glass Thermometer Corp; _____: www.wekslerglass.com/#sle.

6. _____.

7. Substitutions: See Section 016000 - Product Requirements.

B. Bourdon Tube for Liquids and Gases:

1. Dial Size and Cover: 4-1/2 inch diameter scale with polycarbonate window.
2. Dial Text and Markings: Black color on white background with scaled kPa and psi units.
3. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
4. Process Connection: Lower-back, 1/4 inch NPT male except where noted.
5. Gauge Wetted Materials: Painted steel case and brass socket rated to match process pressure and temperature range.
6. Comply with UL 393 when used for fire protection service or UL 404 when used for compressed gas service.

2.02 THERMOMETERS

A. Manufacturers:

1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com/#sle.
2. Moeller Instrument Company, Inc; _____: www.moellerinstrument.com/#sle.
3. Watts Water Technologies, Inc; _____: www.watts.com/#sle.
4. Weiss Instruments, LLC; _____: www.weissinstruments.com/#sle.

B. General:

1. Product Compliance: ASTM E1.
2. Lens: Clear glass, except where stated.
3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

C. Thermometers - Straight: 5 inch v-shape lead-free brass case with clear glass window scale, 2 inch NPT stem, 3-1/4 inch NPT thermowell, and red or blue non-toxic organic liquid filled glass tube.

D. Thermometers - Adjustable Angle: 7 inch v-shape aluminum case with clear glass window scale, 6 inch NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

E. Thermometers - Dial Type:

1. Fixed: 5 inch diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch NPT stem.
    a. Remote-Local Reading: Include built-in platinum RTD probe for remote reading.
2. Adjustable Angle: 5 inch diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch NPT stem.
3. Vapor (Gas) Actuated: 4-1/2 inch glass-reinforced phenolic case, aluminum dial with black pointer, recalibrating screw, 2 inch brass thermowell, adjustable joint with positive locking device allowing 180 degrees in vertical plane adjustment and capillary.

4. Manufacturers:
    a. Marshall Instruments, Inc; _____: www.marshallinstruments.com/#sle.
    b. Reotemp Instruments Corp; _____: reotemp.com/#sle.
    c. Wika Instrument, LP; _____: www.wika.us/#sle.

2.03 PRESSURE-TEMPERATURE TEST PLUGS:

A. Size: 500 psi capacity; 1/2 inch MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch pressure gauge or temperature probe.

B. Wetted Materials per Temperature Range:
    1. Up to 200 degrees F: Brass probe with neoprene core.
    2. 200 to 350 degrees F: Brass probe with EPDM core.
    3. 350 to 400 degrees F: Brass probe with synthetic rubber core.

C. Accessories: Brass, lever-handle cock and snubber-filter.

D. Test Kit: Internally padded carrying case fitted with two 2-1/2 inch diameter pressure gauges, adapters, two 1/8 inch probes, and 1 inch dual-scale dial thermometers.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify Utility Service Provider piping readiness to receive meter.

B. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

3.02 INSTALLATION

A. Install pressure gauges as follows:
    1. At Pumps: Place single gauge before strainer, suction side and discharge side.
    2. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.
    3. Include siphons on high temperature systems and select type according to service rating.
    4. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.

B. Install thermometers as follows:
    1. Hot Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.
    2. Piping: Install thermometers in branch butt weld connection fitting or socket-weld thermowell. Enlarge pipes smaller than 2-1/2 inch to accommodate sockets. Ensure sockets are above insulation clearance.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 05 23

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Iron swing check valves with closure control.
7. Bronze gate valves.
8. Iron gate valves.

1.02 ACTION SUBMITTALS

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

1.03 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valves shall be provided on all supplies to equipment and fixtures.

C. Obtain each type of valve from single source from single manufacturer.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Bronze valves shall be made with dezincificaation-resistant materials. ronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.

2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.

H. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

I. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.02 BRASS BALL VALVES

A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Nibco
2. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 400 psig (2760 kPa).
c. Body Design: One piece.
d. Body Material: Forged brass.
e. Ends: Threaded.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).

c. CWP Rating: 400 psig (4140 kPa).

d. Body Design: Two piece.

e. Body Material: Forged brass.

f. Ends: Threaded or Solder.

g. Seats: PTFE or TFE.

h. Stem: Brass.

i. Ball: Chrome-plated brass.

j. Port: Full.

C. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hammond Valve.

b. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig (1035 kPa).

c. CWP Rating: 600 psig (4140 kPa).

d. Body Design: Two piece.

e. Body Material: Forged brass.

f. Ends: Threaded.

g. Seats: PTFE or TFE.

h. Stem: Brass.

i. Ball: Chrome-plated brass.

j. Port: Regular.

2.03 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Hammond Valve.

d. Milwaukee Valve Company.

e. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig (1035 kPa).

c. CWP Rating: 600 psig (4140 kPa).

d. Body Design: Two piece.

e. Body Material: Bronze.

f. Ends: Threaded or Solder.

g. Seats: PTFE or TFE.

h. Stem: Bronze.

i. Ball: Chrome-plated brass or Stainless Steel.

j. Port: Full.

2.04 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Crane Co.; Crane Valve Group; Jenkins Valves.

d. Hammond Valve.

e. Milwaukee Valve Company.

f. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 3.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Design: Horizontal flow.

d. Body Material: ASTM B 62, bronze.

e. Ends: Threaded.

f. Disc: Bronze.

2.05 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. NIBCO, INC

2. Description:

a. Standard: MSS SP-71, Type I.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Design: Clear or full waterway.

d. Body Material: ASTM A 126, nickel iron with bolted bonnet.

e. Ends: Flanged.

f. Trim: Composition.

g. Seat Ring: Bronze.

h. Disc Holder: Bronze.

i. Disc: ASTM A351.

j. Gasket: Asbestos free.

2.06 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Crane Co.; Crane Valve Group; Jenkins Valves.

d. Crane Co.; Crane Valve Group; Stockham Division.

e. Hammond Valve.

f. Milwaukee Valve Company.

g. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 1.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.

d. Ends: Threaded or solder joint.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Stainless Steel.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Crane Co.; Crane Valve Group; Jenkins Valves.

d. Hammond Valve.

e. Milwaukee Valve Company.

f. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.

d. Ends: Threaded or solder joint.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Stainless Steel.

PART 3 - EXECUTION

3.01 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Shut-off valves shall be provided in main branches, runs to risers and where indicated on drawings

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install on operators for butterfly valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm above finished floor.

1. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.02 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.03 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.

2. Throttling Service: ball, or butterfly valves.

3. Pump-Discharge Check Valves:

a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.

b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.

c. NPS 2-1/2 (DN 65) and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.

4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.

5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.04 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:
1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Two piece, full port, brass or bronze with brass trim.
4. Bronze Swing Check Valves: Class 125, bronze or nonmetallic disc.
5. Bronze Gate Valves: Class 125, NRS.

B. Pipe NPS 2-1/2 (DN 65) and Larger:
1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
5. Iron Gate Valves: Class 125 OS&Y.
6. Iron Globe Valves: Class 125.

3.05 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:
1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, brass or bronze with brass trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Gate Valves: Class 125, NRS.

B. Pipe NPS 2-1/2 (DN 65) and Larger:
1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
3. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
4. Iron Gate Valves: Class 125, OS&Y.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.
4. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying and undue strain.
5. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers.

1.03 SUBMITTALS

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

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.05 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.02 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts. The total load of piping components imposed on trapeze spans shall not exceed manufacturer's design load rating. Load calculation and detail of each unit shall include a safety factor of two times the expected load.

2.03 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa), ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.04 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.05 PIPE STANDS

A. General Requirements for Pipe Stands: shop or field fabricated assemblies made of manufactured corrosion-resistant components ot support roof-mounted piping.

B. Compact pipe stand:

1. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
3. Hardware: Galvanized steel or polycarbonate.
4. Accessories: Protection pads.

C. Single-Base, Single-Pipe Stand:

1. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
3. Vertical Members: Two galvanized steel, continuous thread, 1/2 inch rods.
4. Horizontal Member: Adjustable horizontal, galvanized steel pipe support Chanel.
5. Pipe Supports: Roller
6. Hardware: Galvanized steel
7. Accessories: Protection pads.

2.06 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.07 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.08 ACOUSTICAL NOISE AND VIBRATION ISOLATION

A. Acoustical Isolation System: Consisting of loop hangers, J-hangers, through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material, associated support bracket, and fire stop sleeve devices. For applications requiring acoustical isolation of tubing, piping, and equipment from building elements, such as floors, walls, and framing members.

2.09 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Stainless Steel: ASTM A240/A240M.

C. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Stand Installation:

1. Pipe Stand Types: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.

b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.

c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.

d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.

e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

O. Protect tubing and piping from damage caused by abrasion when passing through studs, joist, and similar framing suing abrasion protection isolators.

P. Prevent damage to piping and tubing caused by contact between dissimilar metals using insert system designed specifically for this application.

3.02 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.04 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.05 PAINTING

A. Touch up: 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 a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touch up: Cleaning and touch up painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting." And Section 099123 "Interior Painting."

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

3.06 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).
8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 05 48

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vibration-isolated equipment support bases.

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:

C. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. California Dynamics Corp: www.caldyn.com.

B. Mason Industries: www.mason-ind.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. General:

1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

3.02 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

C. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

D. Inspect isolated equipment after installation and submit report. Include static deflections.

3.04 SCHEDULES

A. Pipe Isolation Schedule.

1. 1 Inch Pipe Size: Isolate 120 diameters from equipment.
2. 2 Inch Pipe Size: Isolate 90 diameters from equipment.
3. 3 Inch Pipe Size: Isolate 80 diameters from equipment.
4. 4 Inch Pipe Size: Isolate 75 diameters from equipment.
5. 6 Inch Pipe Size: Isolate 60 diameters from equipment.
6. 8 Inch Pipe Size: Isolate 60 diameters from equipment.
7. 10 Inch Pipe Size: Isolate 54 diameters from equipment.
8. 12 Inch Pipe Size: Isolate 50 diameters from equipment.
9. 16 Inch Pipe Size: Isolate 45 diameters from equipment.
10. 24 Inch Pipe Size: Isolate 38 diameters from equipment.
11. Over 24 Inch Pipe Size: As indicated.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: For each ty;e of product indicated, provide manufacturer's standard product data sheets. Data sheets must detail compliance with applicable standards for color and size and clearly define durability of no less than 4 years.

PART 2 - PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Pipe Markers: 3/4 inch diameter and higher.

2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

2.03 NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc: www.pipemarker.com.
2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
3. Seton Identification Products: www.seton.com.

B. Description: Laminated piece with up to three lines of text.

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving minimum 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.

3. Letter Height: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 200 deg F.

C. Equipment Nameplate Content: Each nameplate shall include equipment's Drawing designation or unique equipment number, consistent with the drawings.

2.04 TAGS

A. Manufacturers:
1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Brimar Industries, Inc: www.pipemarker.com.
4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
5. Seton Identification Products: www.seton.com.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges. The content of each tag shall include a 1/4 inch top-line abbreviation identifying the system Terminology shall match drawings. Content, second line shall include a unique sequential 1/2 inch number to identify the valve.

C. Tag Material: Brass, 0.032 inch or stainless steel 0.032 inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

D. Fasteners: Brass or stainless steel S-hook.

2.05 STENCILS

A. Manufacturers:
1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. Seton Identification Products: www.seton.com.

B. Stencils shall be identified as indicated below including direction of flow
1. Gravity Condensate - G.C.
2. Domestic Cold Water - D.C.W.
3. Domestic Hot Water - D.H.W.
4. Domestic Hot Water Return - D.H.W.R.
5. Natural Gas - GAS

C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

D. Stencil Ink: Interior stencil ink shall be compatible with interior surfaces and finishes.

2.06 PIPE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradycorp.com/.
2. Craftmark Pipe Markers: www.craftmarkid.com.
3. Seton Identification Products: www.seton.com.

4. Substitutions: See Section 016000 - Product Requirements.

B. General Requirements for Manufactured Pipe Labels: Identify the content and directional flow of piping systems. Whenever possible select manufacturers standard preprinted, color-coded, pipe markers. Pipe marker sizes and colors shall comply with ANSI / ASME A13.1.

C. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

2.07 CEILING TACKS

A. Manufacturers:

1. Craftmark: www.craftmarkid.com.
2. Brady Corporation: www.bradycorp.com.
3. Seton Identification Products: www.seton.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: Steel with 3/4 inch diameter color coded head.

C. Color code as follows:

1. Plumbing Valves: Green.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints and encapsulate.

3.02 INSTALLATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Install tags in clear view and align with axis of piping

E. Identify valves in main and branch piping with tags.

F. Identify piping, concealed or exposed, with stencilled painting. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Glass fiber insulation.

C. Jacketing and accessories.

D. Insulating Covers for Accessible Lavatory / Sink Piping

1.02 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019, with Editorial Revision (2023).

B. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation 2017 (Reapproved 2023).

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2023.

D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2022a.

E. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2022.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023c.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).

H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness. Inspect for damage.

B. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

C. Protect insulation from damage by securing areas and by leaving factory packaging in place until usage.

PART 2 - PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

B. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASME C81.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.

2.02 GLASS FIBER INSULATION

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com.
2. Johns Manville Corporation: www.jm.com.
3. Knauf Insulation: www.knaufusa.com.
4. Owens Corning Corporation: www.ocbuildingspec.com.

B. Insulation: ASTM C547 and ASTM C552; inorganic, incombustible, rigid, hermetically sealed cells supplied with manufacturer's recommended factory-applied jacket..

1. K Value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Aeroflex USA, Inc: www.aeroflexusa.com.
2. Armacell LLC: www.armacell.us.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation containing antimicrobial additive complying with ASTM C534/C534M Type I; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:

1. Manufacturers:
    a. Johns Manville Corporation: www.jm.com.
2. Jacket: One piece molded type fitting covers and sheet material, off-white color, UV-resistant PVC complying with ASTM D1784.
    a. Minimum Service Temperature: 0 degrees F.
    b. Maximum Service Temperature: 150 degrees F.

c. Connections: Brush on welding adhesive.

B. ABS Plastic Jacket:

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: Minus 40 degrees F.

b. Maximum Service Temperature: 180 degrees F.

c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.

d. Thickness: 30 mil, 0.03 inch.

e. Connections: Brush on welding adhesive.

C. Aluminum Jacket:

1. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.05 TAPES

A. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive: suitable for indoor and outdoor applications.

1. Manufacturers:

a. 3M Industrial Adhesives and Tapes Division

b. Ideal Tape Col, Inc., an American Biltrite Company.

2. Width: 2 inches

3. Thickness: 6mils

4. Adhesion: 64 ounces force/inch in width

5. Elongation: 500 percent.

6. Tensile Strength: 18 lbf/inch in width.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers:

a. 3M Industrial Adhesives and Tapes Division.

b. Ideal Tape Co., Inc., an American Biltrite Company.

2. Width: 2 inches

3. Thickness: 3.7 mils

4. Adhesion: 100 ounces force/inch in width.

5. Elongation: 5 percent.

6. Tensile Strength: 34 lbf/inch in width.

2.06 INSULATING COVERS FOR ACCESSIBLE LAVATORY / SINK PIPING

A. Insulating Covers for Exposed Trap and Drainage Piping, Hot-Water Supplies, and Cold-Water Supplies.

1. Manufacturer:

a. Plumberex Specialty Products, Inc.

b. IPS Corporation.

2. Descriptions: Manufactured plastic insulating covers fro trap and drainage piping, hot-water supplies and cold-water supplies. Thermal insulating properties protect from burns, cold temperature thermal shock, abrasions, or other physical harm from contact with exposed piping under accessible lavatories and sinks. Comply with Americans with Disabilities Act (ADA) and ANSI A117.1 accessibility requirements.
3. Comply with IBC Chapter 7 - Thermal - and Sound _ Insulating Materials. Insulating cover material tested in accordance with ASTM E84 or UL 723, and NFPA 255, resulting in a flame-spread index of 25 and smoke-developed index of 450, Class A, and ASTM C1822, Type L.
4. Comply with microbial and fungal resistance of "Zero growth" when tested in accordance with ASTM G21.
5. Comply with IBC Chapter 11 - Accessibility - General.
6. Comply with IPC Chapter 3 - General Regulations - Section: Washroom and Toilet Room Requirements - Subsection : Interior finish. Interior finish surfaces of toilet rooms shall comply with the International Building Code.
7. Comply with IPC Chapter 4 - Fixtures, Faucets and Fixture Fittings - Section: Accessible Plumbing Facilities - Subsection: Exposed Pipes and Surfaces.
8. Comply with UPC Chapter 4 - Plumbing Fixtures and Fixture Fittings - Section: Fixtures and Fixture Fittings for Persons with Disabilities - Subsection: Exposed Pipes and Surfaces.
9. Comply with ASTM C1822, Insulating Covers on Accessible Lavatory Piping.
10. The insulating cover shall be manufactured in a form suitable for application: no adhesive tapes shall be allowed as method for covering exposed piping.
11. Color as selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces: free of voids throughout the length of piping, including fittings, valves, and specialties.

D. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Exposed Piping: Locate insulation and cover seams in least visible locations.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

I. Install insulation on piping accessories requiring future re-occurring access and service with factory fabricated insulation covers that are easily removed and reapplied

J. Glass fiber insulated pipes conveying fluids below ambient temperature:

    1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

    2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

K. Glass fiber insulated pipes conveying fluids above ambient temperature:

    1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.

    2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

L. Inserts and Shields:

    1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

    2. Insert Location: Between support shield and piping and under the finish jacket.

    3. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

M. Continue insulation through walls, roof, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

N. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

O. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

P. Install manufactured preformed insulating cover around hot-water supplies, and cold-water supplies including supply stops, butted up to bottom surface of lavatory / sink, or up inside between wall and upper lavatory / sink cavity. ensure a straight precision cut fit and finish.

Q. Install manufactured preformed insulating cover around trap and tubing, including all drainage piping, butted up to bottom surface of lavatory and over escutcheon wall trim. Ensure a straight precision cut fit and finish.

R. Secure all covers with fasteners provided. Do not use cable tie fasteners, adhesives, or adhesive tapes for attachments. Do not use adhesives as a component to support the fastening system.

S. Do not use adhesives in any part of the method of construction of the insulation coverings.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 07 19.11

UNDER-LAVATORY PIPE AND SUPPLY COVERS – PLUMBEREX

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Under-lavatory pipe and supply covers.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Owner-furnished fixtures.

B. Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

A. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice current edition.

B. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.

C. ABA Standards - ABA Accessibility Standards 2004, with Amendments (2015).

D. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2022).

F. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019, with Editorial Revision (2023).

G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.

H. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2021.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023b.

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).

K. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 2004.

L. IAPMO (UPC) - Uniform Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of covers, sizes, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

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

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 - PRODUCTS

2.01 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Manufacturers:

B. Plumberex Specialty Products, Inc; _____: www.plumberex.com/#sle.

C. Substitutions: Not permitted.

D. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.

E. Fusion Molded Under-Lavatory Insulators (Non-Sewn): Plumberex Handy-Shield Maxx.

F. Slim Fit Under-Lavatory Insulators (Non-Sewn): Plumberex Trap Gear.

G. Under-Lavatory Covers with Snap-Lock Fasteners (Molded): Plumberex Pro-Extreme.

H. General:

I. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks per ADA Standards.

J. Adhesives, sewing threads, and two-ply laminated materials are prohibited.

K. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.

L. Construction: 1/8 inch PVC with antimicrobial, antifungal, and ultraviolet light (UV) resistant properties.

M. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.

N. Comply with ASTM C1822 for covers on accessible lavatory piping.

O. Comply with ASME A112.18.9 for covers on accessible lavatory piping.

P. Thermal Resistance: R value of 0.504 or lower when tested by ASTM C177.

Q. Thermal Conductivity: K value of 0.358 or density of 21.61 pcf per ASTM C518.

R. ASTM E84 Compliant, Under-Lavatory Insulators:

S. Manufacturers:

T. Plumberex Specialty Products, Inc: Plumberex Trap Gear; www.plumberex.com/#sle.

U. Construction: Soft, non-laminated, flexible PVC with antimicrobial, antifungal, and UV-resistant properties. Fusion molded one piece universal design for multiple P-trap configurations. Adhesives, sewing threads, and two ply laminated materials shall not be allowed. Exterior surfaces shall be smooth nonabsorbent with no finger recessed indentations for easy cleaning. Supply riser shall be flexible and a minimum of 15 inches inches in length.

V. Provide with weep hole for condensation drainage and ventilation.

W. Fasteners: Reusable, fusion bonded Velcro and tamper resistant snap-locking fasteners with no sharp or abrasive external surfaces. No cable tie fasteners allowed.

X. Comply with:

Y. ASTM E84/UL 723 to comply with flame spread and smoke development rating of 25/450.

Z. ASTM C1822 Type I.

AA. ADA Standards.

BB. 36 CFR 1191.

CC. ICC (IBC).

DD. ADAAG Standards 2004 and 28 CFR 36.

EE. GSA and DOD ABA Standards.

FF. ICC A117.1.

GG. IAPMO (UPC).

HH. Color: High gloss color to match fixture.

II. Under-Lavatory Covers with Snap-Lock Fasteners:

JJ. Manufacturers:

KK. Plumberex Specialty Products, Inc: Plumberex Pro-Extreme; www.plumberex.com/#sle.

LL. Construction: PVC with antimicrobial, antifungal, and UV-resistant properties, one piece injected molded design with internal bridge at top of J-bend to prevent separating.

MM. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

NN. Maintenance: Valve and supply cover shall be accessible for maintenance without removal and with removable, reusable access cap.

OO. Comply with:

PP. ADA Standards.

QQ. 36 CFR 1191.

RR. ADAAG Standards and 28 CFR 36.

SS. GSA and DOD ABA Standards.

TT. ICC A117.1.

UU. Requirement to protect against contact with sharp or abrasive surfaces.

VV. Provide with weep hole for condensation drainage and ventilation.

WW. Vandal Resistance: Internal line grooves for trimming not easily torn by hand. All trim line grooves shall require tool cutting only.

XX. Color: High gloss white.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that walls, floor finishes, lavatories, and piping are prepared and ready for installation of under-lavatory guards.

B. Confirm location and size of fixtures and piping before installation.

3.02 INSTALLATION

A. Install under-lavatory guards according to manufacturer's written instructions.

3.03 CLEANING

A. Clean installed under-lavatory guards.

B. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.04 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 22 10 05

PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Domestic water piping, buried beyond 5 feet of building.

B. Domestic water piping, buried within 5 feet of building.

C. Domestic water piping, above grade.

D. Storm drainage piping, buried within 5 feet of building.

1. Sanitary sewer and vent.
2. Natural gas piping, buried beyond 5 feet of building.
3. Natural gas piping, buried within 5 feet of building.
4. Natural gas piping, above grade.
5. Natural Gas.
6. Pipe flanges, unions, and couplings.
7. Pipe hangers and supports.
8. Ball valves.
9. Butterfly valves.
10. Balancing valves.
11. Pressure reducing valves.
12. Pressure relief valves.
13. Strainers.

1.02 REFERENCE STANDARDS

A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing 2019.

B. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems 2015 (Reaffirmed 2020).

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2021.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.

E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.

F. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV 2021.

G. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV 2022.

H. ASME B31.1 - Power Piping 2022.

I. ASME B31.9 - Building Services Piping 2020.

J. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2023.

K. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2022).

L. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.

M. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2021.

N. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2023a.

O. ASTM B32 - Standard Specification for Solder Metal 2020.

P. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.

Q. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2022.

R. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.

S. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.

T. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.

U. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings 2022.

V. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.

W. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings 2020.

X. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2021a.

Y. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings 2022.

Z. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter 2022.

AA. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.

BB. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings 2021.

CC. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.

DD. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping 2020.

EE. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023c.

FF. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core 2023.

GG. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

HH. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2019.

II. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings 2021.

JJ. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2023.

KK. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast 2017, with Errata (2018).

LL. AWWA C606 - Grooved and Shouldered Joints 2022.

MM. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm) 2022.

NN. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2021.

OO. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2020.

PP. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).

QQ. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .

RR. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

SS. NSF 372 - Drinking Water System Components - Lead Content 2022.

TT. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

UU. ASME - Boiler and Pressure Vessel Code

VV. AGA - American Gas Association Code

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Valve Repacking Kits: One for each type and size of valve.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State of California, standards.

1. Maintain one copy on project site.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX. Qualify procedures and operators in accordance with ASME Boiler and Pressure Vessel Code.

E. Piping materials shall bear label, stamp, or other markings fo specified testing agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

E. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping in accordance with requirements of authoritites having jurisdiction.

F. Protect and store PE pipes and valves from direct sunlight.

G. Handle, store, and protect equipmment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations. Replace all damaged or defective items.

1.06 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

B. Interruption of Existing Utility Service: Do not interrupt service to facilities occupied by owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:

1. Notify Construction Manager no fewer thatn two days in advance of proposed interruption of sanitary waste service.

2. Do not proceed with interruption of sanitary waste service without Construction Manager's written permission.

C. Become familiar with details of the scope of work, verify dimensions in the field, and advise the Architect / Engineer of any discrepancy prior to performing any work.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 14, NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

C. Sanitary Waste and Vent Systems: Comply with NSF 14, "Plastics Piping Systesm Compontes and Related Materials," for plastic piping components. Include marking with "FSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

2.02 SANITARY SEWER AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. ABS Pipe: ASTM F628, Schedule 40.

1. ABS Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste and vent patterns.

2. Joints: Solvent welded with ASTM D2235 cement.

a. Solvent cement shall have a VOC content of 325 g/L or less.

b. Solvent cement shall comply with the testing and product requirments of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. PVC Schedule 40 DWV Pipe per ASTM D1785 and ASTM D 2665

1. Fittings: PVC DWV per ASTM D 2665

2. Joints: Solvent cement weld per ASTM F 656 and solvent cement per ASTM D2564
    a. Solvent cement shall have a VOC content of 510 g/L or less.
    b. Adhesive primer shall have a VOC content of 550 g/L or less.
    c. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.03 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A888, CISPI 301, hubless, service weight.
    1. Fittings: Cast iron, ASTM A888 or CISPI 301.
    2. Sovent Stack fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aearator and deaerator drainage fittings.
    3. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
    4. CISPI, Hubless-Piping Couplings:
        a. Standards: ASTM C 1277 and CISPI 310.
        b. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices: and ASTM C 564, rubber sleeve with integral, center pipe stop.
    5. Cast-Iron, Hubless-Piping Couplings:
        a. Standards: ASTM C 1277 and ASTM C 1540.
        b. Descrition: Stanless-steel shield with stainless-steel bands and tightening devices: and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.04 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Ductile Iron Pipe: AWWA C151/A21.51.

B. Ductile Iron Pipe: AWWA C151/A21.51.
    1. Fittings: AWWA C110/A21.10, ductile or gray iron, standard thickness.
    2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket with 3/4-inch diameter rods.

C. Copper Pipe: ASTM B42, hard drawn.

D. Copper Pipe: ASTM B42, hard drawn.
    1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

E. PVC Schedule 80 Pipe: ASTM D 1785.
    1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
    2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.

2.05 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: Class 150 bronze unions with brazed joints below grade, hard drawn.
    1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
    2. Copper Unions:

a. MSS SP-123

b. Cast-copper-alloy, hexagonal-stock body.

c. Ball-and-socket, metal -to-metal seating surfaces.

d. Solder-joint or threaded ends.

2.06 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B32, alloy Sn95 solder.

3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

a. Manufacturers:

1) Anvil International: www.anvilintl.com/#sle.

2) Apollo Valves: www.apollovalves.com/#sle.

3) Grinnell Products: www.grinnell.com/#sle.

4) Viega LLC: www.viega.us/#sle.

2.07 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. ABS Pipe: ASTM D2680.

1. NSF Marking: Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm serwer piping.

2. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.

3. Cellular-Core ABS Pipe: ASTM F628, Schedule 40.

4. Fittings: ABS ASTM D2661, made to ASTM D3311, drain, waste, and vent patterns.

5. Joints: Solvent welded with ASTM D2235 cement.

a. Solvent cement shall have a VOC content of 325 g/L or less.

b. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.08 STORM DRAINAGE PIPING, ABOVE GRADE

A. Hubless Cast Iron Pipe: ASTM A74 extra heavy weight.

1. Fittings: Cast iron ASTM C1277

2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

3. Minimum working pressure: 10-ft head of water.

4. Minimum Working Pressure on Forced-Main Piping: 50 psig.

5. Description: Stainless steel corrugated shield with stainless stell bands and tightinening devices: and ASTM C564, rubber sleeve with integral, center pipe stop.

2.09 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Flexible Gas Piping:

1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.
2. Fittings: Provided by piping system manufacturer.

2.10 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
2. Joints: Threaded or welded to ASME B31.1.
3. All exposed piping shall be painted or jacketed.

2.11 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch and Under:

1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.
2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

C. No-Hub Couplings:

1. Testing: In accordance with ASTM C1277 and CISPI 310.
2. Gasket Material: Neoprene complying with ASTM C564.
3. Band Material: Stainless steel.
4. Eyelet Material: Stainless steel.

D. Grooved and Shouldered Pipe End Couplings:

1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing gasket: "C" shape composition sealing gasket.

2.12 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to ASME B31.9.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.

C. Plumbing Piping - Water:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.

2.13 BALL VALVES

A. Manufacturers:
1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Apollo Valves: www.apollovalves.com.
3. Nibco, Inc: www.nibco.com/#sle.
4. Uponor, Inc: www.uponorengineering.com/#sle.
5. Viega LLC: www.viega.us/#sle.
6. Stockham: www.stockham.com

B. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

C. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handlewith balancing stops, solder endswith union.

2.14 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.15 STRAINERS

A. Size 2 inch and Smaller:
1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 2-1/2 inch to 4 inch:
1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Shut-off valves shall be provided on all main branches, runs to risers and where shown on drawings. Locate shut-off valves over T-Bar Ceiling when possible. Provide access panesl when shut-off valves are located over hard lid ceilings.

I. Provide access where valves and fittings are not exposed.

J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Color to be specified by architect.

K. Exposed, unfinished pipe, fittings, supports, and accessories shall be painted.

L. Exterior piping, fittings, supports and accessories shall have approved UV protection

M. Install valves with stems upright or horizontal, not inverted. See Section 220523.

N. Provide stem extension on all valves for piping requiring insulation to ensure valve can be cycled without damaging pipe insulation.

O. Install water piping to ASME B31.9.

P. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

Q. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.
2. Support horizontal piping as indicated.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.04 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install globe valves for throttling, bypass, or manual flow control services.

E. Provide spring-loaded check valves on discharge of water pumps.

F. Provide flow controls in water recirculating systems where indicated.

3.05 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:

1. Perform hydrostatic testing for leakage prior to system disinfection.

2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.

3. General:

a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.

C. Gas Distribution Systems:

1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.

2. General Systems:

a. Inject a minimum of 10 psi of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.

b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound.

3. Welded Pipes or Systems with Service Pressures Above 14 in-wc:

a. Inject a minimum of 60 psi of compressed air into the piping system for a duration of 30 minutes and verify with a gauge that no perceptible pressure drop is measured.

b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound with 1 psi increments.

D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with local jurisdiction. Potable water systems shall be disinfected and flushed prior to use by water-chlorination solution and have bacteriological examination made by an approved agency per 2022 California Plumbing Code section 609.9 and as prescribed in AWWA C651. Methods of cleaning / disinfecting for new or repair piping as described in C651 or NFPA 24.

B. Prior to starting work, verify system is complete, flushed, and clean.

3.07 INSTALLATION OF FLOW CONTROL VALVES

A. Install automatic flow control valve in each hot water recirculating loop, and elsewhere as indicated. Install a shutoff valve and strainer upstream and a union, check valve and shutoff valve downstream of each automatic flow control valve.

B. Set flow control valve flow rate as follows:

1. Preliminary Procedures For Hot Water Return System Balancing:
    a. Before operating the system perform these steps:
        1) Open Valves at recirculation pump and flow control valves to full open position.
        2) Remove and clean all strainers.
        3) Check recirculation pump rotation.
        4) Set water heater temperature as indicated on the drawings.
2. Procedures For Hot Water Return System Balancing:
    a. Refer to the drawings for required flow rate for each flow control valve.
    b. Provide required instrumentation to obtain proper measurements. Instruments shall be properly maintained and protected against damage.
    c. Apply instrument as recommended by the manufacturer.
    d. Take readings with the eye at the level of the indicated valve to prevent parallax.
    e. Mark flow control valve setting with memory stop. Mark with paint or other suitable, permanent identification materials.
    f. Retest, adjust, and balance systems subsequent to significant systems modifications, and resubmit test results.

C. Reports: Prepare hot water return system balancing reports signed and submit to the architect upon completion of the project. Include the following information:
    1. Valve tag number and description of location
    2. Valve body size
    3. Differential pressure reading from instrument in psi
    4. Actual flow rate derived from the manufacturer's charts and tablets for the valve size and measured differential pressure.

3.08 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
    1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
    2. Provide 18 gauge, 0.0478-inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 10 06

PLUMBING PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Refrigerator valve and recessed box.

E. Backwater valves.

F. Backflow preventers.

G. Double check valve assemblies.

H. Water hammer arrestors.

I. Trap Primer

J. Sanitary waste interceptors.

K. Mixing valves.

L. Catch basins and manholes.

M. Exterior penetration accessories.

N. Fire-rated enclosures.

O. Flexible connectors.

1.02 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains 2022.

B. ASME A112.6.4 - Roof, Deck, and Balcony Drains 2022.

C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers 2023.

D. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent 2021.

E. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies 2021.

F. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies 2021.

G. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance 2011 (Reaffirmed 2016).

H. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

I. NSF 372 - Drinking Water System Components - Lead Content 2022.

J. PDI-WH 201 - Water Hammer Arresters 2017.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Certificates: Certify that grease interceptors meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

B. Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations. Replace all damaged or defective items.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Manufacturers:

1. Josam Company: www.josam.com.
2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Mifab: www.mifab.com

B. Drain Assemblies

1. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

C. Roof Drains:

1. Standard: ASME A112.6.4.
2. Description: Coated cast-iron roof drain, non-puncturing clamp ring with integral gravel stop, and sump with wide roof flange.
3. Body: Lacquered cast iron with sump.
4. Strainer: Removable polyethylene locking dome.
5. Outlet: Bottom no-hub, refer to drawings for size.

D. Overflow Drains:

1. Standard: ASME A112.6.4.
2. Description: Coated cast-iron roof drain, non-puncturing clamp ring with integral gravel stop, sump with wide roof flange.
3. Body: Lacquered cast iron with sump.
4. Strainer: Removable polyethylene locking dome.
5. Outlet: Bottom no-hub, refer to drawings for size.
6. Collar: 2 inch high solid clamping collar

E. Downspout Nozzles:

1. Description: Cast bronze downspout nozzle, loose wall flange and inlet threaded connection.
2. Body Material: Cast bronze
3. Connection Type: No-hub spigot outlet
4. Pipe Size: Refer to drawings.

F. Area Drains:

1. Standard: ASME A112.6.3.
2. Description: Coated cast iron area drain, two-piece body with double drainage flange, non-puncturing flashing collar, weep holes, round top, adjustable collar with rolled thread and loose-set, anti-tiliting, heavy-duty, deep-set tractor grate.
3. Body: Lacquered cast iron with sump.
4. Outlet: Bottom no-hub outlet, refer to plans for size.
5. Strainer: Round nickel-bronze.
6. Load Class: Class C, heavy duty.

G. Area Drains:

1. Standard: ASME A112.6.3.
2. Description: Coated cast iron drain, round medium-duty anti-tilting grate with perimeter drainage slots, set in round, non-puncturing membrane clamp ring and medium sump with 4" wide deck flange, and inside caulk connection.
3. Body: Lacquered cast iron with sump.
4. Outlet: Bottom no-hub outlet, refer to plans for size.
5. Strainer: Round nickel-bronze.
6. Load Class: Class A, light duty.

H. Floor Drain:

1. Standard: ASME A112.6.3.
2. Description: Lacquered cast iron two piece body with double drainage flange, invertible non-puncturing flashing collar with weep holes and threaded to receive adjustable strainer.
3. Body: Lacquered cast iron with sump.
4. Outlet: Bottom no-hub outlet, reefer to plans for size.
5. Trap primer connection: 1/2 inch.
6. Strainer: Round adjustable nickel-bronze.

I. Trench Drain:

1. Standard: ASME A112.6.3
2. Description: Trench drain system assembled from factory fabricated, standard lengths and variable depths, with integral joint flanges and integral grating support rails; includes joint gaskets and grating. End outlets, bottom outlets, end caps, and corner / T-connectors.
3. Body: Sheet molding compound / glass reinforced polyester.
4. Outlet: Bottom no-hub outlet, refer to plans for size.

5. Trap Primer: 1/2 inch connection.
6. Load Class: Class C, heavy duty.
7. Grate: Heel-proof perorated grate.

J. Floor Sink:

1. Standard: ASME A112.6.7
2. Description: Cast iron 8 inch square, 6 inch deep flanged receptor with seepage holes, loose set acid resistant coated cast iron grate.
3. Body: Cast iron with acid-resistant coated interior.
4. Outlet: Bottom no-hub, refer to drawings for size.
5. Strainer: Aluminum dome.
6. Trap Primer: 1/2 inch connection.
7. Grate Coverage Area: Half grate

K. Floor Sink:

1. Standard: ASME A112.6.7.
2. Description: Cast iron 16 inch square, 12 inch deep flanged receptor with seepage holes, loose set acid resistant coated cast iron grate.
3. Body: Cast iron with acid-resistant coated interior.
4. Outlet: Bottom no-hub, refer to drawings for size.
5. Strainer: Aluminum dome.
6. Trap primer: 1/2 inch connection.
7. Grate Coverage Area: Half grate.

L. Planter Drains:

1. Standard: ASME A112.6.4.
2. Description: Planter drain with coated cast iron drain assemblies, perforated PVC standpipe and stainless steel mesh covered domes.
3. Body: Coated cast iron
4. Drain Receiver: Under deck camp, stainless steel mesh covered cast iron dome, clamp collar with gravel guard.
5. Outlet: Bottom no-hub outlet, refer to plans for size.

2.03 CLEANOUTS

A. Cast-Iron Cleanout

1. Manufacturers:
    a. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
    b. Josam Company: www.josam.com.
    c. Zurn Industries, LLC: www.zurn.com.
    d. Mifab: www.mifab.com
2. Standard: ASME A 112.36.2M.
3. Size: Same as connected drainage piping

4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Frame and Cover: Round, stainless steel

2.04 HOSE BIBBS

A. Manufacturers:
1. Woodford: www.woodfordmfg.com.
2. Zurn Industries, LLC: www.zurn.com.
3. Mifab: www.mifab.com

B. Exposed Hose Bibbs:
1. Standard: ASME A112.18.1.
2. Description: Wall mounted hose bibb with integral mounting flange, chrome plated with metal handwheel, and operating tee key.
3. Body Material: Bronze with chrome finish
4. Supply Connections: 3/4 inch.
5. Vacuum Breaker: Integral, non-removable, hose-connection vacuum breaker complying with ASSE 1011.

C. Recessed Hose Bibbs:
1. Standard: ASME A112.18.1.
2. Description: Wall mounted hose bibb with lockable recessed box, chrome plated with metal hand wheel and operating tee key.
3. Body Material: Bronze with chrome finish
4. Supply Connections: 3/4 inch.
5. Vacuum Breaker: Integral, non-removeable, hose-connection vacuum breaker complying with ASSE 1011.
6. Recessed Box: Brass or chrome lockable box.

D. Roof Hose Bibbs:
1. Standard: ASME A112.18.1.
2. Description: Roof mounted hose bibb, chrome plated with metal hand wheel and operating tee key.
3. Body Material: Bronze with chrome finish.
4. Supply connections: 3/4 inch.
5. Vacuum Breaker: Integral, non-removeable, hose-connection vacuum breaker complying with ASSE 1011.

E. Hot and Cold Hose Bibbs:
1. Standard: ASME A112.18.1.
2. Description: Wall mounted hose bibb with integral mounting flange, with dual metal hand wheels and operating tee keys.
3. Body Material: Bronze with chrome finish.
4. Supply Connections: 3/4 inch hot, 3/4 inch cold.

5. Vacuum Breaker: Integral, non-removeable, hose-connection vacuum breaker complying with ASSE 1011.
6. Recessed Box: Brass or chrome lockable box.

2.05 REFRIGERATOR VALVE AND RECESSED BOX

A. Box Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Oatey Supply Chain Services, Inc: www.oatey.com.
3. Viega LLC: www.viega.us.

B. Valve Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Viega LLC: www.viega.us.
3. Zurn Industries, LLC: www.zurn.com.

C. Refrigerator Valve and Recessed Box:
1. Standards: NSF 61 section 9.
2. Mounting: Recessed
3. Description: Plastic preformed rough-in box with faceplate cover.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include 1/2 inch or smaller copper tube outlet.
5. Supply Shutoff Fitting: 1/2 inch quarter turn brass ball valve.

D. Fire Rated Refrigerator Valve and Recessed Box:
1. Standards: ASTM E814
2. Mounting: Recessed
3. Description: Caulk molded compound (BMC) thermoset fire-rated plastic, UL classified fire wrap insulation material, adjustable galvanized steel mounting bracket, and faceplate cover.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include 1/2 inch or smaller copper tube outlet.
5. Supply Shutoff Fitting: 1/2 inch quarter turn brass ball valve.

2.06 BACKWATER VALVES

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.
3. Zurn Industries, LLC: www.zurn.com.

B. Cast Iron Back Water Valve:
1. Standard: ASME A112.14.1
2. Size: same as connected piping.
3. Body Material: Cast iron.
4. Cover: Cast iron with threaded access check valve.
5. End Connections: No hub.

6. Check Valve: Removable, bronze, swing check, factory assembled.
7. Extension: ASTM A74, Service class; full-sized, cast-iron soil-pipe extension to field-installed cleanout at floor, replaces backwater valve cover.

2.07 BACKFLOW PREVENTERS

A. Manufacturers:
1. Conbraco Industries, Inc: www.apollovalves.com.
2. Watts Regulator Company, a part of Watts Water Technologies : www.wattsregulator.com.
3. Zurn Industries, LLC: www.zurn.com.

B. Reduced Pressure Backflow Preventer Assembly:
1. Standard: ASSE 1013.
2. Operation: Continuous pressure applications.
3. Pressure Loss: 13 psi maximum, through middle third of flow range.
4. Size: Refer to plans.
5. Body: 2 inches and smaller bronze body assembly, 2-1/2 inches and larger a stainless steel body. All sizes with corrosion resistant internal parts and stainless steel springs.
6. End Connections: Threaded full port ball valves for 2 inches and smaller, flanged gate valves for 2-1/2 inches and larger.
7. Size: assembly with threaded gate valves.
8. Accessories:
a. Valves 2 inches and smaller: Ball type with threaded ends on inlet and outlet.
b. Valves 2-1/2 inches and larger: Outside screw and yoke-gate type with flanged ends on inlet and outlet.
c. Air gap fitting, lead-free Y-strainer, and test cocks.

2.08 DOUBLE CHECK-VALVE ASSEMBLIES

A. Manufacturers:
1. Apollo Valves: www.apollovalves.com.
2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
3. Zurn Industries, LLC: www.zurn.com.

B. Double Check Valve Assembly:
1. ASSE 1012; cast bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.
2. Size: 3/4 to 2 inch, NPS assembly with threaded full port ball valves.

C. Double Check Valve Assembly:
1. Standard: ASSE 1015 and NSF 61.
2. Operation: Continuous pressure applications unless otherwise indicated.

3. Size: Refer to plans.
4. Body: 2 inches and smaller bronze body assembly, 2-1/2 inches and larger a stainless steel body. All sizes with corrosion resistant internal parts and stainless steel springs.
5. End Connections: Threaded full port ball valves for 2 inches and smaller, flanged gate valves for 2-1/2 inches and larger.
6. Size: assembly with threaded full port ball valves.
7. Accessories:
    a. Valves 2 inches and smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves 2-1/2 inches and larger: Outside-screw and yoke-gate type with flanged ends on inlet an outlet.

2.09 WATER HAMMER ARRESTORS

A. Manufacturers:
1. Precision Plumbing Products: www.pppinc.com.
2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
3. Mifab: www.mifab.com

B. Water Hammer Arrestors:
1. Standard: ASSE 1010
2. Type: Copper tube with piston.
3. Temperature Range: 33 degrees F to 200 degrees F
4. Systems exceeding 80 PSI shall have a pressure reducing valve installed upstream of the water hammer arrestor units.
5. All concealed water hammer arrestoers shall be accessible by means of access door or removable panel.
6. Vertical caped pipe columns will not be permiteted.

2.10 TRAP PRIMERS

A. Manufacturers:
1. Precision Plumbing Products: www.pppinc.com.
2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
3. Mifab: www.mifab.com

B. Pressure Drop Trap Primer
1. Description: Fully automatic, no adjustment required, activates on 3 PSI pressure differential.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Cabinet: All concealed trap primers shall be accessible by means of access door or removable panel. Recessed-mounted steel box with stainless-steel cover.

6. Inlet and Outlet Connection: 1/2 inch threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

C. Electronic Trap Primer

1. Description: Electronic Trap Primer floor drain trap priming device consisting of a solenoid valve, bronze air gap fitting, 3-prong cord, and timer factory set to discharge once every 24 hour period. Add EMS to interface with the facility's energy management system as required. Conforms to UL and CSA Standards. Installed to manufacturer's recommendations.
2. Standard: ASSE 1044.
3. Cabinet: All concealed trap primers shall be accessible by means of access door or removable panel. Recessed -mounted steel box with stainless-steel cover.
4. Inlet and Outlet size: 1/2 inch threaded or solder joint.

2.11 SANITARY WASTE INTERCEPTORS

A. Manufacturers:

1. Zurn Industries, LLC: www.zurn.com.
2. Jensen Precast: ww.jensenprecast.com
3. Xerxes: www.xerxes.com
4. Schier Products Company: www.shierproducts.com

B. Oil Interceptors:

1. Construction:
    a. Material: Precast concrete.
    b. Rough-in: Fully recessed flush with floor (deep rough-in) with anchor flange .
    c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish. Cover shall be rated Load Class C / heavy duty.
    d. End Connections: Hub

C. Grease Interceptors:

1. Construction:
    a. Material: Precast concrete.
    b. Rough-in: Fully recessed flush with floor (deep rough-in) with anchor flange .
    c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish. Cover shall be rated Load Class C / heavy duty.
    d. End Connections: Hub

D. Hydro Mechanical Grease Interceptor:

1. Construction:
    a. Material: Molded polyethylene.

b. Rough-in: Fully recessed flush with floor (deep rough-in) with anchor flange .

c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish. Cover shall be rated Load Class C / heavy duty.

d. End Connections: Flanged

E. Sand/Sediment Interceptors:

1. Construction:

a. Material: Precast concrete.

b. Rough-in: Fully recessed flush with floor (deep rough-in) with anchor flange .

c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish. Cover shall be rated Load Class C / heavy duty.

d. End Connections: Flanged

e. Epoxy coated cast iron body and secured cover with removable stainless steel sediment bucket.

F. Sample Station:

1. Construction:

a. Material: Precast concrete.

b. Rough-in: Fully recessed flush with floor (deep rough-in) with anchor flange .

c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish. Cover shall be rated Load Class C / heavy duty.

d. End Connections: Flanged

2.12 MIXING VALVES

A. Thermostatic Mixing Valves:

1. Manufacturers:

a. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com.

b. POWERS, a WATTS brand: www.watts.com/our-story/brands/powers.

c. Symmons Industrie, Inc.: www.symmons.com.

d. Leonard Valve Company: www.leonardvalve.com.

e. Bradley Corporation: www.bradlycorp.com.

2. Construction:

a. Standard: ASSE 1017

b. Pressure Rating: 125 psig.

c. Type: Therostatically controlled, water mixing valve.

d. Material: Bronze body with corrosion-resistant interior compnents.

e. Connectons: Threade inlets and outlet.

f. Accessories: Check stops on hot-and cold water supplies, and adjustable, temperature control handle.

g. Tempered-Water Setting: 110 deg F unless stated otherwise on plans.

h. Inlet / Outlet Connections: Refer to plans for sizes, provide ball valves.

2.13 CATCH BASINS AND MANHOLES

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for prodding of drainage system.

C. Install floor cleanouts at elevation to accommodate finished floor.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

E. Pipe relief from backflow preventer to nearest drain.

F. Install water hammer arrestors complete with accessible isolation valve on supply piping.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 11 23

DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Circulators.

B. Inline pump systems.

C. Inline pumps.

1.02 RELATED REQUIREMENTS

A. Section 22 05 13 - Common Motor Requirements for Plumbing Equipment.

B. Section 26 05 83 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Provide certified pump curve with duty point marked over pump and system operating conditions and NPSH curve and power requirement by pump tag.

2. Manufacturer's catalog sheets for fixtures, fittings, accessories, and supplies.

C. Shop Drawings: Include dimensions and performance data.

D. Test Reports: Plumbing fixture operational tests.

E. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

F. Executed warranty.

G. Specimen warranty.

H. Project Record Documents: Record actual locations of components.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements for additional provisions.

2. Extra Pump Seals: One of each type and size.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing type of products specified in this section, with minimum three years of documented experience.

B. Certifications: Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc, as suitable for purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rated capacity identified by permanently attached label.

D. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for circulators. Complete forms in Owner's name and register with manufacturer.

PART 2 - PRODUCTS

2.01 CIRCULATORS

A. Manufacturers:

1. Substitutions: See Section 01 60 00 - Product Requirements.

B. Casing: Bronze with bronze cast impeller, and stainless steel rotor assembly.

C. Shaft: Alloy steel with integral thrust collar and two oil-lubricated bronze sleeve bearings.

D. Mechanical Seal: Carbon rotating against a stationary ceramic seat.

E. Pipe-End Connection: Union connection.

F. Maximum Discharge Pressure: 145 psi.

G. Motor: 1,750 rpm, ECM duty with flexible coupling.

H. Service Temperature Range: Minus 30 to 250 degrees F.

I. Controls: Provide aquastat set for high-temp cutoff, electric plug, and illuminated hand switch.

2.02 INLINE PUMPS

A. Manufacturers:

1. Armstrong Fluid Technology; _____: www.armstrongfluidtechnology.com/#sle.
2. Bell & Gossett, a Brand of Xylem, Inc; _____: www.xylem.com/#sle.
3. Grundfos Pumps Corporation; TPE Series: www.grundfos.com/#sle.
4. Taco, Inc; _____: www.tacocomfort.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Split-coupled, end-suction pump for heads up to 175 psi.

C. Type: Vertical, base-mount, single-stage inline with Class 125 flanged pipe-end connections.

D. Casing: Bronze with renewable bronze casing wearing rings and seal flush connection.

E. Impeller: Bronze, fully enclosed, keyed directly to solid alloy steel with bronze sleeve shaft.

F. Seal: Mechanical, single spring type, for 225 degrees F service.

G. Electrical:

1. Motor: 1,750 rpm, continuous duty; see Section 22 05 13.
2. Motor Protection: Include overvoltage, overcurrent, and motor overload.
3. Wiring Connections: See Section 26 05 83.
4. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install products with related fittings, and accessories according to manufacturer instructions.

B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).

C. Electrical-Driven Pump Work:

1. Provide electric-motor-driven equipment specified complete with local disconnect switch and control panel with starter, controls, safety devices, and related wiring.
2. Provide automatic control and protective devices field-wired to interface-related devices required for specified operation.

D. Ensure that small pressure gauges are installed on both upstream and downstream ends.

E. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are nonoverloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.03 CLEANING

A. Thoroughly clean plumbing fixtures and equipment.

B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

3.04 PROTECTION

A. Protect installed products from damage due from subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 11 23.13

DOMESTIC-WATER PACKAGED BOOSTER PUMPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Packaged booster system for pressures up to 145 psi.

1.02 RELATED REQUIREMENTS

A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

1.03 ABBREVIATIONS AND ACRONYMS

A. EPDM: Ethylene propylene diene terpolymer; synthetic rubber.

B. NEMA: National Electrical Manufacturers Association.

C. NPT: National pipe thread.

D. PSC: Pump system controller.

E. VFD: Variable frequency drive.

1.04 REFERENCE STANDARDS

A. ASHRAE Std 90.1 I-P-2010 - Energy Standard for Buildings Except Low-Rise Residential Buildings 2010.

B. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks 2020, with Errata (2023).

C. ICC (IPC) - International Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code) 1989 (Corrigendum 2019).

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

F. NEMA MG 1 - Motors and Generators 2021.

G. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

H. NSF 372 - Drinking Water System Components - Lead Content 2022.

I. UL (DIR) - Online Certifications Directory Current Edition.

J. UL 508 - Industrial Control Equipment Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Manufacturer's catalog sheets for fixtures, fittings, accessories, and supplies.

2. Provide certified pump curve with duty point marked over pump, system operating conditions, NPSH curve, and power requirement by pump tag.

C. Shop Drawings: Include dimensions and performance data.

D. Test Reports: Plumbing fixture operational tests.

E. Manufacturer's qualification statement.

F. Operation and Maintenance Data: Include operation, maintenance, and inspection data replacement part numbers and availability, and service depot location and telephone number.

G. Executed warranty.

H. Specimen warranty.

I. Project Record Documents: Record actual locations of components.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements for additional provisions.

2. Extra Pump Seals: One per type and size.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing type of products specified in this section, with minimum three years of documented experience.

B. Certifications: Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide non-prorated 24-month manufacturer warranty from date of installation, not to exceed 30 months from date of manufacture. Complete forms in Owner's name and register with manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Armstrong

B. Grundfos

C. Or equal

2.02 PACKAGED BOOSTER SYSTEM FOR PRESSURES UP TO 145 PSI

A. General Requirements:

1. Furnish self-contained, factory-assembled pump skid with isolation valves, gauges, threaded or flanged fittings, system fill and drain valves, signage, component identification, electrical raceway, equipment tags, instruments, and controls fitted on fabricated, structural steel frame skid base; tested, adjusted, and shipped as integral unit.

2. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are nonoverloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3. Listings and Energy Conservation Testing:

a. UL (DIR) QCZJ listed and certified as packaged pumping system for US and Canada.

b. NSF 61 and NSF 372 listed for drinking water and low lead requirements.

c. Simulate remote-mount sensor use through proportional pressure control with squared or linear adaptation, or with actual or calculated flow rate, based on performance curves of 5th order polynomial, to adjust setpoint pressure for proportional pressure control. Comply with ASHRAE Std 90.1 I-P-2010.

B. Packaged Performance Requirements:

1. Maximum Discharge Pressure: 145 psi.
2. Skid Capacity Load Distribution: Four pumps; leads at 25 percent and lag at 25 percent.
3. Contactors or Integrated Frequency Converter Operation, Except Where Noted:

C. Functional Requirements:

1. UL (DIR) listed package pumping system.
2. NSF 61 and NSF 372 certified pumping system.
3. ASHRAE Std 90.1 I-P-2010 compliant pumping system.
4. Advanced control interface with password protection.
5. Built-in data logger.
6. Ethernet-ready with built-in web server interface.
7. Clock programmable for pump test run.
8. Stop function in the form of no-flow shutdown.
9. Pump curve data loaded into controller.
10. End of curve protection.
11. Flow rate estimation (viewable on controller).

D. Skid System Construction:

1. Design and fabricate respective suction and discharge manifold to minimize pressure drop, corrosion potential, and bacteria growth prevention at piping intersections.
2. Exclude manifold protruding sharp edge transitions or interconnecting piping. These are not acceptable.
3. Design skid manifold to prevent water stagnation during operation and inhibit bacteria growth inside it.
4. Piping Manifold Material: 316 stainless steel with connection sizes as follows:
    a. 3 inches and smaller: NPT, male.
    b. 4 to 8 inches: ANSI Class 150 rotating flanges.
    c. 10 inches and larger: ANSI Class 150 flanges.
5. Pump Isolation Valves:
    a. Manually operated valve at suction and discharge side of each pump.
    b. 2 inches and Smaller: Full port, nickel-plated brass, ball valve.
    c. 3 inches and Larger: Full-lug style butterfly valve, cast iron body, stainless steel disk, EPDM valve seat, then internally and externally coated with fusion-bonded epoxy.

d. Pump outlet combined pressure-reducing check valve assembly to ensure near-uniform system pressure.

e. Actuators: If required, provide electronic type for modulation control, line-voltage type for pipe or equipment isolation, or pneumatic type for high-torque or non-water applications.

f. Manual Operators: Lock-out tag-out (LOTO) type for manual and actuator operated.

6. Pump Discharge Check Valve:

a. Wafer style, spring-loaded, non-slam type fitted between two flanges.

b. Stainless steel or leadless bronze disk with stainless steel material.

c. Limit head loss to under 5 psi at pump design capacity.

d. 1-1/2 inches and Smaller: POM composite body and poppet with stainless steel spring and EPDM or NBR seats.

e. 2 inches and Larger: Stainless steel or epoxy-coated iron (fusion-bonded) body with EPDM or NBR resilient seat.

7. Pressure Sensors:

a. Factory-installed pressure sensor with transducer on discharge manifold or shipped loose for field installation where indicated on drawings.

b. Provide factory-installed pressure transducer on suction manifold for water shortage protection for systems with positive inlet gauge pressure.

c. Use pressure transducers made of 316 stainless steel with plus/minus 1.0 percent full scale accuracy with hysteresis and repeatability of no greater than 0.1 percent of full scale and output signal of 4-20 mA when supply voltage range between 9 to 32 VDC.

8. Pressure Gauges:

a. Manifold-mount pressure gauge of bourdon tube type for suction and discharge sides.

b. 2-1/2-inch diameter gauge, liquid filled, copper-alloy internal parts, and stainless steel case.

c. 2-1/2 percent accuracy and capable resisting pressures up to 30 percent above maximum span without requiring recalibration.

9. For systems that require diaphragm tank, provide 3/4-inch minimum connection on discharge manifold.

10. For systems with flooded suction inlet or suction lift configurations, provide factory-installed water shortage protection device on suction manifold.

11. Base Frame: Construct using corrosion-resistant 304 stainless steel with rubber vibration dampers fitted between pump and base frame to minimize vibration.

12. Control Panel Installation: Depending on system size and configuration mount of:

a. Skid-attached cabinet stand fabricated of 304 stainless steel.

b. Separate skid-detached cabinet stand fabricated of 304 stainless steel.

c. Separate base floor mount with plinth fabricated of 304 stainless steel.

E. Skid Vibration Isolation: See Section 22 05 48.

F. Low Pressure Control: Stop pump operation if incoming water pressure drops to atmospheric.

G. Pumps:

1. Provide pumps of end-suction, horizontal, multistage design with vertical discharge at pump centerline.
2. Ensure pump-head-capacity curve shows steady rise in head from maximum to minimum flow within preferred operating region. Select minimum shutoff head at 20 percent higher than maximum efficiency point head.
3. Cast Iron Pump Fabrication Requirements:
    a. Nominal Flow: 10 to 130 gpm.
    b. Secure pump impeller directly to pump shaft by means of splined shaft arrangement with Stop Ring and Nord-lock washer or similar parts to disassemble pump from pump side.
    c. Include internal pipe thread (NPT) connections for suction and discharge sides when required by pump station manufacturer.
    d. Pump Suction Inlet End: Include priming plug on top side for liquid filling prior to startup and drain plug on lower side.
    e. Pump Fabrication Materials:
        1) Inlet and Discharge Ends: Class 30, cast iron.
        2) Impellers and Chambers: 304 stainless steel.
        3) Shaft: 431 stainless steel, sized from 2 mm to 16 mm.
        4) Spacing Pipe: 316 stainless steel.
        5) O-Rings: EPDM.
        6) Shaft Seal: O-ring type with fixed driver to include:
            (a) Seal Ring Retainer and Driver: 304 or 316 stainless steel.
            (b) Spring: 304 or 316 stainless steel.
            (c) Stationary Seal: Graphite-imbedded silicon carbide.
            (d) Rotating Seal: Graphite-imbedded silicon carbide.
            (e) O-Rings: EPDM.
4. AISI 304 or 316 Stainless Steel Pump Fabrication Requirements:
    a. Nominal Flow: 10 to 130 gpm.
    b. Secure pump impeller directly to pump shaft by means of splined shaft arrangement with Stop Ring and Nord-lock washer or similar parts to disassemble pump from pump side.
    c. Include internal pipe thread (NPT) connections for suction and discharge sides when required by pump station manufacturer.
    d. Pump Suction Inlet End: Include priming plug on top side for liquid filling prior to startup and drain plug on lower side.
    e. Pump Fabrication Materials:
        1) Flanged Inlet and Discharge Ends: Cast iron.
        2) Impellers, Chambers, and Sleeve: 304 or 316 stainless steel.

3) Shaft: 304 or 316 stainless steel, sized from 2 mm to 16 mm.

4) Spacing Pipe: 316 stainless steel.

5) O-Rings: EPDM.

6) Shaft Seal: O-ring type with fixed driver to include:

(a) Seal Ring Retainer and Driver: 304 or 316 stainless steel.

(b) Spring: 304 or 316 stainless steel.

(c) Stationary Seal: Graphite-imbedded silicon carbide.

(d) Rotating Seal: Graphite-imbedded silicon carbide.

(e) O-Rings: EPDM.

H. Control Panel Requirements:

1. Provide Short Circuit Current Rating (SCCR) of 100 kA for control panel assembly.
2. BMS or Other Integrated Automation Connectivity: ASHRAE Std 135 BACnet MS/TP.
3. Mount pump system controller in UL (DIR) listed, NEMA 250 Type 3R-rated enclosure, and UL 508 listed assembly. Self-certified NEMA enclosure rating not considered equal.
4. Assemble control panel to include:
    a. Main disconnect.
    b. Surge arrestor.
    c. Circuit breaker per pump.
    d. System fault light indicator.
    e. Pump run status light indicators.
    f. Terminal blocks for circuit coordination.
    g. Relays for alarms and other functions.
    h. 80 dB system fault audible alarm with push button to silence.
    i. Switches: Emergency operation, normal operation, and control bypass.

I. Integrated Variable Frequency Drive and Motor Requirements:

1. Combined Efficiency: Select permanent-magnet motor design to meet IE5 efficiency levels with combined motor and VFD efficiency to exceed NEMA Premium requirements.
2. Bearing Current Mitigation: Motors to use Winding Set Back (WSB) and/or Coil Head Shield (CHS) designs to reduce Bearing Voltage Ratio (BVR) to eliminate damaging bearing currents without using shaft grounding rings, brushes, or common mode filters.
3. Motor and Enclosure Cooling: Provide Totally Enclosed Fan Cooled (TEFC) motor with standard C-Face frame, Class F insulation, and Class B temperature limits in compliance with NEMA MG 1. Ensure cooling design of motor and VFD assembly does not exceed Class B at motor winding end at full-rated load and speed at minimum switching frequency of 9.0 kHz.
4. Size motor drive end bearings for minimum of L10 bearing life of 20,000 hours at minimum allowable continuous pump flow rate at full-rated speed.

5. House power and control electronics in UL (DIR) listed, NEMA 250 Type 3 enclosure while ensuring combined motor and VFD meets IEC 60529 IP55 rating for protection against dust and nozzle-directed water from any direction.
6. Select VFDs of Pulse Width Modulation (PWM) design that uses Insulated Gate Bipolar Transistor (IGBT) technology with integrated RFI filter.
7. Set VFD to convert incoming fixed-frequency three-phase AC power into variable frequency and voltage for motor speed control by ensuring supplied current closely approximates a sine wave. Motor voltage varies with frequency to maintain desired motor current suitable for centrifugal pump control and eliminate need for motor derating.
8. Set VFD to automatically reduce switching frequency and/or output voltage and frequency to motor when sustained ambient temperatures are higher than normal operating range. Switching frequency reduces before motor speed reduces.
9. Configure VFD with minimum of two field-adjustable skip frequency bands.
10. Provide VFD with internal solid-state overload protection designed to trip between 105 to 110 percent of rated current range.
11. Provide integrated VFD-motor assembly with protection against input transients, phase imbalance, loss of AC line phase, over-voltage, under-voltage and over-temperature at VFD and motor ends. Ensure three-phase, integrated-VFD motor assembly provides provides full output voltage and frequency with voltage imbalance of up to 10 percent.
12. Minimum integrated VFD-motor assembly input and output capabilities:
    a. Speed Reference Signal: 0-10 VDC or 4-20 mA.
    b. Digital remote ON/OFF.
    c. Fault signal relay, configurable for NC or NO.
    d. Fieldbus communication port, RS-485.

J. Pump System Controller (PSC) Requirements:
1. Provide microprocessor-based PSC developed and supported by pump manufacturer.
2. Operator Display: PSC to include password-protected color display of 3-1/2 by 4-5/8 inches at minimum with backlight and contrast adjustment for system monitoring and programming.
3. Allow PSC to interface remotely via optional fieldbus connection card or locally using personal computer for system monitoring and programming.
4. Galvanic Isolation: PSC to provide internal galvanic isolation per digital and analog inputs as well fieldbus connections.
5. Backup Battery: Provide for PSC to maintain power during outage.
6. Home Screen: Set PSC to display the following readings within main or home screen:
    a. Current value of controlled parameter such as differential pressure.
    b. Most recent existing alarm if active.
    c. System status with current operating mode.
    d. Pump status, current operating mode, and percent of rotational speed per pump.

e. Estimated flow rate or actual flow if filed-mount flow sensor used.

f. One, user-defined, measured parameter such as power consumption.

7. Inputs and Outputs: Minimum hardware points on PSC:

   a. Three analog inputs, configurable for 4-20 mA or 0-10 VDC.

   b. Three digital inputs.

   c. Two digital outputs.

   d. Ethernet connection to access built-in web server.

   e. Field-service PC connection port for advanced programming, software, firmware upgrade, and data logging.

8. Pump System Programming: At minimum, allow field adjustment of the following parameters:

   a. Sensor Settings: Suction, discharge, differential pressure or supply pressure with respective ranges.

   b. PI Controller: Proportional Gain (Kp) and Integral Time (Ti).

   c. Low Suction: Pressure or level shutdown via digital contact.

   d. Limit Exceeding Function: Low system, low suction warnings, and shutdown status using analog input.

   e. Flow meter settings when added using analog signal.

9. Pump Curve Data: Software load PSC with actual pump performance curves of fifth-order polynomial and use as follows:

   a. Display and data logging of calculated flow rate.

   b. Variable pressure control using quadratic or proportionals.

   c. Pump outside of duty range protection.

   d. Sequence pumps based on efficiency.

10. Variable Pressure Control:

    a. Set PSC to use variable pressure control to compensate for pipe friction loss by decreasing pressure set point at lower flow rates and increasing pressure set point at higher flow rates by using actual or calculated flow rate.

    b. Variable pressure control using only power consumption and speed not equal to variable pressure control using actual differential pressure measurement, pump power, and speed.

11. Pressure (P) or Differential Pressure (DP) Sensor or Zone Control:

    a. Boost Control: Set for capacity control using up to six adjustable P or DP zones.

    b. Zone Set Point: Adjustable between controller-configured maximum and minimum.

    c. Energy Optimal Mode: When enabled, reduces controlled capacity until first zone reaches minimum P or DP set point.

12. Check Valve Failure Detection (Systems with Integrated VFD Motors): Set PSC to detect motors turning in opposite direction, notify of check valve failure and allow pump to:

a. Keep pump off to prevent damage and indicate alarm for major leaks.

13. Pulse Flow Meter: Allow PSC to receive readings from digital meter to log and display accumulated flow.
14. Allow PSC to subtract two pressure or temperature sensors for differential pressure or differential temperature control.
15. Additional Programmable Set Points: Allow PSC to accept up to seven programmable set points via additional input/output module or card when required.
16. Set Point Influence Function: Allow PSC set point adjustment by external set point influence function which allows operator to adjust load according to interrelated requirements such as lowering system pressure based on direct flow measurement.
17. Remote Control: Allow PSC to receive and use remote analog set point over 4-20 mA or 0-10 VDC analog signal and remote system ON/OFF command using digital signal.
18. Set Point Ramp: Configure PSC to allow set point change-ramp-time adjustment by operator to increase or decrease.
19. Warnings and Alarms:
    a. Configure PSC to store up to 24 warnings and alarms in memory with recorded date, time, and duration per alarm event.
    b. Provide potential-free relay for remote alarm notification into building management system.
    c. Set PSC to display the following alarm conditions:
        1) Individual pump failure.
        2) Check valve failure.
        3) VFD trip or failure.
        4) External fault.
        5) Pump outside of duty range.
        6) Loss of sensor signal using analog 4-20 mA.
        7) Loss of remote set point signal using analog 4-20 mA.
        8) Limits 1 and 2 Exceeded: When PSC is set to monitor two analog signals (i.e., suction pressure and discharge pressure) for additional pump or system protection.
20. Built-in Data Log: PSC to include data logging capability with logged values available for graphical display and download as delimited text file. Configure to hold at minimum 7,200 samples per logged value for the following parameters:
    a. Estimated or actual flow rate.
    b. Specific pump speed.
    c. Process value sensor feedback.
    d. Power consumption.
    e. Process value set point.
    f. Inlet pressure when remote differential pressure is primary sensor.
21. Redundant Primary Sensor: Allow PSC to receive redundant sensor inputs to set second sensor to function as primary sensor backup.

22. Secondary Sensor: When used, PSC to revert pump system control using locally mounted sensors with specific programmable set point upon loss of signal from remote primary sensor. Pumps maintain constant, proportional, or quadratic pressure control across system until remote primary sensor signal restored.
23. Pump Test Run: Include as operator-programmable feature that switches pumps back ON during inactive periods when pumps are OFF. When active, PSC to switch ON inoperative pumps for three to four seconds at user adjustable interval; 24 hours, 48 hours, once per week, or specific time of day.
24. Reduced Operation: During backup generator operation, allow PSC to reduce pump system power draw by limiting number of pumps in operation or by limiting amount of power consumption in kW using digital input status signal indicating backup generator operating.
25. Power and Energy Consumption: Set PSC to display instantaneous power consumption in watts or kilowatts and cumulative energy consumption in kilowatt-hours.
26. Specific Energy Status: When flow sensor is connected automatically, PSC displays instantaneous energy used in watt-hours per gallon (Wh/gal) or watt-hours per 1,000 gallons (Wh/kgal).
27. Built-In Web Server Interface over Ethernet: Include Ethernet communications card with built-in password-protected web server interface for connection into building management network. Allow read/write access to controller via external web browser.
28. Service Contact Information: Include field-editable screen to populate with specific details, including contact name, address, phone numbers, and associated website.

K. Pump System Controller (PSC) Sequence of Operation:

1. PSC operates equal capacity variable speed pumps to maintain system set point using field-mount remote pressure sensor, remote differential-pressure sensor, or combined remote and skid-mounted pressure and/or differential-pressure sensors depending on application.
2. PSC receives 4-20 mA analog signal from factory-installed pressure transducers located on discharge and suction manifolds to indicate actual system and inlet pressures.
3. PSC capable of controlling load by subtraction of discharge pressure minus suction pressure as differential pressure across manifold.
4. Low-Flow Stop Function for Constant Pressure Applications:
    a. Configure PSC to stop pumps during periods of low flow or zero flow without wasting water or adding unwanted heat to liquid. Temperature-based, no-flow shutdown methods are not acceptable due to tendency to waste water and energy in the form of unwanted pumping fluid temperature rise.
    b. Provide means allowing operator to change from standard "Low-Flow Stop with Energy Saving" mode to "Optional Low-Flow Stop" mode and vice-versa via local or remote interface.
    c. Standard Low-Flow Stop with Energy Saving Mode:
        1) Low- or Zero-Demand Periods: If low- or no-flow shutdown required for expected periods of low or zero demand, provide bladder-type diaphragm tank precharged to 70 percent of system pressure set

point and fitted into discharge manifold or downstream of pump system.

2) Low-Flow Detection:

(a) When only one pump in operation, PSC to detect low flow when load less than 10 percent of pump nominal flow without use of additional flow-sensing devices.

(b) When detected, PSC increases pump speed until discharge pressure reaches configured stop pressure of system set point, plus 50 percent of programmed ON/OFF band, adjustable.

(c) Pump remains off until discharge pressure reaches assigned start pressure of system set point, minus 50 percent of programmed ON/OFF band, adjustable.

(d) Upon low-flow shutdown, pump to restart in one of the following two ways if low-flow condition no longer exists:

(1) Low-Flow Restart: Pump starts and speed increases until assigned stop pressure reached, then pump switches off again.

(2) Normal Flow Restart: Pump starts with speed increasing until system pressure reaches set point.

5. Standard Cascade Control, Efficiency-Based Pumping:

a. As flow demand increases, active pump speed increases to maintain system set point.

b. Utilizing pump curve information of fifth-order polynomial, PSC to stage ON additional pumps to increase system hydraulic efficiency while maintaining set point.

c. Exception: When flow and head are outside allowable operating pump range, then PSC to switch on additional pump thus distributing flow and allowing active pump(s) to operate within allowable operating range.

d. When system pressure is equal to set point, then active pumps reach equal operating speeds.

e. PSC has field-adjustable Proportional Gain and Integral Time (PI) settings for system optimization.

6. Optional Cascade Control, Speed-Based Pump Start:

a. As flow demand increases, active pump speed increases to maintain system set point.

b. When active pumps reach adjustable setting of 96 percent of full speed, next available pump to start and increase speed to maintain system set point.

c. When system pressure is equal to set point, then active pumps reach equal operating speeds.

d. PSC has field-adjustable Proportional Gain and Integral Time (PI) settings for system optimization.

7. PSC switches pumps ON and OFF to satisfy system demand without use of flow switches, motor current monitors, or temperature measuring devices.

8. Configure installed system pumps to alternate automatically based on demand, time, and fault. If flow demand is continuous or no flow shutdown does not occur then set PSC to alternate pumps at adjustable pump run time at changeover intervals such as every 24 hours, every 48 hours, or once per week.
9. Set PSC to control external pressure maintenance (jockey) pump for pressure boost applications using higher or lower system set point. Set pressure maintenance pump to stage ON as backup pump when pump system capacity is exceeded.
10. Specific Control Sequences:
11. Operating Interface per Pump:
    a. Components: HOA selector switch, suction, and discharge-side pressure gauges, resettable run-time meter per pump.
    b. Indicators: Provide illuminated indicators of incandescent or LED-based pilot light type per pump: green for run status, yellow for safety, red for alarm, and black or blue for out of service.
    c. Graphic Panel: Color touchscreen display; use graphics instead of listed components and indicators, except for pump override switches with respective indicators.
12. Pump Alternating: Set pumps for lead/lag operation. Alternate pumps based on run time or manually selected order. Use alternating relay for noncontroller system.
13. Pressure Control Signal: Include pressure-indicating transmitter for remote mounting.
14. Include low- and high-limit pressure switches or sensors; include low- and high-limit temperature switches or controls for hot or chilled water service.
15. Time Delay Function or Relay: Prevent lag pump short cycling on fluctuating demands.
16. Time Clock Function or Relay for Automatic Day-Night Changeover:
    a. Day Cycle: System to operate continuously with pressure to fixtures maintained by pressure-reducing valves.
    b. Night Cycle: Pump to operate intermittently on pressure switch located near pressure tank operating pump for predetermined adjustable time period.
17. Alarm and Warning Indicator: Panel-mounted, audio-visual station with stack-fitted red and amber colored lamps and 100-dB, 100-foot strobe or horn.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products with related fittings and accessories according to manufacturer instructions.

B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).

C. Provide electric-motor driven equipment specified, complete with local disconnect switch and control panel with starter, controls, safety devices, and related wiring.

D. Provide automatic control and protective devices field-wired to interface-related devices required for specified operation.

E. Install small pressure gauges on both upstream and downstream ends.

F. Hot Water Service: Ensure small pressure-temperature gauges installed on both upstream and downstream ends.

G. Contactor-Controlled Pumps: Set manually to ON for continuous operation.

H. VFD-Controlled Pumps: Configure unit to operate within manufacturer-listed pump curve points unless factory precoded; set to operate automatically to maintain downstream pressure set point.

I. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are nonoverloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

C. Operational Test Procedure:

1. Tester: Pump system constructed and calibrated according to ISO 9906 hydraulic test requirements.

2. Test Water:

a. Ensure test water is clean by pretreating with three different filtration systems.

b. Water pretreatment to include:

1) 25-Micron Mechanical Filter: Removes solid parts from water.

2) Activated Carbon Filter: Keeps water clear and eliminates odor.

3) Ultraviolet Light System: Kills bacteria growth.

3. Functional Test:

a. Test the following parameters:

1) System Hydrostatic Test: Set at 1.5 times nameplate maximum pressure.

2) No-flow detection shutoff test.

3) Water shortage test.

4) Two-point setpoint performance test.

b. Provide copy of documented factory-executed functional test report.

4. Performance Test: 10-point verified performance test.

3.03 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

B. Thoroughly clean plumbing fixtures and equipment.

3.04 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Water heaters.
   1. Tank electric.
   2. Tankless electric.
B. Water filters.
C. Water softeners.
D. Acid-effluent neutralizers.
E. Point-of-use water filters.
F. Point-of-entry water filters.
G. In-line circulator pumps.
H. Pressure booster systems.
I. Condensate removal pumps.

1.02 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015 (Reaffirmed 2020).
B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings 2014 (Reaffirmed 2020).
C. AHRI 575 - Method of Measuring Machinery Sound Within an Equipment Space 2017.
D. ANSI Z21.10.1 - Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu Per Hour or Less 2019, with Errata (2020).
E. ANSI Z21.10.3 - Gas-Fired Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous 2019.
F. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks 2020, with Errata (2023).

1.03 SUBMITTALS

A. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Provide electrical characteristics and connection requirements.
B. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.01 WATER HEATERS

A. Tankless Electric Water Heater:

1. Manufacturers:

a. Bradford White Corporation: www.bradfordwhite.com.

b. Rheem Manufacturing Company: www.rheem.com.

c. AO Smith: www.hotwater.com.

2. Standard: UL 499 for electric, tankless (domestic-water heater) heating appliance.

3. Construction: Copper piping or tubing complying with NSF 61 and NSF 372 barrier materials for potable water, without storage capacity.

a. Connections: ASME B1.20.1 pipe thread.

b. Pressure rating 150 psig.

c. Heating Element: Resistance ehating system.

d. Jacket: Aluminum or steel with enameled finish or plastic.

4. Electrical Characteristics: Refer to schedules on plan sheets.

5. Temperature Control: Adjustable thermostat with ranges to include 90 to 180 degrees fahrenheit. Hot water systems utilizing recirculation systems shall be tied into building off-hour controls. Automatic reset high temperature limiting thermostat factory set at 195 degrees fahrenheit. Flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.

6. Accessories:

a. Water Connections: Brass.

b. Dip Tube: Brass.

c. Drain valve.

d. Anode: Magnesium.

e. Temperature and Pressure (T&P) Relief Valve: The pressure relief elemment of a P&T relief vlve shall have adequate capacity to prrevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maxiumum capacity. Relief valves shall be rated according to ANSI Z21.22/CSA 4.4. Relief valves for systems where the maxium rate of heat input is less than 59 kW 200,000 Btu shall have a 3/4 inch minimum inlets, and 3/4 inch outlets. Relief valves for systems where the maximum rate of theat input is greater than 59 kW 200,000 Btu shall have 1 inch minmum inlet, and 1 inch outlet. The discharge pipe from the relief valve shall be the size fo the valve outlet.

7. Support: Bracket for wall mounting.

8. Supply Water Filter: In areas with hard water a filter is required on the supply line. Refer to the manufacturer requirements for water quality.

B. Tank Electric:

1. Manufacturers:

a. Bradford White Corporation: www.bradfordwhite.com.

b. Rheem Manufacturing Company: www.rheem.com..

c. AO Smith: www.hotwater.com.

2. Type: Factory-assembled and wired, electric, vertical storage.

3. Standard: UL 1453.

4. Tank Construction: Non-ASME-Code steel with 150-psig working-pressure rating.

    a. Tappings: Factory fabricated of materialss compatible with tank. Attach tappings to tank before testing.

        1) NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

        2) NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flances, and in accordance with ASME B16.24 for copper and copper-alloy flanges.

    b. Pressure Rating 150 psig.

    c. Interior Finish: Comply wiht NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.

5. Electrical Characteristics: Refer to schedules on plan sheets.

6. Accessories:

    a. Water Connections: Brass.

    b. Dip Tube: Brass.

    c. Drain valve: Corrosion-restant metal with hose-end connection.

    d. Anode: Replaceable Magnesium.

    e. Jacket: Steel with enameled finish or high-impact composite material.

    f. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of thress.

    g. Temperature and Pressure (T&P) Relief Valve: The pressure relief elemment of a P&T relief vlve shall have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maxiumum capacity. Relief valves shall be rated according to ANSI Z21.22/CSA 4.4. Relief valves for systems where the maxium rate of heat input is less than 59 kW 200,000 Btu shall have a 3/4 inch minimum inlets, and 3/4 inch outlets. Relief valves for systems where the maximum rate of theat input is greater than 59 kW 200,000 Btu shall have 1 inch minmum inlet, and 1 inch outlet. The discharge pipe from the relief valve shall be the size fo the valve outlet.

7. Temperature Control: Adjustable thermostat with ranges to include 90 to 180 degrees fahrenheit. Hot water systems utilizing recirculation systems shall be tied into building off-hour controls. Automatic reset high temperature limiting thermostat factory set at 195 degrees fahrenheit. Flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.

C. Electric Point-Of-Use:

1. Manufactuerers:

a. Chronomite: www.chronomite.com

b. Eemax Inc.: www.eemax.com

2.02 EXPANSION TANK

A. Manufacturers:

1. Watts: www.watts.com
2. Amtrol: www.amrtol.com

B. Construction: Steel pressure-rated tank constructed with veled joints and factory installed, butyl-rubber diapharagm. Indlude air precharge to minmum system-operating pressure at tank.

1. Tapings: Factory-fabricated steel, welded to tank before testing and lageling. Include ASME B1.20.1 pipe thread.
2. Interior Finish: Comply with NSF 61 and NSF372 barrier materials for potable water tank linings, inluding extending finsh into and through tank fittings and outlets.
3. Air-Charging Valve: Factory installed.

C. Capacity: Refer to schedule on plan sheets for capacity information.

2.03 DOMESTIC HOT WATER STORAGE TANKS

A. Tank: Welded steel, ASME labeled for working pressure of 125 psig, steel support saddles, tappings for accessories, threaded connections of stainless steel, access manhole.

B. Openings: Up to 3 inches, copper-silicone threaded; over 4 inches, flanged; flanged collar for heat exchanger; manway fitting.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.

B. Coordinate system, equipment, and piping work with applicable electrical, fuel, gas, vent, drain, and waste support interconnections as included or provided by other trades.

C. Pumps:

1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 SCHEDULES - SEE SHEET P-0.1

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Flush valve water closets.

B. Wall hung urinals.

C. Lavatories.

D. Sinks.

E. Under-lavatory pipe supply covers.

F. Indoor drinking fountains.

G. Service sinks.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ANSI Z124.2 - American National Standard for Plastic Shower Units; 1995.

C. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).

D. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.

E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2022).

F. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 2008 (R2011).

G. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018, with Errata.

H. ASME A112.19.3 - Stainless Steel Plumbing Fixtures 2022.

I. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2022.

J. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2020.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023c.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

M. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

N. NSF 372 - Drinking Water System Components - Lead Content 2022.

1.03 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, flow rate, rough-in dimensions, utility sizes, trim, and finishes.

B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.04 QUALITY ASSURANCE

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

B. Servise Support: The equiplment shall be supported by service organizations. These service organizations shall be reasonably convienient to the equiplment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty periord of the contract.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage. Replace any damaged or defective items.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.

1. Bowl: ASME A112.19.2; 16.5 inches high for ADA compliant water closet, and 15 inches high for standard height water close, and with elongated rim.
2. Flush Volume: 1.28 gallon per flush, maximum.
3. Flush Valve: Exposed (top spud).
4. Flush Operateion: Sensor hard wired.
5. Handle height: 44 inches or less. Mounted height of flush valve shall not interfere wtih the hand rail in the ADA stalls.
6. Color: White.
7. Operating Pressure: Minimum 35 psi
8. Provide: Wax bowl ring including plastic sleeve.
9. Water closet must be Water Sense certified.
10. Manufacturers:
    a. American Standard Inc: www.americanstandard.com
    b. Sloan Valve Company: www.sloanvalve.com.
    c. Kohler Company: www.kohler.com.
    d. Toto USA: www.totousa.com

B. Flush Valves:

1. Manufacturers:
    a. American Standard, Inc: www.americanstandard-us.com.
    b. Sloan Valve Company: www.sloanvalve.com.
    c. Zurn Industries, Inc: www.zurn.com.

2. Manual Operated:
    a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type complete with vacuum breaker stops, cover, tailpiece,and and accessories.
    b. Supplied Volume Capacity: 1.28 gal/flush.
    c. Finish: Polished Chrome
3. Sensor-Operated:
    a. Mechanism: Electronic motor-actuated operator with hardwired powered with 120 volt transformer infrared sensor, and mechanical over-ride or over-ride push button.
    b. Supplied Volume Capacity: 1.28 gal/flush.
    c. Finish: Polished Chrome
    d. Style: Exposed

C. Toilet Seats:
1. Manufacturers:
    a. American Standard, Inc: www.americanstandard-us.com.
    b. Bemis Manufacturing Company: www.bemismfg.com.
    c. Church Seat Company: www.churchseats.com.
    d. Olsonite: www.olsonite.com.
    e. Substitutions: See Section 016000 - Product Requirements.
2. Standard: IAPMO/ANSI Z124.5.
3. Material: Solid plastic, antimicrobial.
4. Type: Commerical with extended back.
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining hinge.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

D. Water Closet Carriers:
1. Manufacturers:
    a. Jay R. Smith MFG. Co: www.jrsmith.com.
    b. JOSAM Company: www.josam.com.
    c. Zurn Industries, Inc: www.zurn.com.
    d. Substitutions: See Section 016000 - Product Requirements.
2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.03 WALL HUNG URINALS

A. Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.
2. Kohler Company: www.kohler.com.
3. Toto: www.totousa.com.

B. Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.

1. Consumption Volume: 0.125 gal per flush, maximum.
2. Flush Style: Washout.
3. Flush Valve: Exposed (top spud).
4. Flush Operation: Sensor operated.
5. Trapway Outlet: Integral.
6. Removable stainless steel strainer.

C. Flush Valves:

D. Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.
2. Sloan Valve Company: www.sloanvalve.com.
3. Zurn Industries, Inc: www.zurn.com.
4. Sensor-Operated:

a. Type: ASME A112.19.5; chloramine-resistant, clog-resistant dual-seat diaphragm valve with vacuum breaker, stops and accessories.

b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with low-voltage powered infrared sensor, and mechanical override or override push button.

c. Supplied Volume Capacity: 0.125 gal per flush.

E. Urinal Carriers:

1. Manufacturers:

a. Jay R. Smith MFG. Co: www.jrsmith.com.

b. JOSAM Company: www.josam.com.

c. Zurn Industries, LLC: www.zurn.com.

2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

A. Manufacturers:

1. American Standard Inc.: www.americanstandard.com
2. Kohler Company: www.kohler.com

B. Wall-Hung Basin:

1. Vitreous China, Grade A: ASME A112.19.2; white, rectangular commercial-grade sink with predrilled holes, rear-center drain, front overflow, and hanger. Size as indicated on drawings with 4-inch centerset spacing.
2. Carrier:

a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

b. Manufacturers:

1) Jay R. Smith MFG. Co: www.jrsmith.com.

2) JOSAM Company: www.josam.com.

3) Zurn Industries, LLC: www.zurn.com.

C. Vitreous China Counter Top Basin:

1. ASME A112.19.2; vitreous china self-rimming counter top lavatory, size as indicated on drawings with drillings on 4 inch centers, front overflow, seal of putty, calking, or concealed vinyl gasket.

D. Supply Faucet Manufacturers:

1. Chicago Faucets, a Geberit company: www.chicagofaucets.com.
2. Kohler Company: www.kohler.com.
3. Sloan: www.sloan.com

E. Metered Faucet:

1. ASME A112.18.1 chrome plated metered mixing faucet with self-closing, auto-timed metering cartridge, adjustable run time from 2 to 15 seconds, opens with push, 0.20 max gallons per cycle, and cover plate, open grid strainer.
2. Spout Style: Standard.
3. Mixing Valve: None, single line for tempered water.
4. Water Supply: 3/8 inch compression connections.
5. Aerator: Vandal resistant, 0.5 gpm, non-aerating spray.

F. Manual Faucet:

1. ASME A112.18.1; chrome plated, combination supply fitting with open grid strainer, with single lever handle.
2. Spout Style: Standard.
3. Mixing Valve: External lever operated.
4. Water Supply: 3/8 inch compression connections.
5. Aerator: Vandal resistant, 0.5 gpm, non-aerating spray.

G. Sensor Operated Faucet:

1. Spout Style: Standard.
2. Power Supply:

a. Wireless:

1) Battery: Replaceable alkaline or lithium type with 200,000 cycles, minimum.

2) Low Battery Warning: Provide red or yellow colored indicator to light periodically at 30 days of remaining capacity and continuously 2 weeks prior to get fully discharged.

3. Mixing Valve: Internal, automatic.

4. Water Supply: 3/8 inch compression connections.
5. Automatic Shut-off: 10 seconds.
6. Finish: Polished chrome.

H. Thermostatic Mixing Valve:

1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

I. Accessories:

1. Chrome-plated 17 gauge, 0.0538 inch brass P-trap with clean-out plug and arm with escutcheon.

2.05 SINKS

A. Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.
2. Kohler Company: www.kohler.com.
3. Elkay: www.elkay.com.

B. Single Compartment Bowl:

1. ASME A112.19.3; 25 x 22 x 7 11/16 in outside dimensions, 19 gage thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
    a. Drain: 1-1/2 inch chromed brass drain.

C. Double Compartment Bowl:

1. ASME A112.19.3; 33 x 22 x 8 3/16 inch outside dimensions, 19 gage thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
    a. Drain: 1-1/2 inch chromed brass drain.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, wheel handle stop, rigid supplies.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Manufacturers:

1. Plumberex Specialty Products, Inc: www.plumberex.com.
2. Truebro: www.truebro.com
3. Substitutions: See Section 016000 - Product Requirements.

B. General:

1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
    a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
    b. Comply with ICC A117.1.
3. Color: High gloss white.
4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.07 SHOWERS

A. Trim:

1. ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, integral service stops, bent shower arm with adjustable spray ball joint shower head with maximum 1.5 flow, and escutcheon.

B. Low-Flow Shower Head:

1. ASME A112.18.1; chrome-plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.
2. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.

2.08 SERVICE SINKS

A. Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.
2. Elkay Manufacturing Company: www.elkay.com.
3. Just Manufacturing Company: www.justmfg.com.

B. Bowl: 36 by 24 by 10 inches high, white molded stone, floor mounted, with 1-inch wide shoulders, vinyl bumper guard, stainless steel strainer.

C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

D. Accessories:

1. Hose clamp hanger.
2. Mop hanger.

2.09 EMERGENCY EYE WASH

A. Manufacturers:

1. Haws Corporation: www.hawsco.com.
2. Bradleywww.bradleycorp.com.

B. Emergency Wash: ANSI Z358.1; counter top, self-cleaning, non-clogging eye wash with quick opening, full-flow valves, stainless steel eye wash receptor, twin eye wash headsand face spray ring,stainless steel dust cover, copper alloy control valve and fittings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key or integral stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 00 10

BASIC MECHANICAL REQUIREMENTS

PART 1. GENERAL

1.01 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 23 Sections, in addition to Division 01 - General Requirements.

1.02 DESCRIPTION

A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

1.03 WORK INCLUDED

A. The complete Heating, Ventilating and Air Conditioning (HVAC) systems, including but not limited to these major items.

1. Coordinate work of this Section with related trades.
2. Verify applicable dimensions and locations of existing utilities, fans, and thermostats at the jobsite.
3. Duct systems; supply, return and exhaust complete with fire dampers, combination fire-smoke dampers, and manual dampers.
4. Diffusers and registers.
5. Exhaust supply, return fans and air curtains.
6. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
7. Duct lining and insulation.
8. Shop drawings.
9. Equipment identification.
10. Equipment and systems adjustments and balancing.
11. Air, water and gas systems testing, adjusting and balancing.
12. Written operating and maintenance instructions.
13. Record drawings.
14. Guarantee

1.04 WORK SPECIFIED ELSEWHERE

A. Concrete, Rough Carpentry, Joint Sealants, Sheet Metal, Flashing and Trim, Access Door and Frames, Acoustical Ceiling Tile, Door Hardware, Paints and Coatings, Plumbing and Electrical.

1.05 SITE INSPECTION

A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

1.06 ORDINANCES, REGULATIONS AND CODES

A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.

1. AFI - Air Filter Institute
2. AMCA - Air Moving & Conditioning Association
3. ARI - Air Conditioning & Refrigeration Institute
4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
5. ASME - American Society of Mechanical Engineers
6. ASTM - American Society of Testing Materials
7. AWSC - American Welding Society Code
8. ANSI - American National Standards Institute
9. CBC - California Building Code
10. CCR - California Code of Regulations
11. CEC - California Electrical Code
12. CFC - California Fire Codes
13. CMC - California Mechanical Code
14. CPC - California Plumbing Code
15. FIA - Factory Insurance Association
16. NAFM - National Association of Fan Manufacturers
17. NEMA - National Electrical Manufacturer's Association
18. NFPA - National Fire Protection Association
19. ORS - Office of Regulatory Services
20. SCAQMD - South Coast Air Quality Management District
21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
22. UFC - Uniform Fire Code
23. UL - Underwriter's Laboratories
24. UPC - Uniform Plumbing Code

B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.

C. Codes and Standards:

1. IBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).
3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
4. Uniform Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).

5. National Fire Protection Associations - National Fire Code.

D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.

E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.

F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

1.07 PERMITS, FEES AND INSPECTIONS

A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

1.08 DRAWINGS AND SPECIFICATIONS

A. The Architect's decision will be final on interpretation of the Drawings and Specifications.

B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.

C. Piping, ductwork and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.

D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supersede the specification in the event of a conflict.

E. Alternate support or seismic detail proposed by contractor shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

1.09 SUBMITTALS

A. Before starting work, the Contractor shall furnish for the approval of the Architect, Shop Drawings and Submitals with Itemized Equipment Lists, complete in all details that they proposes to install. All items shall be submitted at the same time.

B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.

C. Variations or deviations on submitted items from that specified must be clearly tagged and / or identified

D. Submittals shall include, but not necessarily be limited to the following which are mandatory:

1. Draw Equipment Layouts to ¼” scale, including equipment, piping accessories, and showing clearances for operating and servicing.
2. Schedule of pipe, fittings, valves, with manufacturer and catalog number.
3. Specialties, valves, gauges and thermometers of all types.
4. Foundations, supports, hangers, inserts.
5. Earthquake supports and calculations.
6. Insulation.
7. Ventilation and air conditioning equipment, specialties and the air control systems.
8. Fans, fan characteristic curves, fan tests.

9. Dampers, louvers, grilles, registers, diffusers.
10. Shop fabrication drawings and installation drawings of ductwork and piping layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of piping and ductwork to finish floor level.
11. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades.
12. Automatic control system diagrams.
13. Exhaust, supply and return fans.
14. Access panels.
15. Hangers, inserts, supports, anchors.
16. Pipe, fittings and specialties.
17. Pipe isolators.
18. Sleeves, escutcheons, caulking, waterproofing, fireproofing.
19. Expansion joints, guides and anchors.
20. Shop fabrications drawings and calculations.
21. Special and miscellaneous products furnished under this section and not listed herein.

1.10 RECORD DRAWINGS AND MANUALS

A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.

B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.

C. Final Record Drawings: Conform to Division 01 requirements.

D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.

E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.

F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.

G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:

1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
2. Specifications
3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
4. Grouting requirements.

5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
6. Start-up and beginning operation procedures.
7. Operational procedures.
8. Shutdown procedures.
9. Maintenance and calibration procedures
10. Parts lists
11. Name, address and telephone number of each manufacturer's local representative.

H. Manual Submittals: Unless otherwise specified, each submittal shall include two copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified.

I. “As-Built” drawings of ductwork and piping, including all elbows, transitions, damper and valve locations shall be provided prior to commencement of air and water balance.

1.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

1.12 SEISMIC DESIGN

A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:

1. In accordance with Title 24, 2019 CBC Chapter 16A, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.
2. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2019 CBC Chapter 16A. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

1.13 SUBSTITUTIONS AND CHANGES

A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.

B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.

C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.

D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. Design West Engineers will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on Design West Engineer's hourly rate for engineering services.

E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with Division 01.

1.14 SUBMITTAL REVIEWS

A. The Architect and / or Engineer will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

1.15 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

A. Immediately after award of the Contract and after the final review of submittals by the Architect and / or Engineer, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time to meet the construction schedule. The contractor shall deliver to the Architect and Owner a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

1.16 LOCATIONS AND ACCESSIBILITY

A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as reviewed by Architect and / or Engineer. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run exposed piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.

B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.

C. Installation at valves, thermometers, gauges, cleanouts, dampers, controls, steam and water specialties, duct access doors or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessible located with reference to the finished building.

D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.

E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.

F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.

G. Provide sheaves and belts if required, to Test, Adjust and Balance Agency, to allow air moving equipment to meet flow requirements specified at no additional cost to the Owner.

1.17 COORDINATION OF TRADES

A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.

B. No extras will be allowed for changes made necessary by interference or coordination between trades.

C. Submit Composite Coordination Drawings in accordance with Submittal Procedures. Include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural interferences. Coordinate these Composite Coordination Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Division 01. Do not start installation of work involved under Composite Coordination Drawings until the Architect reviews applicable submittal. Discrepancies between the Drawings and Composite Coordination Drawings shall be specifically noted and identified on the Composite Coordination Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Coordination Drawings.

   1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation subbase and support.

   2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.

   3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.

   4. Concrete: Conform to Concrete Section of the Specifications.

1.18 GUARANTEES

A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.

B. Guarantee included in this section to cover:

   1. Faulty or inadequate design of equipment or material installed

   2. Improper assembly or erection

   3. Defective workmanship or material

   4. Incorrect or inadequate operation or other failure

C. The contractor shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise

D. Furnish the parts and labor to replace any items found to be defective in the mechanical equipment with the guarantee period.

E. In addition to other guarantees, furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.

F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty and proof of shipment date or purchase date per terms of warranty to the Owner, who shall be named as beneficiary.

1.19 PROTECTION OF EQUIPMENT AND MATERIALS

A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

1.20 CLOSING-IN OF UNINSPECTED WORK

A. Contractor shall not allow or cause any of the work, specifically ductwork and piping, to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, he shall at his own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

1.21 BUILDING FOOTING CLEARANCES

A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

1.22 DAMAGE BY LEAKS

A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

1.23 EQUIPMENT LABELS

A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

1.24 PRELIMINARY OPERATION

A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

1.25 ELECTRICAL WORK

A. Coordinate with Division 26 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.

B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, he shall pay additional electrical costs.

C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 26.

D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.

E. All interconnecting power wiring and conduits shall be provided by Division 26.

F. Control wiring shall be provided by Division 23, unless otherwise indicated on the drawings.

G. Conduit for control wiring shall be provided by Division 26.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Three phase electric motors.

1.02 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015 (Reaffirmed 2020).

B. NEMA MG 1 - Motors and Generators 2021.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

D. Operation Data: Include instructions for safe operating procedures.

E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.04 QUALITY ASSURANCE

A. Comply with applicable electrical code.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Baldor Electric Company/ABB Group; _____: www.baldor.com/#sle.

B. As specified by Carrier Corp..

C. Substitutions: See Section 016000 - Product Requirements.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:

1. Open drip-proof type except where specifically noted otherwise.

2. Design for continuous operation in 104 degrees F environment.

3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:

1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.

2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 APPLICATIONS

2.04 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

G. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

3.02 SCHEDULE

A. NEMA Open Motor Service Factors.

1. 1 hp:

a. 3600 rpm: 1.25.

b. 1800 rpm: 1.15.

c. 1200 rpm: 1.15.

2. 1.5-150 hp:

a. 3600 rpm: 1.15.

b. 1800 rpm: 1.15.

c. 1200 rpm: 1.15.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 05 29

HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following hangers and supports for mechanical system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections include the following:

1. Division 05 for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "Fire-Suppression Piping" for pipe hangers for fire-protection piping.
3. Division 23 Section "Mechanical Vibration and Seismic Controls" for vibration isolation devices.
4. Division 23 Section "Pipe Expansion Fittings and Loops" for flexible pipe.
5. Division 23 Section "Metal Ducts" for duct hangers and supports.

1.02 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.03 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.

3. Powder-actuated fastener systems. Not allowed for this project.
4. Pipe positioning systems.

B. Welding and brazing certificates.

1.05 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." ASME Boiler and Pressure Vessel Code: Section IX.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.02 STEEL PIPE HANGERS AND SUPPORTS

A. Description: ANSI/MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.03 TRAPEZE PIPE HANGERS

A. Description: ANSI/MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.04 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.05 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig-minimum, compressive-strength insulation inserts encased in sheet metal shield.

B. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.06 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Before Installation: Verify suitability for use in lightweight concrete or concrete slabs less than 4 inches thick with project structural engineer.

2.07 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

1. Submit: Calculations and details of each pipe stand unit.

2. Available Manufacturer: MIRO Industries.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Base: Stainless steel.

2. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.

3. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Available Manufacturer: Portable Pipe Hangers.

2. Bases: One or more plastic.

3. Vertical Members: Two or more protective-coated-steel channels.

4. Horizontal Member: Protective-coated-steel channel.

5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.08 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Available Manufacturer: HOLDRITE Corp.; Hubbard Enterprises.

2.09 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes or struts.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, non-corrosive, and nongaseous.

2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with ANSI/MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for bare piping for noise abatement.

F. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members notching. Provide such members with reinforcement steel straps of Kees Protecta-Plate or equal.

G. For fastening to wood rafters and beams, or joists, furnish Grinnell figure 128 or 202 or equal pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2 inch x 2 inch x 1/4 inch angle clips 3 inches long, with 2 staggered 10d nails, clinched over joist.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 and larger, requiring up to 4 inches of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated stationary pipes, NPS 3/4 to NPS 8.

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.

8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.

9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 and larger.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 and larger, with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 and larger, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers.
    2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
    2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
    3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
    4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
    5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
        a. Light (MSS Type 31): 750 lb.
        b. Medium (MSS Type 32): 1500 lb.
        c. Heavy (MSS Type 33): 3000 lb.
    2. Side-Beam Brackets (MSS Type 34): For sides of wooden beams.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

N. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

P. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.02 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Each trapeze pipe hanger requires submittal of calculations and details.

2. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

3. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

1. Each metal framing system requires submittal of calculations and details.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Each pipe stand in requires submittal of calculations and details.

2. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

3. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 for curbs specifications.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

1. Each equipment support requires submittal of calculations and details.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

O. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

b. NPS 4: 12 inches long and 0.06 inch thick.

c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.

7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.03 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.04 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.06 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

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

END OF SECTION

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vibration-isolated equipment support bases.

B. External seismic snubber assemblies.

C. Seismic restraint systems.

1.02 REFERENCE STANDARDS

A. ASCE 19 - Structural Applications of Steel Cables for Buildings 2016.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.

C. MFMA-4 - Metal Framing Standards Publication 2004.

D. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

1.03 **DESIGN REQUIREMENTS**

A. It is the intent of this Specification to provide the necessary design for the avoidance of excessive noise or vibration in the building due to the operation of machinery or equipment, or due to interconnected piping, ductwork, or conduit and to seismically restraint piping, ductwork and equipment per the applicable codes against seismic forces in any direction.

B. All isolators shall:

1. Be provided by a single manufacturer.
2. Be designed or treated for resistance to corrosion. Structural steel bases shall be cleaned of welding slag and coated with an SCAQMD compliant primer.
3. Be selected to perform their function without undue stress or overloading.
4. All isolators shall have a method for leveling and have a 1/4" thick ribbed neoprene acoustical pad under the spring baseplate
5. Be installed in a manner to prevent the transmission of vibration to the structure. No rigid connections between rotating or oscillating equipment or piping and the building will be permitted.
6. Be designed to be non-resonant with equipment forcing frequencies or support structure natural frequencies.

C. Anchor floor mounted isolated equipment to concrete housekeeping pads of sufficient size to accommodate the anchorage of seismic restraints. Housekeeping pads shall be anchored to the structure as specified by the Structural Engineer of Record.

D. Each fan and motor assembly shall be supported on a single structural steel frame. Flexible duct connections shall be provided at inlet and discharge ducts.

E. Where called for in the specifications or on the drawings, all structural steel bases, including concrete pouring form bases, shall be designed and fabricated by the isolation manufacturer.

F. Unless otherwise indicated, all equipment mounted on vibration bases shall have a minimum operating clearance of 1" between structural steel base and floor or support base beneath. The minimum operating clearance between concrete inertia bases and housekeeping pads

shall be 1 inch. Check clearance space after installation to ensure that no debris has been left to possibly short circuit isolation bases.

G. Where necessary due to height limitations, provide height saving brackets.

H. Design isolators for positive anchorage against uplift and overturning.

I. Purchased and/or fabricated equipment must be designed and manufactured with provision for positive anchorage against seismic forces.

J. Seismic restraints for pipes and ducts shall be as per the SMACNA Guidelines for seismic Restraint of Mechanical Systems.

K. Seismic restraints for equipment shall be designed to meet the criteria of the current California Code of Regulations.

1.04 **THE MANUFACTURER OF VIBRATION ISOLATION AND SEISMIC CONTROL EQUIPMENT SHALL HAVE THE FOLLOWING RESPONSIBILITIES:**

A. Determine adequate vibration isolation and seismic restraint sizes and locations.

B. Provide piping and equipment isolation systems and seismic restraints as scheduled and/or specified.

C. Provide installation instructions and drawings to assure proper installation and performance.

1.05 SUBMITTALS

A. Product Data:

1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.
2. Include seismic rating documentation for each isolator and restraint component accounting for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Specific vibration isolators and seismic restraints to be utilized showing compliance with the specifications.
2. Isolation frame construction for each machine including dimensions, structural member sizes, support points and restraint locations and details.
3. Methods for isolation and restraint of suspended piping, ductwork, and equipment.
4. Methods for guides and isolation of piping risers.
5. Seismic restraint calculations signed and stamped by an engineer licensed in the State of California and experienced in the design of isolation and seismic restraint for flexibly mounted equipment.
6. Fully dimensioned fabrication drawings and installation details for vibration isolation bases, member sizes, attachments to isolators, and supported equipment.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General:

1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
2. Steel springs to function without undue stress or overloading.

2.02 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:

1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut) for structural element; suitable for both compressive and tensile design loads.

D. Comply with:

1. ASHRAE (HVACA) Handbook - HVAC Applications.
2. SMACNA (SRM).

E. Shall be capable of safely accepting external forces as specified in the applicable codes without failure. Restraints shall maintain equipment, duct, and piping in a captive position during an earthquake. Restraints shall not short circuit vibration isolation systems or transmit objectionable vibration or noise under normal operating conditions. Seismic restraints shall be provided on all equipment as scheduled on the drawings. Submit calculations by a California registered engineer to verify snubber capacities.

F. Type "3500" seismic restraint shall be constructed of steel plate, concentric steel pipes, and structural members in an all welded assembly. All contact points shall be cushioned with minimum 1/4" thick resilient pad.

G. Type "3200" seismic restraint shall be all directional type with interlocking steel members constructed of structural angle and A-36 threaded rod. All contact points shall be cushioned with minimum 1/4" thick resilient pad or bushing.

H. Type "CR" seismic restraints shall be constructed of 7x19 strand galvanized aircraft cable. Cable assembly shall come complete with minimum (2) "U" bolt clamps per end and thimbles to protect cable from chafing. Allowed loads shall be the cable breaking strength with a safety factor of three. Actual loads shall be calculated with the worst case of all load applied to one cable and anchor pattern. Cable shall be installed with 1/4" slack to prevent the transmission of vibration to the structure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

3.02 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. Vibration isolators must not be installed in a manner that will result in piping stress or misalignment.

C. The structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the equipment or isolators. The isolators shall be installed without raising the equipment and frame assembly.

D. After the entire installation is complete and under full operational load, the isolator shall be adjusted so that the load is transferred from the blocks or shims to the isolator. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.

E. Once the equipment is in operation, install and anchor the seismic restraints with proper operating clearances as indicated on drawings.

F. Mechanical equipment shall be isolated from the building structure by vibration isolators as scheduled on the drawings.

G. All piping 1 1/4" and over located in mechanical equipment rooms, and for a minimum of fifty (50) feet or 100 pipe diameters whichever is greater, from connection to vibrating mechanical or electrical equipment, shall be isolated from the building structure by means of vibration isolators as identified above.

H. All HVAC piping and vertical risers shall be isolated from the building structure by means of vibration isolators and guides.

I. All piping and ductwork to be isolated shall freely pass through walls and floors without contact. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork and maintain adequate clearance around the outside surfaces. Any materials used to fill the clearance space shall be permanently flexible so that vibration will not pass through it.

J. No rigid connections between equipment and building structure, including electrical conduit and refrigerant lines, shall be made that degrades the vibration isolation system herein specified. Inform other following trades, such as plastering, or electrical, to avoid any contact which would short-circuit the vibration isolation.

K. Bring to the Architect's attention prior to installation any conflicts with other trades which will result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.

L. Bring to the Architect's attention any discrepancies between the specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the contractor's expense.

M. Obtain inspection and approval of any isolation installation to be covered or enclosed, prior to such closure.

N. Thrust restraints shall consist of spring hangers with the same deflection as specified for the spring mountings. Thrust restraints shall be attached to the fan at the centerline of air discharge opening.

O. Correct, at no additional cost, all installations that are deemed defective in workmanship or materials.

P. Support piping connections to equipment mounted on isolators using isolators or resilient hangers for scheduled distance.

    1. Up to 4 Inches Pipe Size: First three points of support.
    2. 5 to 8 Inches Pipe Size: First four points of support.
    3. 10 inches Pipe Size and Over: First six points of support.

4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.03 PIPING ISOLATORS

A. All piping except fire standpipe systems are included under this section.

B. Isolate piping within 50 feet of rotating equipment and pressure reducing stations.

C. The isolators shall be installed with the isolator hanger box attached to, or hung as close as possible to, approved locations on the supporting structure.

D. The isolators shall be suspended from substantial structural members, not from slab diaphragm unless specifically permitted.

E. Hanger rods shall be aligned to clear the hanger box.

F. Horizontal floor supported piping shall be isolated by type "RMLS-EQ", with a minimum static deflection of 1.0 inch or the same deflection as isolated equipment to which pipe is connected, whichever is greater.

G. Vertical riser pipe support and restraint system shall consist of type "RMS" springs and type "PG-EQ" guides. Install vertical riser guides so that clearances are maintained around concentric pipes in the guides. Install vertical restraints on the floor location as shown on drawings.

H. Pipe anchors, where required, shall utilize resilient pipe anchors, type "RPA" or equivalent, to avoid direct contact of piping with building.

I. Pipe Extension and Alignment connectors: Provide connectors at pump suction and discharge, riser take offs, cooling and heating coils, and elsewhere as required to accommodate thermal expansion and misalignment.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Adhesive-backed duct markers.

D. Pipe markers.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Piping: Tags.

C. Thermostats: Nameplates.

2.02 NAMEPLATES

A. Manufacturers:

1. Advanced Graphic Engraving, LLC; _____: www.advancedgraphicengraving.com/#sle.
2. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
3. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
4. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
5. Letter Color: White.
6. Letter Height: 1/4 inch.
7. Background Color: Black.
8. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving; _____: www.advancedgraphicengraving.com/#sle.
2. Brady Corporation; _____: www.bradycorp.com/#sle.
3. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
4. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
5. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation; _____: www.bradycorp.com/#sle.
2. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
3. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
4. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

E. Color code as follows:

1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
2. Compressed Air: Blue with white letters.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 099123 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 099123.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Identify piping, concealed or exposed, with stencilled painting. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

G. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

H. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

C. Measurement of final operating condition of HVAC systems.

D. Commissioning activities.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008, with Errata (2019).

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

1.03 SUBMITTALS

A. The contractor shall procure the services of an independent Air Balance and Testing Agency, approved by the Engineer, which specializes in the balancing and testing of heating, ventilating, and air conditioning systems. The independent agency shall be certified and in good standing with the AABC.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to Architect.
2. Submit to the Commissioning Authority.
3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with Architect and other installers to sufficiently understand the design intent for each system.
5. Include at least the following in the plan:

a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

c. Identification and types of measurement instruments to be used and their most recent calibration date.

d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

e. Final test report forms to be used.

f. Expected problems and solutions, etc.

g. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.

h. Details of how TOTAL flow will be determined; for example:

1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.

2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

i. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.

j. Confirmation of understanding of the outside air ventilation criteria under all conditions.

k. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

l. Method of checking building static and exhaust fan and/or relief damper capacity.

m. Time schedule for deferred or seasonal TAB work, if specified.

n. False loading of systems to complete TAB work, if specified.

o. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.

p. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

q. Procedures for formal progress reports, including scope and frequency.

r. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Logs: Submit at least twice a week to the Commissioning Authority.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Progress Reports.

G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit to the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.

2. Revise TAB plan to reflect actual procedures and submit as part of final report.

3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.

4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.

5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

7. Include the following on the title page of each report:
    a. Name of Testing, Adjusting, and Balancing Agency.
    b. Address of Testing, Adjusting, and Balancing Agency.
    c. Telephone number of Testing, Adjusting, and Balancing Agency.
    d. Project name.
    e. Project location.
    f. Project Architect.
    g. Project Engineer.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
    1. AABC (NSTSB), AABC National Standards for Total System Balance.
    2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
    3. SMACNA (TAB).
    4. Maintain at least one copy of the standard to be used at project site at all times.

B. A minimum of two air balance test shall be completed for the project. One shall be completed prior to any demolition is made to test existing systems in scope of work. Second test shall begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
    1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
    2. Certified by the following:
        a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
    1. Systems are started and operating in a safe and normal condition.
    2. Temperature control systems are installed complete and operable.
    3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner and / or project inspector.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.02 inches negative static pressure in chemical storage rooms.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.06 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.07 COMMISSIONING

A. Perform prerequisites prior to starting commissioning activities.

B. Include cost for commissioning requirements in the contract price.

C. Attend commissioning meetings scheduled by the CxA when requested. TAB will need to be present 2 weeks prior to the start of TAB to review the TAB plan/procedures and weekly/bi-weekly during the on-site TAB work.

D. Submit the TAB plan/procedures to the CxA for review at least two weeks prior to beginning TAB work.

E. Notify the CxA a minimum of two weeks in advance of scheduled TAB work.

F. Where applicable, complete the Certificate(s) of Acceptance per the contract documents.

1. Retain Certificate(s) of Acceptance in a 3-ring binder in an organized fashion. Binder is to remain on the job site
2. Provide copies of all Certificate(s) of Acceptance to the CxA.
3. Certificate(s) of Acceptance shall be conducted by companies who are certified as a Mechanical Acceptance Test Technician employer and only completed by those employees of said company who are certified to complete the respective acceptance test.

G. Monitor and respond to Resolution Tracking Forms distributed by the CxA in order to expedite corrective actions necessary to achieve design intent.

H. Participate in the Functional Performance Tests as required to achieve design intent.

I. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

J. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for ___ percent of the air handlers plus a random sample equivalent to ____ percent of the final TAB report data as directed by Commissioning Authority.

1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
2. Use the same test instruments as used in the original TAB work.
3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
4. For purposes of re-check, failure is defined as follows:
    a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
    b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
    c. Temperatures: Deviation of more than one degree F.
    d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
    e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

K. In the presence of the Commissioning Authority, verify that:

1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.08 SCOPE

A. Test, adjust, and balance the following:

1. Plumbing Pumps.
2. Packaged Roof Top Heating/Cooling Units.
3. Unit Air Conditioners.
4. Fans.
5. Air Filters.
6. Air Terminal Units.
7. Air Inlets and Outlets.

3.09 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. V-Belt Drives:

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C. Pumps:
    1. Identification/number.
    2. Manufacturer.
    3. Size/model.
    4. Impeller.
    5. Service.
    6. Design flow rate, pressure drop, BHP.
    7. Actual flow rate, pressure drop, BHP.
    8. Discharge pressure.
    9. Suction pressure.
    10. Total operating head pressure.
    11. Shut off, discharge and suction pressures.
    12. Shut off, total head pressure.

D. Air Cooled Condensers:
    1. Identification/number.
    2. Location.
    3. Manufacturer.
    4. Model number.
    5. Serial number.
    6. Entering DB air temperature, design and actual.
    7. Leaving DB air temperature, design and actual.
    8. Number of compressors.

E. Return Air/Outside Air:
    1. Identification/location.
    2. Design air flow.
    3. Actual air flow.
    4. Design return air flow.
    5. Actual return air flow.
    6. Design outside air flow.
    7. Actual outside air flow.
    8. Return air temperature.
    9. Outside air temperature.
    10. Required mixed air temperature.
    11. Actual mixed air temperature.
    12. Design outside/return air ratio.
    13. Actual outside/return air ratio.

F. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

G. Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

H. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

1.02 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.

B. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023c.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. Knauf Insulation: www.knaufinsulation.com.
2. Johns Manville: www.jm.com.
3. Owens Corning Corporation: www.ocbuildingspec.com.

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

2.03 DUCT LINER

A. Manufacturers:

1. Knauf Insulation: www.knaufinsulation.com.
2. Johns Manville: www.jm.com.

B. Note: Choose the liner type - Elastomeric Foam or Glass Fiber.

C. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer or acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.

1. Apparent Thermal Conductivity: Maximum of .24 at 75 degrees F.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Finish with tape and vapor barrier jacket.
2. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

D. Insulated Ducts Conveying Air Above Ambient Temperature:

E. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with calked aluminum jacket with seams located on bottom side of horizontal duct section.

F. External Duct Insulation Application:

1. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
2. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

G. Duct and Plenum Liner Application:

1. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
2. Seal and smooth joints. Seal and coat transverse joints.
3. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.03 **R-VALUE FOR INSULATION ON DUCTS SHALL BE PER TITLE-24 REQUIREMENTS**

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 07 16

HVAC EQUIPMENT INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019, with Editorial Revision (2023).

B. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement 2007 (Reapproved 2019).

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.

D. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation 2017 (Reapproved 2023).

E. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2023.

F. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).

G. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2022a.

H. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials, thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any). and thickness for equipment scheduled.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: 12 inches (300 mm) long by NPS 2 (DN 50).
2. Sheet Form Insulation Materials: 12 inches (300 mm) square.
3. Sheet Jacket Materials: 12 inches (300 mm) square.
4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

D. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail removable insulation at equipment connections.
4. Detail application of field-applied jackets.
5. Detail application at linkages of control devices.
6. Detail field application for each equipment type.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum _____ years of experience.

C. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

C. A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with requirements in "Breeching Insulation Schedule" and "Equipment Insulation Schedule" articles for where insulating materials shall be applied.

B. See "Product Characteristics" Article in Evaluations for comparisons and temperature ranges for insulation material properties.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. Products shall be Greenguard certified for Children & Schools.

E. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

F. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

G. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturers:

1. Knauf Insulation; _____: www.knaufinsulation.com.
2. Owens Corning Corporation; _____: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C553; flexible, noncombustible.

1. K Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
2. Maximum Service Temperature: 1,000 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.

1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
2. Secure with self-sealing longitudinal laps and butt strips.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.03 GLASS FIBER, RIGID

A. Manufacturer:

1. Knauf Insulation; _____: www.knaufusa.com.
2. Owens Corning Corporation; _____: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C612or ASTM C592; rigid, noncombustible.

1. K Value: 0.25 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
2. Maximum Service Temperature: 1,200 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.
4. Maximum Density: 8.0 pcf.

C. Vapor Barrier Jacket:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with self-sealing longitudinal laps and butt strips.
4. Secure with outward clinch expanding staples and vapor barrier mastic.

D. Facing: 1 inch galvanized steel hexagonal wire mesh stitched on one face of insulation.

2.04 CELLULAR GLASS

A. Manufacturer:

1. Owens Corning Corporation; FOAMGLAS: www.ocbuildingspec.com/#sle.
2. Pittsburgh Corning Corporation: Foamglass.

B. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

C. Block Insulation: ASTM C 552, Type I.

D. Special-Shaped Insulation: ASTM C 552, Type III.

E. Board Insulation: ASTM C 552, Type IV.

F. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

2.05 HYDROUS CALCIUM SILICATE

A. Manufacturer:

1. Johns Manville Corporation; _____: www.jm.com/#sle.
2. Industrial Insulation Group (IIG): Thermo-12 Gold.

B. Insulation: ASTM C533; rigid molded, asbestos free, gold color. Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement.

C. Tie Wire: 0.048 inches stainless steel with twisted ends on maximum 12 inch centers.

D. Insulating Cement: ASTM C449.

2.06 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

1. Aeroflex USA, Inc; Aerocel AC Sheet and Roll: www.aeroflexusa.com/#sle.
2. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.
3. K-Flex USA LLC; Insul-Sheet: www.kflexusa.com/#sle.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3, in sheet form. Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

2.07 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Product attributes in first paragraph below are based on Foster Brand products; there are variations among manufacturers.

C. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F (10 to 427 deg C).

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-97.

b. Eagle Bridges - Marathon Industries; 290.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-27.

d. Mon-Eco Industries, Inc.; 22-30.

e. Vimasco Corporation; 760.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Phenolic and Polyisocyanurate Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).

1. Products: Subject to compliance with requirements,available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-96.

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-33.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Product: Subject to compliance with requirements, provide Armacell LLC; Armaflex 520 Adhesive or comparable product by one of the following:

a. Aeroflex USA, Inc

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company.

c. K-Flex USA.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

a. Product: Subject to compliance with requirements, provide Armacell, LLC; Armaflex 520BLV Adhesive or comparable product by one of the following:

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements,available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.

b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.

d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Polystyrene Adhesive: Solvent- or water-based, synthetic resin adhesive with a service temperature range of minus 20 to plus 140 deg F (29 to plus 60 deg C).

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-96.

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60.

I. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.

b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.

d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

J. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Dow Corning Corporation; 739, Dow Silicone.
    b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    c. P.I.C. Plastics, Inc; Welding Adhesive.
    d. Speedline Corporation; Polyco VP Adhesive.
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.08 SEALANTS

A. Sealants are categorized into "joint sealants" and "flashing sealants." Joint sealants are primarily used for vapor sealing longitudinal seams and butt joints of insulation materials. Flashing sealants are primarily used for sealing jacket and mastic materials.

B. Joint Sealants:
1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    b. Eagle Bridges - Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Pittsburgh Corning Corporation; Pittseal 444.
2. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-70.
    b. Eagle Bridges - Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
    d. Mon-Eco Industries, Inc.; 44-05.
3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
6. Color: White or gray.
7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

8. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    b. Eagle Bridges- Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
    d. Mon-Eco Industries, Inc.; 44-05.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.09 JACKETING AND ACCESSORIES

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing

C. PVC Plastic: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedule.

1. Manufacturers:
    a. Johns Manville Corporation: Zeston Series www.jm.com.
    b. P.I.C. Plastics Inc FG Series.
    c. Proto Corporation: LoSmoke.

D. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet. Alloy 3003, 3005, 3105, or 5005, Temper H-14
    1. Thickness: 0.016 inch sheet.
    2. Joining: Longitudinal slip joints and 2 inch laps.
    3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.
    4. Moisture Barrier for Indoor Application: 1 mil (0.025 mm) thick, heat-bonded polyethylene and kraft paper.
    5. Moisture Barrier for Outdoor Application: 3 mil (0.075 mm) thick, heat bonded polyethylene and kraft paper
    6. Factory-Fabricated Fitting Covers:
        a. Same material, finish, and thickness as jacket.
        b. Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        c. Tee covers.
        d. Flange and union covers.
        e. End caps.
        f. Beveled collars.
        g. Valve covers.
        h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.10 SECUREMENTS

A. Bands:
    1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
        a. ITW Insulation Systems; Gerrard Strapping and Seals.
        b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
    2. Wing seals are primarily used for fastening bands together. Closed seals are occasionally used for large, 84-inch- (2130-mm-) diameter applications and where fastening bands are used with springs. Wing seals are reusable; closed seals are not.
    3. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with wing seal.
    4. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal.
    5. Springs are used for large, 84-inch- (2130-mm-) diameter applications and on applications with rapid changes in expansion and contraction.

6. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, [0.106-inch- (2.6-mm-)] [0.135-inch- (3.5-mm-)] diameter shank, length to suit depth of insulation indicated.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) AGM Industries, Inc.; CWP-1.

        2) GEMCO; CD.

        3) Midwest Fasteners, Inc.; CD.

        4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) AGM Industries, Inc.; CHP-1.

        2) GEMCO; Cupped Head Weld Pin.

        3) Midwest Fasteners, Inc.; Cupped Head.

        4) Nelson Stud Welding; CHP.

3. Pre-Formed Engineered Pipe Hangers: Elastomeric foam with urethane inserts and an outside, painted, aluminum jacket

    a. Product: Subject to compliance with requirements, provide Armacell LLC; ArmaFix IPH or comparable product by one of the following:

4. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.

        2) GEMCO; Perforated Base.

        3) Midwest Fasteners, Inc.; Spindle.

    b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.

    c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.

    d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
        1) GEMCO; Nylon Hangers.
        2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.
    b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
    c. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
    d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
6. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
        1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers, Series.
        2) GEMCO; Peel & Press.
        3) Midwest Fasteners, Inc.; Self Stick.
    b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
    c. Spindle: [Copper- or zinc-coated, low-carbon steel] [Aluminum] [Stainless steel], fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
    d. Adhesive-backed base with a peel-off protective cover.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 08 00

COMMISSIONING OF HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.

B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.

D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:

1. Control system.
2. Major and minor equipment items.
3. Piping systems and equipment.
4. Ductwork and accessories.
5. Variable frequency drives.
6. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
7. Indoor Air Quality Procedures: The Commissioning Authority will coordinate; Contractor will execute; see Section 015719.

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS

A. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

1.03 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 - HVAC&R Technical Requirements for the Commissioning Process 2007, with Errata (2012).

1.04 SUBMITTALS

A. HVAC Control System Documentation: Submit detailed sequences of operation, control system drawings, and points list, as specified in Section 15940.

B. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:

1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other

features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.

2. Full as-built set of control drawings.
3. Full as-built sequence of operations for each piece of equipment.
4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
    a. Floor.
    b. Room number.
    c. Room name.
    d. Air handler unit ID.
    e. Reference drawing number.
    f. Air terminal unit tag ID.
    g. Maximum air flow rate.
5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as-built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller and/or module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.
    g. Dampers and damper actuators.
    h. Program setups (software program printouts).

E. Project Record Documents:

1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

F. Draft Training Plan: include:

1. Follow the recommendations of ASHRAE Guideline 1.1.

2. Control system manufacturer's recommended training.
3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

G. Training Manuals:

1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 - EXECUTION

3.01 PREPARATION

A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the Commissioning Authority.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

1. Include cost of sheaves and belts that may be required for testing, adjusting, and balancing.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

3.02 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Provide two-way radios for use during the testing.

D. Damper Stroke Setup and Check:

1. For all damper actuator positions checked, verify the actual position against the control system readout.
2. Set fan to normal operating mode.
3. Command damper closed; visually verify that damper is closed and adjust output zero signal as required.
4. Command damper open; verify position is full open and adjust output signal as required.
5. Command damper to a few intermediate positions.
6. If actual damper position does not reasonably correspond, replace actuator.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.

1. The scope of trend logging is partially specified; trend log up to 20 percent more points than specified at no extra cost to Owner.
2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.

1. Setpoint changing features and functions.
2. Sensor calibrations.

G. Demonstrate to the Commissioning Authority:

1. That all specified functions and features are set up, debugged and fully operable.
2. That scheduling features are fully functional and setup, including holidays.
3. That all graphic screens and value readouts are completed.
4. Correct date and time setting in central computer.
5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if

any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.

7. Power failure and battery backup and power-up restart functions.
8. Global commands features.
9. Security and access codes.
10. Occupant over-rides (manual, telephone, key, keypad, etc.).
11. O&M schedules and alarms.
12. Occupancy sensors and controls.
13. All control strategies and sequences not tested during controlled equipment testing.

H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

A. See Section 017800 for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.06 DEMONSTRATION AND TRAINING

A. See Section 017900 for additional requirements.

B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:

1. HVAC Control System: 2 hours.
2. Packaged Rooftop Units: 2 hours.
3. Split System AC or Heat Pumps: 2 hours.
4. Specialty Exhaust Fans: 2 hours.

E. TAB Review: Instruct Owner's personnel for minimum 2 hours, after completion of TAB, on the following:

1. Review final TAB report, explaining the layout and meanings of each data type.
2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.

5. Other salient information that may be useful for facility operations, relative to TAB.

F. HVAC Control System Training: Perform training in at least three phases:

1. Phase 1 - Basic Control System: Provide minimum of 8 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.

    a. This training may be held on-site or at the manufacturer's facility.

    b. If held off-site, the training may occur prior to final completion of the system installation.

    c. For off-site training, Contractor shall pay expenses of up to two attendees.

2. Phase 2 - Integrating with HVAC Systems: Provide minimum of 8 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:

    a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.

    b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.

    c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.

    d. Every display screen, allowing time for questions.

    e. Point database entry and modifications.

3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of 8 hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 23 08 02

INSTALLATION & ACCEPTANCE TESTING OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.01 INTRODUCTION

A. Title 24 requires the completion of applicable Certificates of Installation and Certificates of Acceptance for mechanical systems. This shall include applicable mechanical systems as defined in the energy compliance sheets included with the contract documents.

1.02 RELATED DOCUMENTS

A. Contract drawings and specifications, general provisions of the contract, including general and supplementary conditions, mechanical provisions and Division-1 Specification sections apply to work of this section.

1.03 DESCRIPTION OF WORK

A. Complete Title 24 required Certificate(s) of Installation (NRCI) and Certificate(s) of Acceptance (NRCA) to be completed per the contract documents.

1.04 RESPONSIBILITIES OF INSTALLING CONTRACTORS

A. General Contractor (GC)

1. Ensure that contractors identified as the contractor responsible for acceptance testing and completion of the Title 24 Certificate(s) of Acceptance are certified by the State of California or its designated body to conduct each respective test.

B. Mechanical Contractor (MC)

1. Verify proper installation and performance of mechanical services provided.
2. Complete Title 24 Certificate(s) of Installation and manufacturer's pre-start checklists prior to scheduling startup/programming of mechanical control equipment.
    a. Retain Certificate(s) of Installation in a 3-ring binder in an organized fashion. Binder is to remain on the job site
    b. Make Certificate(s) of Installation available for building inspector's review.
    c. Retain calibration records for equipment provided with manufacturer calibrated sensors in the Certificate(s) of Installation binder.
    d. Correct labeling of circuits with connected equipment.
3. Complete the Certificate(s) of Acceptance per the contract documents.
    a. The company installing the mechanical systems must be an authorized Mechanical Controls Acceptance Test Employer certified by a Mechanical Controls Acceptance Test Technician Certification Provider or include in their bid the cost of retaining and overseeing a contractor who is an authorized Mechanical Controls Acceptance Test Employer to complete the acceptance testing.
    b. At the discretion of the GC, the Mechanical Controls Acceptance Testing may be completed by the Testing & Balancing (TAB) Contractor if the TAB contractor' s company and personnel meet requirements in this specification section.

c. Required acceptance testing must be completed by a Mechanical Controls Acceptance Test Technician employed by the Mechanical Controls Acceptance Test Employer.

d. Retain Certificate(s) of Acceptance in a 3-ring binder in an organized fashion. Binder is to remain on the job site

e. Provide copies of Certificate(s) of Acceptance to the GC for review by the building inspector

f. Upload Certificate(s) of Acceptance to the California Title 24 Certificates of Acceptance database, if, at the time of project completion, the database is available to the public.

4. Successful completion of the required Acceptance Tests is the responsibility of the installing contractor. Any costs associated with modifications necessary to obtain compliance and re-testing of systems shall be included in the base bid of this project.

END OF SECTION

SECTION 23 09 13

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Thermostats:

1. Electric thermostats.
2. Room-mount thermostat accessories.

1.02 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating 2018.

B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats 2013.

1.03 SUBMITTALS

A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

B. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences.

C. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

PART 2 - PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 THERMOSTATS

A. Electric Thermostats:

1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
2. Service: Cooling only.
3. Covers: Locking with set point adjustment, with thermometer.

B. Room-Mounted Thermostat Accessories:

1. Thermostat Covers: Brushed aluminum.
2. Insulating Bases: For thermostats located on exterior walls.
3. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

C. Airstream Thermostats:

1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that systems are ready to receive work.

B. Beginning of installation means installer accepts existing conditions.

C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

D. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

E. Ensure installation of components is complementary to installation of similar components.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches and humidistats; see Section 262726.

C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

SECTION 23 31 00

HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

1.02 RELATED REQUIREMENTS

A. Section 230130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.

B. Section 230713 - Duct Insulation: External insulation and duct liner.

C. Section 233300 - Air Duct Accessories.

D. Section 233319 - Duct Silencers.

E. Section 233700 - Air Outlets and Inlets: Fabric air distribution devices.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023c.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2024.

D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2024.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.

F. SMACNA (FGD) - Fibrous Glass Duct Construction Standards 2021.

G. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors Current Edition, Including All Revisions.

1.04 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.05 SUBMITTALS

A. Product Data: Provide data for duct materials, duct liner, and duct connections.

B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:

E. Duct Sealing and Leakage in accordance with Static Pressure Class:

F. Duct Fabrication Requirements:

1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. VOC Content: Not more than 250 g/L, excluding water.
3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Flexible Ducts:

1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
    a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
    b. Maximum Velocity: 4000 fpm.
    c. Temperature Range: -20 degrees F to 210 degrees F.

D. Insulated Flexible Ducts:

1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
    a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
    b. Maximum Velocity: 4000 fpm.

c. Temperature Range: -20 degrees F to 210 degrees F.

E. Low Pressure Supply (System with Cooling Coils): 1 inch w.g. pressure class, galvanized steel.

F. Medium and High Pressure Supply: 6 inch w.g. pressure class, galvanized steel.

G. Return and Relief: 1 inch w.g. pressure class, galvanized steel.

H. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

I. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

A. Fabricate ductwork gauge in accordance with current (CMC) California Mechanical Code and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Tee's, bends, and elbows: Construct according to (CMC) California Mechanical Code and SMACNA (DCS).

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 DUCT MANUFACTURERS

A. Metal-Fab, Inc: www.mtlfab.com.

B. SEMCO Incorporated: www.semcoinc.com.

C. United McGill Corporation: www.unitedmcgill.com.

2.05 METAL DUCTS

A. Material Requirements:

1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

D. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

E. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device

or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

F. Locate ducts and dampers with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.

H. Use double nuts and lock washers on threaded rod supports.

I. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

J. Connect diffusers or return air boots to low pressure ducts with 5 feet maximum length of flexible duct.

K. Flexible air ducts shall not be used in lieu of ridged elbows or fittings. Flexible air ducts shall be permitted to be used as an elbow at a terminal device

1. Elbow at a terminal device shall be provide with straps and support, "FlexRight" (Durable Elbow Support).
2. Shall be a universal-mount, 1-piece, fully adjustable, radius forming brace
3. Classified: UL 2043
4. Material: 100 percent recycled copolymer polyporpylene
5. Support Frame Radius: 8 Inches
6. Compliance for Flexible Duct Radius with SMACNA HVAC Duct Construction Standards and ASHRAE Advanced Energy Design Guides
7. Manufacturer: Build Right Products or equal

L. Install flexible duct elbow supports in accordance with manufacturer's instructions.

M. Install flexible duct elbow supports over outer jacket of flexible ducts to form smoot, 90-degree bends to eliminate flexible duct kinks and airflow restrictions

N. Make bends in flexible ducts with minimum of 1-duct diamter centerline radius

O. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

P. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.02 CLEANING

A. Clean thoroughly each duct system. See Section 23 01 30.51.

B. Clean duct system by forcing air at high velocity through duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers.

C. Duct access doors.

D. Duct test holes.

E. Flexible duct connectors.

F. Volume control dampers.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2024.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.

C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service Current Edition, Including All Revisions.

D. UL 555 - Standard for Fire Dampers Current Edition, Including All Revisions.

E. UL 555S - Standard for Smoke Dampers Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.

1.04 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 - PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:

1. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com/#sle.
2. PCI Industries, Inc; Pottorff Brand; : www.portorff.com.
3. Ruskin Company: www.ruskin.com/#sle.
4. Titus HVAC, a brand of Johnson Controls: www.titus-hvac.com/#sle.

B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with worm drive mechanism with removable key operator.

2.02 BACKDRAFT DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
2. Nailor Industries, Inc: www.nailor.com/#sle.
3. PCI Industries, Inc; Pottorff Brand : www.portorff.com.
4. Ruskin Company: www.ruskin.com/#sle.

B. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.03 DUCT ACCESS DOORS

A. Manufacturers:

1. Nailor Industries, Inc: www.nailor.com/#sle.
2. Ruskin Company: www.ruskin.com/#sle.
3. SEMCO LLC: www.semcohvac.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.04 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.05 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

2.06 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
2. Nailor Industries, Inc: www.nailor.com/#sle.
3. PCI Industries, Inc; Pottorff Brand : www.portorff.com.
4. Ruskin Company: www.ruskin.com/#sle.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 34 16

CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Backward inclined centrifugal fans.

B. Bearings and drives.

C. Accessories.

1.02 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015 (Reaffirmed 2020).

1.03 SUBMITTALS

A. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point plotted, power, rpm, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

B. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.04 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Loren Cook Company; _____: www.lorencook.com/#sle.

B. PennBarry, Division of Air System Components; _____: www.pennbarry.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

2.03 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and backplate; cast iron hub riveted to back plate and keyed to shaft with set screws.

2.04 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA STD 9 life at 50,000 hours.

B. Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp and under, selected so required rpm is obtained with sheaves set at mid Fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

2.05 ACCESSORIES

A. Inlet/Outlet Screens: Galvanized steel welded grid.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide safety screen where inlet or outlet is exposed.

C. Provide backdraft dampers on exhaust fans located at discharge side; see Section 233300.

END OF SECTION

SECTION 23 34 23

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters.

B. Ceiling exhaust fans.

C. Inline centrifugal fans and blowers.

D. Utility vent blowers.

1.02 REFERENCE STANDARDS

A. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data 2022.

B. UL 705 - Power Ventilators Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

1.04 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Greenheck Fan Corporation: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

2.02 ROOF EXHAUSTERS

A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

B. A backward-inclined, non-overloading centrifugal wheel to generate high efficiency and minimal sound.

C. Roof Curb: 12 inch highself-flashing of galvanized steel with continuously welded seams, built-in cant strips.

D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

F. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.03 UTILITY VENT BLOWERS

A. Direct Drive Fan:

1. Fan Wheel:

a. Type: Non-overloading, backward inclined centrifugal.

b. Material: Aluminum, statically and dynamically balanced.

2. Housing:

a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.

b. Rigid internal support structure.

c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.

d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.

e. Provide breather tube for fresh air motor cooling and wiring.

B. Shafts and Bearings:

1. Fan Shaft:

a. Ground and polished steel with anti-corrosive coating.

b. First critical speed at least 25 percent over maximum cataloged operating speed.

2. Bearings:

a. Permanently sealed or pillow block type.

b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.

c. 100 percent factory tested.

C. Drive Assembly:

1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.

2. Belts: Static free and oil resistant.

3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.

4. Motor pulley adjustable for final system balancing.

5. Readily accessible for maintenance.

D. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Hung Cabinet Fans:

    1. Install flexible connections between fan and ductwork; see Section 233300. Ensure metal bands of connectors are parallel with minimum 1 inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Diffusers:

B. Rectangular ceiling diffusers.

C. Registers/grilles:

1. Ceiling-mounted, exhaust and return register/grilles.
2. Ceiling-mounted, supply register/grilles.

D. Fabric air distribution devices.

1.02 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating 2023.

B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2008.

C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets 2023.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023c.

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit sheets indicating materials of construction, finish, and mounting deatils; and performance data including throw and drop, static-pressure drop, and nose ratings.

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Krueger: www.krueger-hvac.com.

B. Price Industries: www.price-hvac.com.

C. Titus: www.titus-hvac.com.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square, adjustable pattern, stamped, multi-core diffuser to discharge air in four way pattern with sectorizing baffles where indicated.

B. Frame: T-Bar and Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame. In T-Bar ceiling provide filler panel.

C. Fabrication: Steel with baked enamel off-white finish.

2.03 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory off-white enamel finish.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.05 FABRIC AIR DISTRIBUTION DEVICES

A. General Requirements:

1. Diffuser material to comply with ASTM E84, UL 723, UL 2518, NFPA 90A, and NFPA 90B.

2. Air Dispersion Method:

3. Hanger Supports:

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with airtight connection.

D. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

3.02 **SCHEDULES SHOWN ON SHEET M0.1**

END OF SECTION

SECTION 23 74 16

PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 2 – PRODUCTS

1.01 MANUFACTURERS

A. Carrier Corporation; _____: www.commercial.carrier.com/#sle.

B. Substitutions: See Section 016000 - Product Requirements.

1.02 PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

A. Manufacturers:

1. Carrier Corporation; _____: www.commercial.carrier.com/#sle.

2. Substitutions: See Section 016000 - Product Requirements.

B. General: Roof mounted units having gas burner and electric refrigeration that are 6 tons and smaller in capacity.

C. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

D. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

1.03 PERFORMANCE REQUIREMENTS

1.04 CASING

A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver-operated flush, cam type fasteners. Structural members to be minimum 18 gauge, 0.0478 inch, with access doors or panels of minimum 20 gauge, 0.0359 inch.

B. Insulation: 1/2-inch thick, neoprene-coated glass fiber with edges protected from erosion.

C. Insulation: One-inch thick, neoprene-coated glass fiber with edges protected from erosion.

D. Insulation: 2-inch thick, neoprene-coated glass fiber with edges protected from erosion.

1.05 FANS

A. Supply and Return Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted. Provide with high efficiency motor or direct drive as indicated. Isolate complete fan assembly. See Section 230548.

1.06 BURNERS

A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame-sensing device, and automatic 100 percent shutoff pilot.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

1.07 ELECTRIC HEATING COIL

A. Finned tube heating elements easily accessible with automatic reset thermal cut-out. Provide with built-in magnetic contactors, galvanized steel frame, control circuit transformer and fuse, manual reset thermal cut-out, airflow proving device, pilot duty toggle switch, load fuses.

B. Controls: Start supply fan before electric elements are energized and continue operating until air temperature reaches minimum setting, with switch for continuous fan operation.

1.08 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

1.09 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

C. Provide refrigerant pressure switches to cycle condenser fans.

1.10 HEAT RECOVERY COIL

A. Provide copper tube aluminum fin coil assembly with multiple circuits arranged to provide heat recovery.

1.11 COMPRESSORS

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

B. Five minute timed off circuit to delay compressor start.

C. Outdoor thermostat to energize compressor above 35 degrees F ambient.

D. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

1.12 MIXED AIR CASING

A. Dampers: Provide manual outside and return air dampers for fixed outside air quantity.

B. Dampers: Provide remote controlled outside and return air dampers with damper operator and remote rheostat for adjusting outside air quantity.

C. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fall to closed position. Relief dampers may be gravity balanced.

D. Gaskets: Provide tight fitting dampers with edge gaskets.

E. Gaskets: Provide tight fitting dampers with edge gaskets maximum leakage 5 percent at 2-inch pressure differential.

F. Damper Operator: 24 volts with gear train sealed in oil.

G. Damper Operator, Units 7.5 Ton Cooling Capacity and Larger: 24 volt with gear train sealed in oil with spring return on.

H. Damper Operator: Pneumatic piston or gear driven type with spring return and pilot positioner.

I. Mixed Air Controls: Maintain selected supply air temperature and return dampers to minimum position on call for heating and above 75 degrees F ambient, or when ambient air temperature exceeds return air temperature.

1.13 AIR FILTERS:

A. 2-inch thick, glass fiber disposable media in metal frames.

B. See Section 234000.

1.14 AIRFLOW MEASUREMENT

A. Manufacturers:

1. Paragon Controls, Inc; _____: www.paragoncontrols.com/#sle.

2. Substitutions: See Section 016000 - Product Requirements.

1.15 OPERATING CONTROLS

A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.

1. Include system selector switch heat-off-cool and auto-on fan control switch.

2. Locate thermostat in room as indicated on drawings.

B. Provide remote-mounted auto-on fan control switch.

1.16 ROOF CURBS

A. Roof Mounting Curb: 14 inches high, galvanized steel, channel frame with gaskets, nailer strips.

B. Vibration Isolation Curb: _____.

PART 2 – NOT USED

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as required by manufacturer.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 90A.

C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

D. Locate remote panels where indicated on drawings.

3.03 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

3.04 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

3.05 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of packaged rooftop units for one year from Date of Substantial Completion.

D. Provide routine maintenance service with a two-month interval as maximum time period between calls.

E. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.

F. Provide 24-hour emergency service on breakdowns and malfunctions.

G. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION

SECTION 26 00 10

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. This section supplements all sections of this division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems for the Project. The work required under this division is not limited to the electrical specifications and drawings. Refer to all bid documents including Civil, Architectural, Structural, and Mechanical documents which may designate Work to be accomplished. The intent of the Specifications is to provide a complete and operable electrical system, which shall include all documents that are a part of the entire Project Contract.

1. Work included: Furnish all labor, material, tools, equipment, facilities, transportation, skilled supervision necessary for, and incidental to, performing operations in connection with furnishing, delivery, and installation of the work in this division complete as shown or noted on the Drawings and specified herein.

B. Related Work Specified Elsewhere:

1. Refer to all sections in the general contract conditions, Contract Requirements and Division 1, General Requirements.

C. Work Installed but Furnished by Others:

1. The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify installation details. Foundations for apparatus and equipment will be furnished by others unless otherwise noted or detailed.

1.02 GENERAL REQUIREMENTS

A. Guarantee See General Conditions:

1. Except as may be specified under other Sections in the specification, guarantee equipment furnished under the specifications for a period of one year, except for equipment required to have a longer guarantee period, from date of final completion. Guarantee all work against defective workmanship, material, and improper installation. Upon notification of failure, correct deficiency immediately and without additional cost to the Owner.

2. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner or his service agency as approved. Furnish to the Owner, through the Architect, printed manufacturer's warranties complete with material included and expiration dates, upon completion of project. Conform to Division 01.

B. Equipment Safety: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety.

C. Codes and Regulations:

1. Design, manufacturer, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the latest publications or standard rules of the following:

a. Institute of Electrical and Electronic Engineers - IEEE

b. National Electrical Manufacturers' Association - NEMA

c. Underwriters' Laboratories, Inc. - UL

d. National Fire Protection Association - NFPA

e. American Society for Testing and Materials - ASTM

f. American National Standards Institute - ANSI

g. California Electrical Code - CEC, Title 24, Part 3

h. California Code of Regulations, Title 8, Subchapter 5

i. California Building Code-CBC, Title 24 Parts 1 &2

j. State & Municipal Codes in Force in the Specific Project Area

k. Occupational Safety & Health Administration - OSHA

l. California State Fire Marshal

m. California Fire Code- CFC, Title 24 Part 9

n. National Electrical Testing Association - NETA

2. The term "Code", when used within the specifications, shall refer to the Publications, Standards, ordinances and codes, listed above. In the case where the codes have different levels of requirements the most stringent rules shall apply.

D. Requirements of Regulatory Agencies:

1. Codes, Permits, and Fees: Where the Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply. The most stringent condition shall be as interpreted by the Engineer.

a. Comply with all requirements for permits, licenses, fees and Code. Permits, licenses, fees, inspections and arrangements required for the Contractor at his expense shall obtain the Work, unless otherwise specified.

b. Comply with the requirements of the applicable utility companies serving the Project. Make all arrangements with the utility companies for proper coordination of the Work.

E. Shop Drawings:

1. See Division 01 for additional requirements.

2. Time Schedules for Submission and Ordering: The Contractor shall prepare, review and coordinate his schedule of submissions carefully, determining the necessary lead time for preparing, submitting, checking, ordering and delivery of materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.

3. Submittals will be checked for general compliance with specifications only. The Contractor shall be responsible for deviations from the drawings or specifications and for errors or omissions of any sort in submittals.

4. Submit a complete list of materials and equipment proposed for the job, including manufacturers names and catalog numbers.

5. Shop drawings shall be submitted in completed groups of materials (i.e., lighting fixtures or switchgear). The Contractor shall add and sign the following paragraph on equipment and materials submitted for review. "It is hereby certified that the (equipment) (material) shown and marked in this submittal is that proposed to be

incorporated into the project; is in compliance with the Contract Drawings and specifications and can be installed in the allocated spaces". Failure to add the above written statement for compliance will result in return of submittals without review.

a. Bind catalog cuts, plate numbers, descriptive bulletins and drawings, 11" x 17" (275 mm x 435 mm) or smaller, in sets with covers neatly showing titles.

b. The Contractor shall verify dimensions of equipment and be satisfied as to Code compliance for fit prior to submitting shop drawings for approval.

c. Where current limiting devices are specified, submit technical data to substantiate adequate protection of equipment cascaded downstream. Submittals shall not be reviewed unless supporting calculations and data are submitted therewith.

d. Include complete catalog information such as construction, ratings, insulation systems, as applicable.

e. For any material specified to meet UL or trade standards, furnish the manufacturers or vendor's certification that the material furnished for the work does in fact equal or exceed such specifications.

f. Reference listings to the specifications' Sections and Article to which each is applicable.

g. Equipment Floor Plans: After approval of material is secured prepare a floor plan of each electrical and communication equipment space, room or yard, drawn to scale at 1/2 inch equals 1 foot and submit for approval in the same manner as for shop drawings. The layout drawings shall be exact scale.

6. Contractor shall prepare coordinated drawings when required by Division 01 or where noted otherwise.

F. Interpretations: The Contractor through the Architect must make Requests for interpretations of drawings and specifications. Any such requests made by equipment manufacturers or suppliers will be referred to the Contractor.

G. Standard of Quality

1. The contract Drawings and Specifications establish the “MINIMUM STANDARD OF QUALITY” each product and/or system must meet to be considered acceptable. Products of other manufactures will be considered if the product and/or system meet or exceed the “MINIMUM STANDARD OF QUALITY” established by this Contract Document.

2. Items for similar application shall be of the same manufacturer.

3. The label of listing by UL shall appear on all materials and equipment for which standards have been established by the agency.

4. Where codes as listed in Section General Requirement Section of the Specifications that establish label or approved requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.

5. Provide the type and quantity of electrical materials and equipment necessary to complete Work and all systems in operation, tested and ready for use.

6. Provide and install all incidental items that belong to the Work described and which are required for complete systems.

7. All switchboards, distribution boards, panel boards and circuit breakers shall be of the same manufacturer.

8. All wiring devices such as switches and receptacles shall be of the same manufacturer.

H. Substitutions: Refer to Division 01

I. Submit comprehensive material list, shop drawings and complete technical data for the following equipment and materials:

1. General Requirements:

a. Main service and distribution switchboards.

b. Panelboards.

c. Conduits

d. Conductors, include all selected insulation types.

e. Fuses

f. Disconnect switches and Starters.

g. Pullboxes, manholes and handholes.

h. Standard lighting fixtures, specially fabricated fixtures, ballasts and lamps, with samples and sample of standard finish available (where requested).

i. Control devices, standard and special receptacles, switches, outlets and finish device plates.

j. Cabinets for signal and telephone system, special terminals and cabinets. Include all cabinet dimensions.

k. Fire alarm system.

l. Transformers

J. Utility Service:

1. Contractor shall verify the locations shown on the drawings and shall include extensions of lines to building service from locations which are acceptable to the Owner.

2. Verify electrical, civil, architectural and structural, dimensional and other requirements with the Owner.

3. Should any major modifications to the work indicated be necessary to comply with the Owner requirements, notify the Architect.

4. Contractor shall contact the utility company representatives to establish pre-construction coordination, obtain all necessary meters and/or approvals, and schedule utility work to coordinate with the construction schedule.

5. All utility services shall be installed per the utility company requirements. Verify final construction requirements with utility company service planners prior to construction.

K. Record Drawings: Refer to Division 01, Contract Closeout.

L. Work Responsibilities:

1. The drawings indicate diagrammatically the desired locations or arrangement of conduit runs, outlets, junction boxes and equipment and are to be followed. Execute the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations. The Contractor is responsible for the correct placing of his work. Where conflicts occur in plans and/or specifications, the most stringent application shall apply and shall be part of the base bid.

2. Locations shown on architectural plan or on wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify the Architect.
3. In the event minor changes in the indicated locations or arrangement are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment or due to interference with other trades, such changes shall be made without extra cost.
4. Verify dimensions and the correct location of Owner-Furnished equipment before proceeding with the roughing-in of connections.
5. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with work carefully check and verify dimensions and sizes with the drawings to see that the furnished equipment will fit into the spaces provided without violation of applicable Codes.
6. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Architect.
7. Contractor shall be responsible for coordination of coordinated drawings when required by the Architect.
8. Replace or repair, without additional compensation any work which does not comply with or which is installed in violation of any of these requirements.

M. Installation General: For special requirements, refer to specific equipment under these requirements.
1. Unless otherwise specified elsewhere in the specifications, do all excavating necessary for the proper installation of the electrical work.
2. Locations of Openings: Locate chases, shafts and openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required. Cutting or drilling in any structural member is prohibited without approval of the Architect. Furnish all access panels to make all boxes, connections and devices accessible as required by CEC.
3. Location of Sleeves: Where conduits pass through concrete walls, suspended slabs or metal deck floors, install sleeves of adequate size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend 2 inches above floor surfaces. Verify locations.
4. Wherever conduit extends through roof, install flashings in accordance with drawings and details.
5. Contractor shall be responsible for cutting and patching which may be required for the proper installation of the electrical work.
6. Protect work, materials and equipment and provide adequate and proper storage facilities during the progress of the work. Storage outdoors shall be weather protected and shall include space heaters to prevent condensation. Provide for the safety and good condition of all work until final acceptance of the work. Replace all damaged or defective work, materials and equipment before requesting final acceptance.
7. Conduit and Equipment to be Installed: Clean thoroughly to remove plaster, spattered paint, cement and dirt on both exterior and interior. All underground conduits shall be mandrelled prior to pulling wire.
8. Conduit and Equipment to be Painted: Clean conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from

conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.

9. Items with Factory Finish: Remove cement, plaster, grease and oil, and leave surfaces, including cracks and corners, clean and polished. Touch up scratched or bare spots to match finish.
10. Site Cleaning: Remove from site all packing cartons, scrap materials and other rubbish on a weekly basis. Vacuum out all cabinets, switchgear and panels and junction boxes prior to pulling any conductors.
11. Electrical equipment and materials exposed to public and in finished areas shall be finish-painted after installation in accordance with the Painting Section. All exposed screw-type fasteners, exterior, or interior in restrooms, shall be vandal-resistant spanner type; include tool.

N. Excavation, Cutting and Patching:

1. Excavating, trenching and backfilling required for the work of this Division in accordance with the applicable requirements of Division 2. Excavating and backfilling connected with electrical work, repaving cuts and providing and maintaining protective measures for the electrical work excavation required by the governing authorities having jurisdiction shall be performed as a part of the work of this Division.
2. Verify openings indicated on the drawings. Provide all cutting, patching and reinforcement of the construction of the building as required to install electrical work.

O. Tests

1. Equipment and systems for which the National Electrical Testing Association (NETA) has an approved or recommended procedure, shall be tested in accordance with that procedure. Test values shall equal values recommended by NETA. Copies of test reports shall be submitted as required under shop drawing submittals.
2. Resistance to ground tests shall be accomplished by a qualified independent testing firm to measure resistance to ground at grounding electrodes. Make tests before slabs or affected areas are poured in order that corrective measures, if required, may be taken. Submit a report showing the results of these measurements. If the resistances exceed values specified elsewhere or NETA test procedure recommendations, perform corrective measures required to reduce resistance to acceptable values.
3. Prior to energizing any motor, measure the service voltage for phase balance and report if unbalance exceeds 1% from mean.
4. Measure the three-phase voltage at no load and at maximum load conditions and submit to the engineer a report showing the results of these measurements.
5. Upon completion of the work and adjustment of all equipment, conduct an operating test. Conduct the test in the presence of an authorized representative of the Owner's Representative. Demonstrate system and equipment to operate in accordance with requirements of the Contract Documents and to be free from electrical and mechanical defects. Provide systems free from short circuits and grounds and show an insulation resistance between phase conductors and ground not less than the requirements of the governing electric code. Test circuits for proper neutral connection.
6. Complete tests prior to final inspection of project, including corrective work based on the results of the tests.
7. Perform special tests on systems and equipment as specified herein using personnel qualified to perform such tests.

P. Protection: Protect finish parts of the materials and equipment against damage during the progress of the work and until final completion and acceptance. Cover materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred. Keep moving parts clean, dry and lubricated.

Q. Cleaning Up:

1. Upon completion of the work and at various time during the progress of the work, remove from the building all surplus materials, rubbish and debris resulting from the work of this Division.
2. Thoroughly clean switchgear including busses, apparatus, exposed conduit, metal work including the exterior and interior, and accessories for the work of this Division, of cement, plaster and other deleterious materials; remove grease and oil spots with cleaning solvent; carefully wipe surfaces and scrape cracks and corners clean.
3. Thoroughly polish chromium or plated work. Remove dirt and stains from lighting fixtures.
4. Leave the entire installation in a clean condition.

R. Completion:

1. The work will not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, panel directories and nameplates specified herein have been approved and properly posted or installed and final cleaning of equipment and premises has been completed.
2. When the installation is complete and adjustments have been made, operate the system for a period of one week, during which time demonstrate that systems are completed and operating in conformance with the specifications.

S. Operating and Maintenance Data: Submit complete and at one time, prior to acceptance of the installation, 4 copies of manufacturer's instructions for operation and maintenance of electrical equipment, including replacement parts lists. As specified in Division 01

T. Inspection and Acceptance Procedures: The Architect will submit observation reports periodically during the construction phase detailing Contract deficiencies. The Contractor is responsible for making corrections immediately. Notice of Completion of the project will not be made until all items have been corrected.

U. Final Completion of Electrical Systems:

1. Prior to Final Completion of operating electrical systems, the Contractor shall:
    a. Provide materials of the type and quality specified and as necessary for proper operation, tested and ready for use.
    b. Furnish the required Operating and Maintenance Data/Manuals.
    c. Clean up of the project pertaining to this Division of the work.
    d. After installation has been completed and adjustments made, operate the system for a period of one week, during which time, demonstrate to the Architect that systems are complete and operating in conformance with Contract Documents.
    e. Conduct tests required and as specified in this Division and submit test reports and corrective actions taken.
    f. Submission of warranties and guarantees.
2. Final Completion of Work Shall be Contingent On:
    a. Contractor replacing defective materials and workmanship.

b. Upon completion of work and adjustments made, Contractor shall conduct an operating test for each system for approval at such time as Architect directs. Conduct test in presence of authorized representative of Architect and demonstrate that systems and equipment do operate in accordance with requirements of the Contract Documents and are free from electrical and mechanical defects.

c. Contractor shall provide the necessary training programs and instructions to the Owner's representative. Number of hours shall be a minimum of four (4) hours for each system or days as required under separate Sections of these Specifications. Complete operation and maintenance manuals shall be provided at least two (2) weeks prior to training.

d. Submit copies of manufacturer's instructions and maintenance of electrical equipment including replacement parts lists. Each set shall include one set of shop drawings of equipment installed.

V. Submittals for Change Orders: When changes are made during the construction phase, deletions and additions shall be presented in a manner that will indicate the cost of each item of material and corresponding labor. Markup shall be then added in accordance with the requirements of the General Conditions as modified by the Supplementary Conditions.

W. The Contractor at a time convenient to the Owner shall provide instruction to the Owner's operating personnel in the proper operation and maintenance of all equipment and systems. The instructors shall have received factory training and shall be thoroughly familiar with the equipment installed. The operating personnel shall receive the number of days instruction as indicated in other sections.

1.03 PROJECT RECORD DOCUMENTS

A. Record Drawings: CAD: Use a computer aided drafting (CAD) system in the preparation of record drawings for this Project. Acceptable CAD systems shall be capable of producing files in AutoCAD Version 2012 compatible DWG or DXF format. Owner's consultant will furnish CAD backgrounds for use by the Contractor after construction is 85% complete except where prohibited by Contract.

B. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.

C. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.

D. Final Record Drawings: Conform to Division 01 requirements.

E. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.

F. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.

G. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.

H. At all times when the work is in progress, maintain at the workplace, fabrication shop or Project Site as applies, a complete separate, clean, undamaged set of the latest stamped, actioned submittals. As work progresses, maintain records of "as installed" conditions on this set in suitable ink or chemical fluid. Update the set daily. After successful completion of

Project Site testing specified herein, and after completion of Punch List corrections, copy all records of "as installed" conditions on to originals.

I. Quantity:

1. Review sets: As for Shop and Field Drawings.
2. Record set: Refer to Division 01.

J. Content: All drawings required under "Field and Shop Drawings". Show "as installed" condition. Where room designations according to Project permanent signage differ from construction designations in the Contract Documents, show both designations.

K. Warranty Certificates: Comply with Division 01.

PART 2 - COMMISSIONING

2.01 COMMISSIONING OF ELECTRICAL SYSTEMS

A. Include cost for commissioning requirements in the contract price.

B. Attend commissioning meetings scheduled by the CxA.

C. Prepare preliminary schedule for indoor lighting system inspections, O&M manual submission, training sessions, lighting controls testing, system verification, performance testing, and system completion for use by the CxA. Update schedule as appropriate throughout the construction period and provide updated schedule to the commissioning team.

D. Verify proper installation and performance of all electrical services provided.

E. Complete Title 24 Certificate(s) of Installation and manufacturer's pre-start checklists prior to scheduling startup of HVAC and electrical equipment.

1. Retain Certificate(s) of Installation in a 3-ring binder in an organized fashion. Binder is to remain on the job site
2. Make Certificate(s) of Installation available for CxA review upon request.
3. Retain calibration records for equipment provided with manufacturer calibrated sensors in the Certificate(s) of Installation binder.

F. Where applicable, complete the Certificate(s) of Acceptance per the contract documents.

1. Retain Certificate(s) of Acceptance in a 3-ring binder in an organized fashion. Binder is to remain on the job site
2. Provide copies of all Certificate(s) of Acceptance to the CxA.
3. Certificate(s) of Acceptance shall be conducted by companies who are certified as California Advanced Lighting Controls Training Program Acceptance Technician (CALCTP-AT) employer and only completed by those employees of said company who are certified to complete the respective acceptance test.

G. Monitor and respond to Resolution Tracking Forms distributed by the CxA in order to expedite corrective actions necessary to achieve design intent.

H. Participate in the Certificate(s) of Acceptance and Functional Performance Tests as required to achieve design intent.

I. Participate in the opposite-season testing as required to achieve design intent.

J. Participate in O&M Training as required by project specifications.

K. Ensure participation of major equipment manufacturers and their representatives as applicable.

L. Obtain O&M data on all equipment and assemble in binders using tabs as required.

M. Conduct a maintenance orientation and inspection with hands on training per the contract documents.

N. Provide written certification and completed Certificate(s) of Installation forms and checklists documenting that the following work has been completed in accordance with the plans and specifications and that they are functioning as designed.

    1. Correct labeling of all circuits with connected equipment.

    2. Lighting system controls operations, including occupancy sensors, automatic time controls or Energy Management control, override timers, manual dimming controls, exterior lighting controls, multi-level switching, as applicable to the Work.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Wiring connectors.

C. Electrical tape.

D. Heat shrink tubing.

E. Wire pulling lubricant.

F. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes 2020.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.

I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.

L. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.

M. UL 267 - Outline of Investigation for Wire-Pulling Compounds Current Edition, Including All Revisions.

N. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

O. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.

P. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.

Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.

I. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
    a. Exceptions:
        1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
        2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
        3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
        4) 20A exterior circuits: 10 AWG..
2. Control Circuits: 14 AWG.

J. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
    a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
    a. 480Y/277 V, 3 Phase, 4 Wire System:
        1) Phase A: Brown.
        2) Phase B: Orange.
        3) Phase C: Yellow.
        4) Neutral/Grounded: Gray.
    b. 208Y/120 V, 3 Phase, 4 Wire System:
        1) Phase A: Black.
        2) Phase B: Red.
        3) Phase C: Blue.
        4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:

a. Cerro Wire LLC: www.cerrowire.com/#sle.

b. Encore Wire Corporation: www.encorewire.com/#sle.

c. Southwire Company: www.southwire.com/#sle.

d. Rome Wire and Cable.

e. Okonite Wire

f. Pirelli Wire and Cable

g. Carol Cable

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN-2, except as indicated below.

a. Size 4 AWG and Larger: Type XHHW-2.

b. Installed Underground: Type XHHW-2.

2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

C. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.

3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide bolted type or set-screw type.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.05 ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.

5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Wire Pulling Lubricant:

1. Listed and labeled as complying with UL 267.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

G. Install conductors with a minimum of 12 inches of slack at each outlet.

H. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

K. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

O. Identify conductors and cables in accordance with Section 26 05 53.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section Firestopping.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground access wells.

1.02 RELATED REQUIREMENTS

A. Section 09 65 00 - Resilient Flooring: Static control flooring.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2022.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

B. Field quality control test reports.

C. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 25 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

F. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:

a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

4. Concrete-Encased Electrode:

    a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.

5. Ground Rod Electrode(s):

    a. Provide two electrodes unless otherwise indicated or required.

    b. Space electrodes not less than 10 feet from each other and any other ground electrode.

    c. Provide ground access well for each electrode.

6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

    a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

    b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

    c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

G. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.

2. Provide equipment grounding conductor routed with supply conductors.

3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.

4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

I. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:

    a. Transformers (except autotransformers such as buck-boost transformers).

2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.

3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

J. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    b. Metal gas piping.
    c. Metal process piping.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame.
10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

K. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.

2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
    c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
    1. Provide products listed, classified, and labeled as suitable for the purpose intended.
    2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
    1. Use insulated copper conductors unless otherwise indicated.
        a. Exceptions:
            1) Use bare copper conductors where installed underground in direct contact with earth.
            2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
    1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
    2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
    3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
    1. Description: Copper rectangular ground bars with mounting brackets and insulators.
    2. Size: As indicated.
    3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
    1. Comply with NEMA GR 1.
    2. Material: Copper-bonded (copper-clad) steel.
    3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

F. Ground Access Wells:
    1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
    2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
    3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
    4. Cover: Factory-identified by permanent means with word "GROUND".

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.

D. MFMA-4 - Metal Framing Standards Publication 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
    a. NFPA 70.
    b. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. New Concrete: Use preset concrete inserts.

3. Existing Concrete: Use expansion anchors.
4. Solid or Grout-Filled Masonry: Use expansion anchors.
5. Hollow Masonry: Use toggle bolts.
6. Hollow Stud Walls: Use toggle bolts.
7. Steel: Use 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.
8. Sheet Metal: Use sheet metal screws.
9. Wood: Fasten with lag screws or through bolts.
10. 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.
11. Plastic and lead anchors are not permitted.
12. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    b. Comply with MFMA-4.
    c. Channel Material: Use galvanized steel.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners in accordance with manufacturer's recommended torque settings.

K. Remove temporary supports.

3.03 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. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete or Cast-in-Place Concrete (Limited Applications)" as applicable.

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 manufacturers written instructions.

3.04 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 05 33.13

CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. PVC-coated galvanized steel rigid metal conduit (RMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Galvanized steel electrical metallic tubing (EMT).

F. Reinforced thermosetting resin conduit (RTRC).

1.02 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.

E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

F. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit 2018.

G. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series 2015.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.

J. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.

K. UL 360 - Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.

L. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.

M. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

N. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.

4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

B. Project Record Documents: Record actual routing for conduits installed underground and conduits 2 inch (53 mm) trade size and larger.

1.05 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use rigid PVC conduit.
2. Exterior, Direct-Buried: Use rigid PVC conduit.
3. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.
4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use PVC-coated galvanized steel rigid metal conduit elbows for bends.
5. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
6. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities

having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.

1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

J. Exposed, Exterior: Use galvanized steel rigid metal conduit.

K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.

L. Corrosive Locations Above Ground: Use stainless steel rigid metal conduit (RMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), stainless steel electrical metallic tubing (EMT), or reinforced thermosetting resin conduit (RTRC).

M. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC).

N. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

1. Maximum Length: 6 feet.

O. Flexible Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit (FMC).

2. Damp, Wet, or Corrosive Locations: Use liquid tight flexible metal conduit (LFMC).

3. Maximum Length: 6 feet unless otherwise indicated.

4. Vibrating equipment includes, but is not limited to:

a. Transformers.

b. Motors.

P. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4-inch trade size.
3. Control Circuits: 1/2-inch trade size.
4. Flexible Connections to Luminaires: 3/8-inch trade size.
5. Underground, Exterior: 1-inch trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

2.05 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

2.06 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

C. PVC-Coated Boxes and Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use steel or malleable iron.
5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.07 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

2.09 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.

2.10 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

2.11 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.12 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

E. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
5. Arrange conduit to maintain adequate headroom, clearances, and access.
6. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
7. Arrange conduit to provide no more than 150 feet between pull points.
8. Route conduits above water and drain piping where possible.
9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
10. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
11. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
12. Group parallel conduits in same area on common rack.

F. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.

7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
9. Use of spring steel conduit clips for support of conduits is not permitted.
10. Use of wire for support of conduits is not permitted.

G. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

H. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.

I. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:
    a. Underground, Exterior: 18 inches.
    b. Under Slab on Grade: 12 inches to bottom of slab.
2. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length.

J. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section Concrete with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

L. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
    a. Where conduits pass from outdoors into conditioned interior spaces.
    b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

M. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

N. Provide grounding and bonding; see Section 26 05 26.

O. Identify conduits; see Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 05 33.16

BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for floor boxes and underground boxes/enclosures.

B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Keys for Lockable Enclosures: Two of each different key.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 - PRODUCTS

2.01 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use suitable concrete type boxes where flush-mounted in concrete.

4. Use suitable masonry type boxes where flush-mounted in masonry walls.

5. Use raised covers suitable for the type of wall construction and device configuration where required.

6. Use shallow boxes where required by the type of wall construction.

7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
13. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    b. Back Panels: Painted steel, removable.
    c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section Access Panels as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
    a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

H. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

I. Install boxes plumb and level.

J. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

K. Install boxes as required to preserve insulation integrity.

L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

N. Close unused box openings.

O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

P. Provide grounding and bonding in accordance with Section 26 05 26.

3.02 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.03 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.03 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011 (Reaffirmed 2017).

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011 (Reaffirmed 2017).

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace 2024.

E. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

B. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 - PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    a. Switchboards:
        1) Identify ampere rating and name.
        2) Identify voltage and phase.
        3) Identify power source and circuit number. Include location when not within sight of equipment.
        4) Use identification nameplate to identify main overcurrent protective device.
        5) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
    b. Panelboards:
        1) Identify ampere rating and name.
        2) Identify voltage and phase.
        3) Identify power source and circuit number. Include location when not within sight of equipment.
        4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
        5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
    c. Transformers:
        1) Identify kVA rating and name.
2. Service Equipment:
    a. Use identification nameplate to identify each service disconnecting means.
3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
    c. Motor control centers.
    d. Elevator control panels.
    e. Industrial machinery.

4. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    a. Minimum Size: 3.5 by 5 inches.
    b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

B. Identification for Conductors and Cables:
    1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
    2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
    3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
        a. At each source and load connection.
        b. Within boxes when more than one circuit is present.
        c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
    4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

C. Identification for Raceways:
    1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
    2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
    3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
    4. Use underground warning tape to identify underground raceways.

D. Identification for Boxes:
    1. Use voltage markers to identify highest voltage present.
    2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
        a. For exposed boxes in public areas, use only identification labels.

E. Identification for Devices:
    1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
    2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

3. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

F. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:

a. Indoor Clean, Dry Locations: Use plastic nameplates.

b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend:

a. Equipment designation or other approved description.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

a. Equipment Designation: 1/2 inch.

b. Other Information: 1/4 inch.

5. Color:

a. Normal Power System: White text on black background.

D. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

E. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

F. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

C. Minimum Size:
1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

D. Legend:

1. Markers for Voltage Identification: Highest voltage present.

E. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:
2. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Conduits: Legible from the floor.
8. Boxes: Outside face of cover.
9. Conductors and Cables: Legible from the point of access.
10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 26 05 83

WIRING CONNECTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

2. Determine connection locations and requirements.

B. Sequencing:

1. Install rough-in of electrical connections before installation of equipment is required.

2. Make electrical connections before required start-up of equipment.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.

2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 08 02

INSTALLATION & ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS

INTRODUCTION

1.01 TITLE 24 REQUIRES THE COMPLETION OF ALL APPLICABLE CERTIFICATES OF INSTALLATION AND CERTIFICATES OF ACCEPTANCE FOR LIGHTING SYSTEMS. THIS SHALL INCLUDE INDOOR AND OUTDOOR LIGHTING SYSTEMS.

1.02 RELATED DOCUMENTS

A. Contract drawings and specifications, general provisions of the contract, including general and supplementary conditions, electrical provisions and Division-1 Specification sections apply to work of this section.

1.03 DESCRIPTION OF WORK

A. Complete all Title 24 required Certificate(s) of Installation (NRCI) and Certificate(s) of Acceptance (NRCA) to be completed per the contract documents.

1.04 RESPONSIBILITIES OF INSTALLING CONTRACTORS

A. General Contractor (GC)

1. Ensure that all contractors identified as the contractor responsible for acceptance testing and completion of the Title 24 Certificate(s) of Acceptance are certified by the State of California or its designated body to conduct each respective test.

B. Electrical Contractor (EC)

1. Verify proper installation and performance of all electrical services provided.
2. Meet with acceptance tester at beginning of construction to review project requirements.
3. Complete Title 24 Certificate(s) of Installation and manufacturer's pre-start checklists prior to scheduling startup/programming of lighting control equipment.
    a. Retain Certificate(s) of Installation in a 3-ring binder in an organized fashion. Binder is to remain on the job site
    b. Make Certificate(s) of Installation available for building inspector's review.
    c. Retain calibration records for equipment provided with manufacturer calibrated sensors in the Certificate(s) of Installation binder.
    d. Correct labeling of all circuits with connected equipment.
4. Complete the Certificate(s) of Acceptance per the contract documents.
    a. The company installing the lighting systems must be an authorized Lighting Controls Acceptance Test Employer certified by a Lighting Controls Acceptance Test Technician Certification Provider or include in their bid the cost of retaining and overseeing a contractor who is an authorized Lighting Controls Acceptance Test Employer to complete the acceptance testing.

b. All required acceptance testing must be completed by a Lighting Controls Acceptance Test Technician employed by the Lighting Controls Acceptance Test Employer. The acceptance tester shall be present for all commissioning **efforts**.

c. Retain Certificate(s) of Acceptance in a 3-ring binder in an organized fashion. Binder is to remain

on the job site

d. Upload all Certificate(s) of Acceptance to the California Title 24 Certificates of Acceptance database, if, at the time of project completion, the database is available to the public.

5. Successful completion of the required Acceptance Tests is the responsibility of the installing contractor. Any costs associated with modifications necessary to obtain compliance and re-testing of systems shall be included in the base bid of this project.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Daylighting controls.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems

B. Section 26 05 33.16 - Boxes for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts 2020.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1472 - Solid-State Dimming Controls Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.

4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

B. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

C. Field Quality Control Reports.

D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Operation and Maintenance Data: Include detailed information on device programming and setup.

F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. Provide five-year manufacturer warranty for all occupancy sensors.

B. Provide five-year manufacturer warranty for all daylighting controls.

PART 2 - PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.

2. Sensor Technology:

a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.

b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.

c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.

4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.

5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.

6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.

7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

8. Sensitivity: Field adjustable.

9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.

10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.

11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.

B. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.

c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.

d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

C. Wall Dimmer Occupancy Sensors:

1. General Requirements:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.

b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

e. Finish: Color to be selected.

D. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:

a. Description: Low profile occupancy sensors designed for ceiling installation.

b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.

d. Finish: White unless otherwise indicated.

2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 1000 at a mounting height of 9 feet, with a field of view of 360 degrees.

E. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.

2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.

3. Input Supply Voltage: Dual rated for 120/277 V ac.

4. Load Rating: As required to control the load indicated on drawings.

2.03 DAYLIGHTING CONTROLS

A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

    a. Wall Switch Occupancy Sensors: 48 inches above finished floor.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

G. Provide required supports in accordance with Section 26 05 29.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Identify lighting control devices in accordance with Section 26 05 53.

J. Occupancy Sensor Locations:

1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Daylighting Control Photo Sensor Locations:

1. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
2. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

L. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

N. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

O. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

A. Inspect each lighting control device for damage and defects.

B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

C. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

D. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
4. Location: At project site.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 26 09 43

NETWORK LIGHTING CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes a networked lighting control system comprised of the following components:

1. System Software Interfaces
    a. Management and Visualization Interface
    b. Historical Database and Analytics Interface
    c. Personal Control Applications
    d. Smartphone Programming Interface for wired devices
2. System Backbone and Integration Equipment
    a. System Controller
    b. OpenADR Interface
3. Wired Networked Devices
    a. Wall Switches, Dimmers and Scene Controllers
    b. Graphic Wall Stations
    c. Auxiliary Input/Output Devices
    d. Occupancy and Photocell Sensors
    e. Power Packs and Secondary Packs
    f. Networked Luminaires
    g. Relay and Dimming Panel
4. Wireless Networked Devices
    a. Sensor Interface
    b. Light Controllers
    c. Digital Sensor Attachments
    d. Networked Luminaires
    e. Communication Bridge

B. The networked lighting control system shall meet all of the characteristics and performance requirements specified herein.

C. The contractor shall provide, install and verify proper operation of all equipment necessary for proper operation of the system as specified herein and as shown on applicable drawings.

1.02 RELATED DOCUMENTS

A. Section 262726 Wiring Devices

B. Section 260923 Lighting Control Devices

C. Section 265113 Interior Lighting Fixtures

1.03 SUBMITTALS

A. Submittal shall be provided including the following items.

1. Bill of Materials necessary to install the networked lighting control system.
2. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
3. Riser Diagrams showing device wiring connections of system backbone and also typical per room/area type.
4. Information Technology (IT) connection information pertaining to interconnection with facility IT networking equipment and third-party systems.
5. Other Diagrams and Operational Descriptions – as needed to indicate system operation or interaction with other system(s).
6. Contractor Startup/Commissioning Worksheet (must be completed prior to factory start- up).
7. Service Specification Sheets indicating general service descriptions, including startup, training, post-startup support, and service contract terms.
8. Hardware and Software Operation Manuals.

1.04 APPROVALS

A. Prior approval from owner's representative is required for products or systems manufactured by companies not specified in the Network Lighting Controls section of this specification.

B. Any alternate product or system that has not received prior approval from the owner's representative at least 10 days prior to submission of a proposal package shall be rejected.

C. Alternate products or systems require submission of catalog datasheets, system overview documents and installation manuals to owner's representative.

D. For any alternate system that does not support any form of wireless communication to networked luminaires, networked control devices, networked sensors, or networked input devices, bidders shall provide a total installed cost including itemized labor costs for installing network wiring to luminaires, control devices, sensors, input devices and other required system peripherals.

1.05 QUALITY ASSURANCE

A. Product Qualifications

1. System electrical components shall be listed or recognized by a nationally recognized testing laboratory (e.g., UL, ETL, or CSA) and shall be labeled with required markings as applicable.
2. System shall be listed as qualified under DesignLights Consortium Networked Lighting Control System Specification V2.0.
3. System luminaires and controls are certified by manufacturer to have been designed, manufactured and tested for interoperability.
4. All components shall be subjected to 100% end of line testing prior to shipment to the project site to ensure proper device operation.
5. All components and the manufacturing facility where product was manufactured must be RoHS compliant.

B. Installation and Startup Qualifications

1. System startup shall be performed by qualified personnel approved or certified by the manufacturer.

C. Service and Support Requirements

1. Phone Support: Toll free technical support shall be available.
2. Remote Support: The bidder shall offer a remote support capability.
3. Onsite Support: The bidder shall offer onsite support that is billable at whole day rates.
4. Service Contract: The bidder shall offer a Service Contract that packages phone, remote, and onsite support calls for the project. Response times for each type of support call shall be indicated in the terms of the service contract included in the bid package.

1.06 WARRANTY

A. The manufacturer shall provide a minimum five-year warranty on all hardware devices supplied and installed. Warranty coverage shall begin on the date of shipment.

B. The hardware warranty shall cover repair or replacement any defective products within the warranty period.

1.07 MAINTENANCE & SUSTAINABILITY

A. The manufacturer shall make available to the owner new parts, upgrades, and/or replacements available for a minimum of 5 years following installation.

PART 2 – EQUIPMENT

2.01 MANUFACTURERS

A. Manufacturers that are listed with DesignLights Consortium Networked Lighting Control System Specification V2.0.

2.02 SYSTEM PERFORMANCE REQUIREMENTS

A. System Architecture

1. System shall have an architecture that is based upon three main concepts: (a) networkable intelligent lighting control devices, (b) standalone lighting control zones using distributed intelligence, (c) optional system backbone for remote, time based and global operation between control zones.

    a. Intelligent lighting control devices shall have individually addressable network communication capability and consist of one or more basic lighting control components: occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 0-10V input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible so as to minimize overall device count of system.

    b. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices and shall be capable of providing automatic control from sensors (occupancy and/or photocell) and manual control from local wallstations without requiring connection to a higher level system backbone; this capability is referred to as “distributed intelligence.”

    c. System must be capable of interfacing directly with networked luminaires such that either low voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches and system backbone (see Control Zone Characteristics sections for each type of network connection, wired or wireless).

2. The system shall be capable of providing individually addressable switching and dimming control of the following: networked luminaires, control zones to include multiple switch legs or circuits, and relay and dimming outputs from centralized panels to provide design flexibility appropriate with sequence of operations required in each project area or typical space type. A single platform shall be used for both indoor and outdoor lighting controls.
3. Lighting control zones shall be capable of being networked with a higher level system backbone to provide time based control, remote control from inputs and/or systems external to the control zone, and remote configuration and monitoring through a software.
4. All system devices shall support remote firmware update, such that physical access to each device is not necessary, for purposes of upgrading functionality at a later date.
5. System shall be capable of “out of box” sequence of operation for each control zone.
    a. Standard sequence is:
        1) All switches control all fixtures in a zone
        2) All occupancy sensors automatically control all fixtures in the control zone with a default timeout.

B. Wired Networked Control Zone Characteristics
1. Following proper installation and provision of power, all networked devices connected together with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g., software application, handheld remote, pushbutton). The “out of box” default sequence of operation is intended to provide typical sequence of operation so as to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.
2. System shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.
3. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:
    a. Low-Voltage power sensing: These devices shall automatically provide 100% light level upon detection of loss of power sensed via the low voltage network cable connection.
    b. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard, and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss of power sensed via line voltage connections.
    c. Emergency egress devices shall be provided and UL labeled by the lighting control manufacturer.

C. Wireless Networked Control Zone Characteristics
1. Following proper installation and provision of power, all wireless networked devices paired, meshed or grouped together shall automatically follow the “out of box” default sequence of operations.
2. Wireless network communication shall support uniform and instant response such that all luminaires in a lighting control zone respond immediately and synchronously in response to a sensor or wallstation signal.

3. To support the system architecture requirement for distributed intelligence, wireless network communication shall support communication of control signals from sensors and wallstations to networked luminaires and wireless load control devices, without requiring any communication, interpretation, or translation of information through a backbone device such as a wireless access point, communication bridge or gateway.
4. All wireless communication shall be encrypted using at least 128-bit Advanced Encryption Standard (AES).
5. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:
    a. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard, and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss or interruption of power sensed via line voltage connections.

D. System Integration Capabilities
1. The system shall interface with third party building management systems (BMS) to support two-way communication using the industry standard BACnet/IP or BACnet/MSTP protocols.

2.03 SYSTEM SOFTWARE INTERFACES

A. Management Interface
1. System shall provide a web-based management interface that provides remote system control, live status monitoring, and configuration capabilities of lighting control settings and schedules.
2. Management interface must be compatible with industry-standard web browser clients, including, but not limited to, Microsoft Internet Explorer®, Apple Safari®, Google Chrome®, Mozilla Firefox®.
3. All system software updates must be available for automatic download and installation via the internet.

B. Historical Database and Analytics Interface
1. System shall provide a browser-based trending and monitoring interface that stores historical data for all occupancy/daylight sensors and lighting loads. Additionally, the system shall optionally upload that data to a cloud based server.

C. Visualization Interfaces
1. System shall provide an optional web-based visualization interface that displays a graphical floorplan. System data, to include status of occupancy sensors, daylight sensors and light output shall be overlaid to the floorplan to provide a graphical status page.

D. Portable Programming Interface for Standalone Control Zones
1. Portable handheld application interface for standalone control zones shall be provided for systems that allows configuration of lighting control settings.
2. Programming capabilities through the application shall include, but not be limited to, the following:
    a. Switch/occupancy/photosensor group configuration
    b. Manual/automatic on modes
    c. Turn-on dim level
    d. Occupancy sensor time delays

e. Dual technology occupancy sensors sensitivity

f. Photosensor calibration adjustment and auto-setpoint

g. Trim level settings

2.04 SYSTEM BACKBONE AND SYSTEM INTEGRATION EQUIPMENT

A. System Controller

1. System Controller shall be a multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.
2. System Controller shall perform the following functions:
    a. Facilitation of global network communication between different areas and control zones.
    b. Time-based control of downstream wired and wireless network devices.
    c. Linking into an Ethernet network.
    d. Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.
    e. Connection to various software interfaces, including management interface, historical database and analytics interface, visualization interface, and personal control applications.
3. System Controller shall not require a dedicated PC or a dedicated cloud connection.
4. Device shall automatically detect all networked devices connected to it, including those connected to wired and wireless communication bridges.
5. Device shall have a standard and astronomical internal time clock.
6. Shall be capable of connecting to the customers Local Area Network (LAN) via IEEE 802.11.x Wireless and IEEE 802.3 Wired connection.
7. System Controller shall support BACnet/IP and BACnet/MSTP protocols to directly interface with BMS and HVAC equipment without the need for additional protocol translation gateways.
    a. BACnet/MSTP shall support a minimum of 50 additional BACnet MS/TP controllers in addition to the Expansion I/O modules.
    b. BACnet/MSTP shall support 9600 to 115200 baud.
    c. System Controller shall be BACnet Testing Laboratory (BTL listed) using Device Profile BACnet Building Controller (B-BC) with outlined enhanced features.
    d. System controller must support BACnet/IP Broadcast Management Device (BBMD) and Foreign Device Registration (FDR).

B. OpenADR Interface

1. System shall provide an interface to OpenADR protocol Demand Response Automation Servers (DRAS) typically provided by local electrical utility.
2. OpenADR interface shall meet all of the requirements of Open ADR 2.0a Virtual End Nodes (VEN), including:
    a. Programmable with the account information of the end-user’s electrical utility DRAS account credentials.

2.05 WIRED NETWORKED DEVICES

A. Wired Networked Wall Switches, Dimmers, Scene Controllers

1. Wall switches & dimmers shall support the following device options:

a. Number of control zones: 1, 2 or 4

b. Control Types Supported: On/Off or On/Off/Dimming

2. Scene controllers shall support the following device options:

a. Number of scenes: 1, 2 or 4

b. Control Types Supported:

1) On/Off or On/Off/Dimming

2) Preset Level Scene Type

3) Reprogramming of other devices within daisy-chained zone so as to implement user selected lighting scene

4) Selecting a lighting profile to be run by the system's upstream controller so as to implement a selected lighting profile across multiple zones

B. Wired Networked Graphic Wall Stations

1. Device shall have a full color touch screen.

2. Device shall enable configuration of all switches, dimmers, and lighting preset scenes via password protected setup screens.

3. Graphic wall stations shall support the following device options:

a. Number of control zones: Minimum of 16

b. Number of scenes: Minimum of 16

c. Optional password protection for setup screens.

C. Wired Networked Auxiliary Input / Output (I/O) Devices

1. Auxiliary Input/Output Devices shall be specified as an input or output device with the following options:

a. Contact closure input

1) Input shall be programmable to support maintained or momentary inputs that can activate local or global scenes and profiles, ramp light level up or down, or toggle lights on/off.

b. 0-10V analog input

1) Input shall be programmable to function as a daylight sensor.

c. RS-232/RS-485 digital input

1) Input supports activation of up to 4 local or global scenes and profiles, and on/off/dimming control of up to 16 local control zones.

d. 0-10V dimming control output, capable of sinking a minimum of 20mA of current

1)

D. Wired Networked Occupancy and Photosensors

1. Sensors shall utilize passive infrared (PIR) or passive dual technology (PDT) to detect both major and minor motion as defined by NEMA WD-7 standard.
2. Sensing technologies that are acoustically passive, meaning they do not transmit sounds waves of any frequency do not require additional commissioning. Ultrasonic or Microwave based sensing technologies may require commissioning due to the active nature of their technology, if factory required.
3. Sensor programming parameter shall be available and configurable remotely from the software and locally via the device.
4. Sensor mounting type shall match project design requirements as shown on plans.
    a. Sensors shall have optional features for photosensor/daylight override, dimming control, and low temperature/high humidity operation.
5. The system shall support the following types of photocell-based control:
    a. On/Off: The control zone is automatically turned off if the photocell reading exceeds the defined setpoint and automatically turned on if the photocell reading is below the defined setpoint. A time delay or adaptive setpoint adjustable behavior may be used to prevent the system from exhibiting nuisance on/off switching.
    b. Continuous Dimming: The control zone automatically adjusts its dimming output in response to photocell readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task. The photocell response shall be configurable to adjust the photocell setpoint and dimming rates.

E. Wired Networked Wall Switch Sensors
1. Wall switches sensors shall support the following device options:
    a. User Input Control Types Supported: On/Off or On/Off/Dimming
    b. Occupancy Sensing Technology: PIR only or Dual Tech
    c. Daylight Sensing Option: Inhibit Photosensor

F. Wired Networked Embedded Sensors
1. Embedded sensors shall support the following device options:
    a. Occupancy Sensing technology: PIR only or Dual Tech
    b. Daylight Sensing Option: Occupancy only, Daylight only, or combination Occupancy/Daylight sensor

G. Distributed System Power, Switching and Dimming Controls
1. Devices shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output, and contribute low voltage Class 2 power to the rest of the system.
2. Device programming parameters shall be available and configurable remotely from the software and locally via the device push-button.
3. Device shall be plenum rated.
4. Devices shall be UL Listed for load and load type as specified on the plans.

H. Wired Networked Luminaires
1. Networked luminaire shall have a factory installed mechanically integrated control device and carry a UL Listing as required.

2. Networked LED luminaire shall provide low voltage power to other networked control devices.
3. System shall be able to maintain constant lumen output over the specified life of the LED luminaire (also called lumen compensation) by automatically varying the dimming control signal to account for lumen depreciation.
4. System shall be able to provide control of network luminaire intensity, in addition to correlated color temperature of specific LED luminaires.
5. Controls manufacturer is responsible for primary troubleshooting and tech support of complete fixture.

I. Wired Networked Relay and Dimming Panel

1. Relay and dimming panel(s) shall be capable of providing the required amount of relay capacity, as required per panel schedules shown on drawings, with an equal number of individual 0-10V dimming outputs.
2. Standard relays used shall have the following required properties:
    a. Configurable in the field to operate with normally closed or normally open behavior.
    b. Provides visual status of current state and manual override control of each relay.
    c. Be individually programmable
3. 0-10 dimming outputs shall support a minimum of 100mA sink current per output.
4. Panel shall be UL924 listed for control of emergency lighting circuits.
5. Panel shall provide a contact closure input that acts as a panel override to activate the normally configured state of all relays (i.e., normally open or normally closed) in the panel.

2.06 WIRELESS NETWORKED DEVICES

A. Wireless Networked Sensor Interface

1. The device shall be capable of broadcasting the following manual wall control commands: on, off, and adjust dim level.

B. Wireless Networked Light Controllers (No Sensor)

1. The wireless light controller shall be capable of providing continuous dimming and on/off control of one commercial light fixture including fluorescent, HID, induction and LEDs.
2. An external antenna attached to the luminaire shall not be allowed.
    a. Each wireless light controller shall provide measurement capability of the amperage, voltage, wattage, and watt-hours of its controlled lighting.

C. Wireless Networked Digital Sensors

1. In addition to providing Wireless Networked Light Controllers functionality, also provides:
    a. Integrated digital occupancy sensing and digital photocell sensor.
    b. Sensor shall connect directly to the wireless light controller and shall be suitable for embedding into the enclosure of a luminaire.
    c. Sensor shall have software-adjustable settings
    d. Photocell shall be suitable for closed and open loop applications.

D. Wireless Network Communication Bridge

1. A communication bridge device shall be provided that interfaces with the System Controller via Owner's LAN connection and interfaces with wireless network.
2. Device shall be capable of communicating with a group of a minimum of 250 wireless networked devices and luminaires, so as to reduce the amount of communication bridges required in the system.

PART 3 – EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Installation Procedures and Verification

1. The successful bidder shall review all required installation and pre-startup procedures with
    a. the manufacturer's representative through pre-construction meetings.
2. The successful bidder shall install and connect the networked lighting control system components according to the manufacturer's installation instructions, wiring diagrams, the project submittals and plans specifications.
3. The successful bidder shall be responsible for testing of all low voltage network cable included in the bid. Bidder is responsible for verification of the following minimum parameters:
    a. Wire Map (continuity, pin termination, shorts and open connections, etc.)
    b. Length
    c. Insertion Loss

B. Coordination with Owner's IT Network Infrastructure

1. The successful bidder is required to coordinate with the owner's representative to secure all
    a. required network connections to the owner's IT network infrastructure.
    b. The bidder shall provide to the owner's representative all network infrastructure requirements of the networked lighting control system.
    c. The bidder shall provide, to the manufacturer's representative, all necessary contacts pertaining to the owner's IT infrastructure, to ensure that the system is properly connected and started up.

C. Coordination with Mechanical Division

1. The successful bidder shall provide all integration equipment detailed in Division 260943.
2. The successful bidder to verify integration scope with the Mechanical Contractor prior to submittal phase and provide all necessary schedules to the Lighting Control manufacturer.

D. Documentation and Deliverables

1. The installing contractor shall be responsible for documenting installed location of all networked devices, including networked luminaires. This includes responsibility to provide as-built plan drawing showing device addresses corresponding to locations of installed equipment.

2. The installing contractor is also responsible for the following additional documentation to the manufacturer's representative if visualization / graphical floorplan software is provided as part of bid package:

    a. As-Built floor plan drawings showing wired network control zones outlined, in addition to device address locations required above. All documentation shall remain legible when reproducing\scanning drawing files for electronic submission.

    b. As-Built electrical lighting drawings (reflected ceiling plan) in PDF and CAD format. Architectural floor plans shall be based on as-built conditions.

        1) CAD files shall have layers already turned on/off as desired to be shown in the graphical floorplan background images. The following CAD elements are recommended to be hidden to produce an ideal background graphical image:

            (a) Titleblock

            (b) Text- Inclusive of room names and numbers, fixture tags and drawings notes Fixture wiring and homeruns

            (c) Control devices

            (d) Hatching or poché of light fixtures or architectural elements

        2) CAD files shall be of AutoCAD 2013 or earlier. Revit file overall floor plan views shall be exported to AutoCAD 2013.

3.02 SYSTEM STARTUP

A. Upon completion of installation by the installer, including completion of all required verification and documentation required by the manufacturer, the system shall be started up and programmed by an authorized representative of the manufacturer.

    1. Low voltage network cable testing shall be performed prior to system startup at the discretion of the manufacturer.

B. System start-up and programming shall include:

    1. Verifying operational communication to all system devices.

    2. Programming the network devices into functional control zones to meet the required sequence of operation.

    3. Programming and verifying all sequence of operations.

    4. Customization of owner's software interfaces and applications.

C. Initial start-up and programming is to occur on-site. Additional programming may occur on-site or remotely over the Internet as necessary.

3.03 PROJECT TURNOVER

A. System Documentation

    1. Submit software database file with desired device labels and notes completed.

B. Owner Training

    1. Provisions for onsite training for owner and designated attendees to be included in submittal package.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers 2015.

F. NEMA ST 20 - Dry Type Transformers for General Applications 2021.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 506 - Standard for Specialty Transformers Current Edition, Including All Revisions.

K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with placement of supports, anchors, etc. required for mounting.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

1. Vibration Isolators: Include attachment method and rated load and deflection.

B. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.

B. Schneider Electric: www.se.com/#sle.

C. Siemens Industry, Inc: www.usa.siemens.com.

D. Source Limitations: Provide transformers produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:

1. Altitude: Less than 3,300 feet.

2. Ambient Temperature:

a. Greater than 10 kVA: Not exceeding 104 degrees F.

b. Less than 10 kVA: Not exceeding 77 degrees F.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Insulation System and Allowable Average Winding Temperature Rise:

1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.

2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

C. Coil Conductors: Continuous copper windings with terminations brazed or welded.

D. Winding Taps:

1. Less than 3 kVA: None.

2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.

3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

F. Sound Levels: Standard sound levels complying with NEMA ST 20

G. Mounting Provisions:

1. Less than 15 kVA: Suitable for wall mounting.

2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.

3. Larger than 75 kVA: Suitable for floor mounting.

H. Transformer Enclosure: Comply with NEMA ST 20.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

2. Construction: Steel.

a. Less than 15 kVA: Totally enclosed, non-ventilated.

b. 15 kVA and Larger: Ventilated.

3. Finish: Manufacturer's standard grey, suitable for outdoor installations.

4. Provide lifting eyes or brackets.

2.04 SOURCE QUALITY CONTROL

A. Factory test transformers according to NEMA ST 20.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:

1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.
2. Use integral transformer flanges to support wall-mounted transformers.
3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

3.02 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.

3.03 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.04 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

E. NEMA PB 1 - Panelboards 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.

G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

K. UL 67 - Panelboards Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

C. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Load centers are not acceptable.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Copper.

2. Ground Bus Material: Copper.

D. Circuit Breakers:

1. Provide bolt-on type.

2. Provide thermal magnetic circuit breakers for circuit breaker frame sizes less than 225 amperes.

3. Provide electronic trip circuit breakers for circuit breaker frame sizes 225 amperes and above.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Copper.

3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
    a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
        1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
        2) 14,000 rms symmetrical amperes at 480 VAC.
    b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
    a. Provide mechanical lugs unless otherwise indicated.
    b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
    a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
8. Do not use tandem circuit breakers.
9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
10. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 26 05 26.

K. Install all field-installed branch devices, components, and accessories.

L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

M. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

C. Test GFCI circuit breakers to verify proper operation.

D. Test shunt trips to verify proper operation.

E. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates and covers.

1.02 RELATED REQUIREMENTS

A. Section 26 05 33.16 - Boxes for Electrical Systems.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2014h, with Amendments (2017).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification) 2014g, with Amendment (2017).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1. Wall Dimmers: Include derating information for ganged multiple devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Hubbell Incorporated: www.hubbell-wiring.com.

B. Leviton Manufacturing Company, Inc: www.leviton.com.

C. Lutron Electronics Company, Inc: www.lutron.com.

D. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

2.02 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide GFCI protection for receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles installed in kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.03 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.

D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

2.04 WALL SWITCHES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.

2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.05 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switches: 48 inches above finished floor.

b. Receptacles: 18 inches above finished floor or 6 inches above counter.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or

improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

O. Identify wiring devices in accordance with Section 26 05 53.

3.04 FIELD QUALITY CONTROL

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch with circuit energized to verify proper operation.

C. Test each receptacle to verify operation and proper polarity.

D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses 2012.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements Current Edition, Including All Revisions.

D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.

2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.

B. Littelfuse, Inc: www.littelfuse.com.

C. Mersen: ep-us.mersen.com.

2.02 APPLICATIONS

A. Individual Motor Branch Circuits: Class RK1, time-delay.

2.03 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26 28 16.16

ENCLOSED SWITCHES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 28 13 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.

C. Project Record Documents: Record actual locations of enclosed switches.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

2. Minimum Ratings:

a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:

1. Comply with NEMA KS 1.

2. Conductor Terminations:

a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information 2019.

B. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information 2002 (Reaffirmed 2008).

C. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.

D. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.

E. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems 2006.

F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.

G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012 (Reaffirmed 2018).

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.

K. UL 1598 - Luminaires Current Edition, Including All Revisions.

L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
   3. Ballasts: Include wiring diagrams and list of compatible lamp configurations.
   4. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

C. Samples:
   1. Provide one sample(s) of each luminaire proposed for substitution upon request.

D. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
   2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.

G. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. Provide five year manufacturer warranty for all LED luminaires, including drivers.

B. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

PART 2 - PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

H. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.

2. Directional Arrows: As indicated or as required for installed location.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
4. Secure pendant-mounted luminaires to building structure.
5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:

1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
4. Install canopies tight to mounting surface.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Emergency Lighting Units:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

N. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 26 51 20

AUTOMATIC LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide and design an automatic lighting control system as described in this specification and as called for on the drawings.

1.02 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of 10 years experience in manufacturing and installing this type of system.

B. The Contractor shall provide a list of recent jobs completed during the last 5 years with the name and phone number of a contact person.

C. All components and assemblies are to be pre-tested and assembled at the factory prior to installation.

D. Provide a factory-trained technician on site. The technician shall functionally test each component in the system after installation to verify proper operation and confirm that the panel wiring and addressing conform to the wiring documentation.

1.03 SUBMITTALS

A. The following list includes the required shop drawings and product data information that shall be submitted.

1. Underwriters Laboratories, Inc. (UL) listing and factory test reports.
2. Internal and system wiring diagrams.
3. Single line diagram of the system configuration. Typical riser diagrams are not acceptable.
4. Dimensions of the equipment layout.
5. Control wiring and conduits layout and connections.
6. Floor plans to scale showing the location of each device and equipment.
7. Product data of all the components including but not limited to programmable central controllers, transceivers panels, input relays, switches and other ancillary equipment.

1.04 REFERENCES

A. UL 916 Energy Management Equipment.

B. FCC Emissions Standards specified in Part 15, subpart J for Class A, Applications.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide and microprocessor controlled relay panels for the Lighting Control System. The system shall include programmable standalone master panel, switch inputs, wiring, power supplies, relays and ancillary relays.

B. Panels shall be capable of standing alone or operating as part of a network.

1. The system shall provide intelligence to operate as follows:

a. Store all user operating data.

b. Initiate all relay output commands based on:

1) Operator inputs

2) Automatic operating schedule

3) Binary type field sensors

4) Universal override switch inputs

5) Internal 56K Baud modem

c. Provide automatic system diagnostics and alarming based on detected faults in the controller, transceiver panels, relays, and data line.

2. System shall include a memory back up to be able to survive an indefinite length of power failure.

C. Lighting Control Panel (LCP): Microprocessor based, complete prewired assemblies consisting of the following:

1. Stand alone panel controller capable of receiving and acting upon programs downloaded from the central computer. Programs downloaded from the network shall be capable of continuing to operate even if the network should fail. Battery Back up provides 8 days of memory retention. Panel shall be part of a system that can control up to 750 relays and receive up to 500 switch inputs. Panel shall have an USB input for local programming and trouble shooting from a laptop computer.

2. Internal digital clock with self control power.

3. Output modules: Plug in type to receive coded digital commands from the panel controller and pulse output relays to the appropriate state. Actual status feedback of the relays are to be fed back to the panel controller and from there to the central computer. Actual status of each relay is to be indicated by a pilot LED on the control board. Each Module controls 8 or 16 relays.

4. Switch input modules: Plug-in type, actuated by remote external contact closures. These contact closures may be either momentary or maintained. The action of the contact is noted by the panel controller and acted upon as programmed by software. The action of the contact can command any group of output relays to the desired state. Either 8 or 24-input channels as shown on the plans.

5. Output Relays

a. Type: Momentary pulsed, mechanically latched with pilot light contact.

b. Rating: 20 Ampere, 277VAC

c. Number per panel: 16,32 or 48 as required to satisfy this project scope.

6. The low voltage and high voltage sections of the lighting control cabinet shall be separated by a 14 gage steel barrier in which the relays are mounted. In areas where both 120 volt and 277 volt loads are present the high voltage compartment shall have a 14 gage steel barrier between the relays that carry 120 VAC and the relays that carry 277VAC. Each section shall be clearly labeled as to the voltage in that compartment.

7. Panel power supply shall be dual primary 115/277 volts AC, 60 Hz. ± 10%. Low voltage side shall be protected from power line surges and spikes on the input power. The low voltage section shall be protected against short circuit faults and relay failures.

8. Panels shall be UL approved and shall have a short circuit withstand current rating at 14,000 AIC.
9. Manufacturer: Lighting Control and Design, or G.E. or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Lighting Control System shall be installed and wired completely as required by the equipment manufacturer by the contractor, who shall make all necessary wiring connections to the lighting fixtures, override switches, photo cells and equipment.

B. The Contractor shall provide on-site programming time with factory-trained personnel for the system set-up. The Contractor shall set up the software program and program the entire system in accordance with the Owner's instructions.

C. Documentation

1. Accurate "as-built" drawings shall be provided by the Contractor. These shall indicate the load controlled by each relay and the identification number for that switch connected to an input and the identification number of that input. Three sets of space plans or reflected ceiling plans shall be provided by the contractor indicating which fixtures are controlled by each relay.
2. A separate data grade private line with RJ45 jack shall be furnished for each modem.

3.02 SERVICE AND SUPPORT

A. Startup: After the system has been installed, the Contractor shall provide the services of a factory trained representative of the manufacturer to verify correct operation of all system components. The contractor shall guarantee all material and workmanship involving the system for three years after startup.

B. Training: After system startup and after all the programming is completed, the Contractor shall arrange for a factory trained representative to train the Owner's personnel. The trainer shall instruct the Owner's personnel in how to program the system and demonstrate a typical operating program for an area. The Contractor shall allow for 24 hours' instruction time for the Owner's training.

C. Factory Support: Factory support shall be available free of charge during the three-year warranty period to answer programming and application questions. The manufacturer, or his representative, shall have a remote terminal capable of programming the system to support the Owner's personnel during this period. The Contractor shall include a modem, necessary cabling and telephone extension to support this telecommunications operation. The Contractor shall provide a three-year maintenance service contract as part of the cost.

D. The Contractor shall also provide a software site licensing so that the Owner will be able to transfer the software program from the main computer to the other computers. This transfer shall not be an extra cost to the Owner.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.

B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

D. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2000 (Reaffirmed 2006).

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1598 - Luminaires Current Edition, Including All Revisions.

G. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution upon request.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

C. Samples:

1. Provide one sample(s) of each luminaire proposed for substitution upon request.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

A. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 - PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Removal of vegetation, grass, grass roots, shrubs, tree stumps, trees, upturned stumps, weed growth, tree roots, brush, masonry, concrete, rubbish, debris and other materials.
2. Removal of concrete and bituminous surfaces.
3. Removal of existing fences and gates.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 2200 - Grading.
3. Section 31 2313 - Excavation and Fill.
4. Section 31 2316 - Excavation and Fill for Pavement.
5. Section 31 2319 - Excavation and Fill for Structures.
6. Section 31 2323 - Excavation and Fill for Utilities.
7. Section 31 2326 - Base Course.
8. Section 32 3113 - Chain Link Fences and Gates.
9. Section 32 9000 - Planting.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of site clearing.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, current edition, as a minimum requirement.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 TREE AND STUMP REMOVAL

A. Remove trees and stumps indicated or required to be removed. Remove trees, together with bulk of roots, to a minimum depth of 4 feet below required grade, and within a radius of approximately 7 feet beyond perimeter of trunk at grade.

B. Fill and compact excavation from tree and stump removal. Fill in 6 inch layers, each compacted to 90 percent of maximum density in accordance with ASTM D1557.

1. Back filling shall not commence until the excavation is inspected and tested.

3.02 CONCRETE AND BITUMINOUS SURFACING REMOVAL

A. Break up and completely remove existing concrete surfacing, curbs, gutters, walks and bituminous surfacing to indicated limits. Cutting shall be performed to a neat and even line with proper tools or a concrete cutting saw. Minimum depth of cut shall be 1 1/2-inch, unless otherwise indicated. Remove concrete broken beyond the indicated limits to the nearest joint or score line and replace with new concrete to match existing.

3.03 FENCING

A. Existing fences scheduled to remain may be removed to facilitate the Work, provided they are installed to their original condition in accordance with requirements of Section 32 3113 - Chain Link Fences and Gates.

B. Fencing indicated to be removed and not reinstalled shall be completely removed, including footings. Fill and compact excavations.

C. Install chain link fencing indicated to be relocated or reset in accordance with applicable requirements specified under Section 32 3113 - Chain Link Fences and Gates.

3.04 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 1000 - Site Clearing.
3. Section 31 2313 - Excavation and Fill.
4. Section 31 2316 - Excavation and Fill for Pavement.
5. Section 31 2319 - Excavation and Fill for Structures.
6. Section 31 2323 - Excavation and Fill for Utilities.
7. Section 31 2326 - Base Course.
8. Section 32 9000 - Planting.

1.02 PROJECT REQUIREMENTS

A. General:

1. Fees: Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.
4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on public buried utilities and pipelines. Retain the services of an underground utility locator for on-site utilities.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall conform to requirements specified in this and related sections.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain installed stakes until their removal is required for the Work. Provide replacement grade or location stakes lost or disturbed.

B. Install grade stakes and compare to indicated grades. If discrepancies are found between existing grades and grades indicated on Drawings, do not proceed until discrepancies are resolved.

3.02 ROUGH AND FINE GRADING

A. Rough grade area sufficiently high to require cutting by fine grading:

1. Grade area for bituminous surfacing and other paving to the indicated grades, equal to the section of the indicated base and pavement.

2. Slope banks to required finish grades as cut progresses or leave cuts full and finish grade by mechanical equipment to provide grades and soil densities indicated on the Drawings.

3. Rough grade, fill and compact banks beyond indicated finish grades. Finish grade banks and slopes to indicated grades and specified soil densities.

4. Grade Only Areas: In areas not indicated to receive pavement, rough grade to approximate finish grades and then scarify, moisten and roll to obtain required density and indicated finish grades.

5. Tolerances: Finish grades shall be within a tolerance of 0.05 inch per foot above or below grades indicated. Provide an average grade as indicated.

B. Base or Subgrade:

1. After subgrade has been constructed to approximate required grades, scarify to a depth of at least 12 inches:

a. After scarifying, process loosened material to a finely divided condition and adjust moisture content to optimum condition by addition of water, addition and blending of dry suitable material, or by drying of existing material.

b. Subgrade material shall be compacted by tamping, sheepsfoot rollers or pneumatic tire rollers. Required relative compaction shall be 95 percent minimum for the top 12 inches below subgrade.

c. Install base course in accordance with Section 31 2326 - Base Course.

2. Tolerance of completed grades of base or subgrade shall not vary more than 0.03 inch per foot from grades indicated. Provide an average grade as indicated.

3.03 SHORING

A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of CalOHSA.

C. Remove shoring upon completion of the Work of this section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.04 EXCESS MATERIAL DISPOSAL

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 31 23 13

EXCAVATION AND FILL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, filling, backfilling, and compacting for Project site pavement, planting areas, buildings, and other structures.

2. Trenches for utility lines such as water, gas, irrigation, storm drain and sewer lines, concrete-encased conduits, manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes, and other utility appurtenances.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 4524 - Environmental Import/Export Materials Testing.

3. Section 31 1000 - Site Clearing.

4. Section 31 2200 - Grading.

5. Section 31 2326 - Base Course.

6. Section 32 0117 - Pavement Repair.

7. Section 32 1313 - Site Concrete Work.

8. Section 32 3113 - Chain Link Fences and Gates.

9. Section 32 8413 - Potable Water Irrigation.

10. Section 32 9000 - Planting.

11. Section 33 1100 - Site Water Distribution Utilities.

12. Section 33 3000 - Site Sanitary Sewer Utilities.

13. Section 33 4000 - Storm Drainage Utilities.

14. Division 22 - Plumbing.

15. Division 26 - Electrical.

1.02 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:

1. Fees: Pay as required by authorities having jurisdiction over the area.

2. Bonds: Post as required by authorities having jurisdiction over the area.

3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 SUBMITTALS

A. Shoring calculations as required in Article 3.03 of this Section.

1.04 QUALITY ASSURANCE

A. Comply with the Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and exported soils shall be performed in accordance with Section 01 4524, Environmental Import/Export Materials Testing.

1.05 TESTING

A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of OWNER.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.05 of this Section.

1.06 PROJECT CONDITIONS

A. Information on Drawings or in soil investigation report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.01 FILL AND BACKFILL MATERIALS

A. Fill and backfill material shall be a granular material previously removed from excavation or imported fill material, free of clods and stones larger than 3 inches, (2½ inches for utility trenches) foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and moisture content shall be blended and aerated to stabilize and upgrade the material.

C. Bedding material from trench bottom to one foot above the pipe:

1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.

2. Sand complying with the Specifications for cement concrete aggregates.

D. Brick rubble and broken concrete originating from the Project site shall be legally disposed of off the Project site No such material shall be imported from outside the Project site.

E. Permeable Backfill:

1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size:	Percentage Passing:
3/4 inch (19mm)	100
3/8 inch (10mm)	80 to 100
No. 100	0 to 8
No. 200	0 to 3

2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.

3. Provided backing for weep-holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.

4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system Miradrain by Mirafi, Inc., American Wick Drain, JDR Enterprises, or equal, may be provided if reviewed and approved by the ARCHITECT.

F. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.

2.02 BASE MATERIALS

A. Bituminous Surfacing: Provide as indicated on Drawings and specified in Section 31 2326 Base Course.

PART 3 - EXECUTION

3.01 GENERAL

A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Where the Work includes a building extension or addition on an occupied Project site, perform Work in such a manner, and at such times, as not to disrupt performance of existing utility services to existing Project site facilities. Where an interruption is necessary, obtain review from the Owner's Authorized Representative before proceeding.

C. Remove concrete or bituminous pavement to straight lines by saw cutting.

3.02 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, OSHA regulations.

B. Protect existing improvements including landscaping against damage. Repair or replace damaged items.

C. Protect existing utility services and distribution systems from damage or displacement.

D. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of two feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.

E. Shore, crib, or lag excavations and earthen banks as necessary to prevent cave in, erosion or gullying of sides.

F. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed earth and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

3.03 SHORING

A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of governing Cal-OSHA requirements.

C. Remove shoring upon completion of the Work of this Section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.04 EXCAVATION

A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork", except as modified herein.

B. Form sides of footings, pads, grade beams, and slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other required Work.

C. Machine-drill excavation for round footings to size and depth indicated. Provide a collar or casing, or other adequate protection, to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.

D. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.

E. Barricade trenches, ditches, pits, sumps, and similar Work outside the barricaded working area with chain link fence as specified in Section 01 5000 - Construction Facilities and Temporary Controls, and in accord with Cal-OSHA standards and requirements.

F. Trenches over five feet in depth shall comply with the Construction Safety Orders of the California Division of Industrial Safety.

G. Where indicated or required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.

H. For Structures:

1. Calculate excavation quantities based on elevations or depths indicated on Drawings.

2. Provide 2,000 psi concrete for backfill of over-excavated areas to indicated or required elevations.

3. Special preparation of bottom of excavated planes areas: Excavate areas shown on Drawings as bottom of excavated planes (B.E.P.), by excavating and filling to indicated grades and elevations.

I. For Utilities:

1. Excavate trenches to required depth for utility lines, such as pipes, conduits, and tanks, with minimum allowance of 6 inches at the bottom and 6 inches at the sides for bedding or concrete encasement as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before placing sand bedding or concrete encasement.

2. Do not install piping lengthwise under concrete walks without review by the ARCHITECT.

3. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of two horizontal to one vertical, from a line 9 inches above bottom of footings.

   a. Unless otherwise indicated on Drawings, depth of excavations outside buildings shall provide for a minimum coverage above top of piping, tank or conduit measured from the lowest adjoining finished grade, as follows:

Steel Pipe	24 inches below finish grade
Copper Water Tube	18 inches below finish grade
Cast-Iron, Pressure Pipe	36 inches below finished grade
Plastic Pipe (other than waste)	30 inches below finished grade
Tanks or other structure	36 inches below finished grade
Soil, sewer and storm drain	minimum 18 inches below finished grade, and as required for proper pitch and traffic load. Install polypropylene sewer pipe with at least 24 inches of coverage.
Irrigation Pipe:	Non-pressure pipe - 12 inches, pressure pipe - 24 inches.

   b. Trench width shall provide space for fitting and joining. Excavate for piping bells and fittings, bell and spigot pipe and other fittings.

4. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements. Repair pavement as specified in Section 32 0117 - Pavement Repair.

5. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits placed in the same trench or outside surfaces of containers and tanks.

3.05 IMPORT/EXPORT OF MATERIALS

A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300 - Earthwork, except as modified herein. Install and compact fill in layers not to exceed 6 inches in thickness.

B. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

C. In addition to the requirements of this Section, import and/or exported materials shall comply with the requirements of Section 01 4524, Environmental Import/Export Materials Testing.

D. Imported fill materials shall be sampled by the Geotechnical Engineer, for compliance with the requirements of Part 2 of this Section.

E. Initial sampling and testing shall be performed before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and entity responsible for the source site. The Geotechnical Engineer, will obtain both the initial and additional samples from the identified site and submit samples for required testing.

F. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

G. The independent approved testing laboratory will perform the required tests and report results of tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, Owner's Authorized Representative, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, and the California Building Code.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the Owner's Authorized Representative, a certification statement attesting that imported material has been obtained from the identified source site.

3.06 INSTALLATION OF MATERIALS

A. Pavement: Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the Geotechnical Engineer, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but not more than 1 in 20. Provide adequate drainage at all times during installation of the Work of this Section.

B. Structures:

1. After concrete has been placed, forms removed, and concrete Work inspected, backfill excavations with earth to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish, debris and other waste materials from excavations before placing backfill.

2. Before placing backfill, adequately cure concrete and provide bracing, if required to stabilize structure. Protect waterproofing or damp-proofing against damage during backfilling operations, with required protection board. Remove bracing as backfill operation progresses.

3. Do not furnish or install expansive soils for retaining wall backfill.

4. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished. Do not over-saturate or compact by flooding or jetting.

5. Install wall backfill before installing railings and fences on walls.

6. Install weep hole drainage at the backside of walls so the backing completely covers the weep holes, is horizontally centered and extends at least 12 inches above the bottom of the weep opening. Provide an 8-inch square section of 1/4 inch galvanized or aluminum screen, with a minimum wire diameter of 0.03 inch, and install at the backside of each weep hole before installing the backfill material.

7. Where a reviewed drainage matting system is provided instead of permeable backfill for retaining structures, install in accordance with the manufacturer recommendations.

C. Utilities:

1. Do not install backfill until the Work of this Section has been inspected and tested. Do not furnish or install materials excavated from the Project site containing materials not permitted for backfill.

2. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the Inspector of Record.

3. Install backfill in layers not exceeding 6 inches in thickness, except cement-sand slurry.

4. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grades plus one inch.

3.07 COMPACTING

A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated and directed compaction equipment.

B. Install and compact sand bedding to provide a uniform bearing under the full length of piping and conduits.

C. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least ninety percent.

D. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

A. The Geotechnical Engineer will inspect and test excavations, sample material quality for testing as set required in Part 2 and observe installation and compaction of fill materials.

B. The Geotechnical Engineer will sample imported fill materials from their designated source and submit samples to the independent approved testing laboratory before delivery to the Project site.

C. Installation of backfill shall be observed by the Geotechnical Engineer.

D. The Geotechnical Engineer will inspect and test excavation Work before the installation of fill and other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

F. The Project Inspector will inspect foundation excavations when completed and ready for forms, after forms are in place, and before first placement of concrete.

3.09 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 23 16

EXCAVATION AND FILL FOR PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, backfill, and compacting for paved areas.
2. Installation of fill materials.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4524 - Environmental Import/Export Materials Testing.
3. Section 31 1000 - Site Clearing.
4. Section 31 2200 - Grading.
5. Section 31 2323 - Excavation and Fill for Utilities.
6. Section 32 2326 - Base Course.
7. Section 32 0117 - Pavement Repair.
8. Section 32 1216 - Asphalt Paving.
9. Section 32 1313 - Site Concrete Work.

1.02 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:

1. Fees: Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 4524 - Environmental Import/Export Materials Testing.

1.04 TESTING

A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of OWNER.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.05 of this Section.

1.05 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.01 BASE MATERIALS

A. Bituminous Surfacing: As indicated on Drawings and specified in Section 31 2326 - Base Course.

2.02 FILL AND BACKFILL MATERIALS

A. Fill and backfill materials shall be previously excavated materials or imported fill material, free of clods and stones larger than 3-inch, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and moisture content shall be blended or aerated to stabilize and upgrade the material.

C. Imported Fill Material:

1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.

2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than 2 percent from air dry to optimum moisture content and not more than 6 percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

D. Brick rubble and broken concrete originating from the Project site shall be legally disposed of off the Project site. No such materials shall be imported from outside the Project site.

E. Permeable Backfill:

1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size:	Percentage Passing:
3/4 inch (19mm)	100
3/8 inch (10mm)	80 to 100
No. 100	0 to 8
No. 200	0 to 3

2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.

3. Provided backing for weep holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.

4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system, Miradrain by Mirafi, Inc., or equal, may be provided if reviewed and approved by the ARCHITECT.

PART 3 - EXECUTION

3.01 GENERAL

A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Clear the Project site as indicated in Section 31 1000 - Site Clearing.

3.02 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.

B. Protect adjacent existing improvements including landscaping against damage.

3.03 EXISTING UTILITY LINES

A. Protect existing utility lines from damage or displacement.

B. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of 2 feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.

3.04 EXCAVATION

A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.

3.05 FILL

A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.

B. Provide fill materials as specified in Part 2 - Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

C. In addition to the requirements of this Section, import and/or exported materials shall comply with the requirements of Section 01 4524 - Environmental Import/Export Materials Testing.

D. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.

E. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will

obtain both the initial and additional samples from the identified site and will submit samples to the approved independent testing laboratory for testing.

F. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

G. The independent approved testing laboratory will perform the required tests and report results of tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, Owner's Authorized Representative, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, and the CBC.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the Owner's Authorized Representative a certification statement attesting that imported material has been obtained from the identified source site.

3.06 INSTALLATION OF MATERIALS

A. Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the Geotechnical Engineer, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but no more than 1 in 20. Provide adequate drainage at all times during construction of the Work of this Section.

3.07 COMPACTING

A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated and directed compaction equipment.

B. Unless otherwise indicated, compact each layer of earth fill to a relative compaction of at least 90 percent.

C. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each compacted layer before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.

B. The Geotechnical Engineer will sample imported fill materials from their designated source before delivery to the Project site.

C. Installation of backfill will be observed by the Geotechnical Engineer.

D. The Geotechnical Engineer will inspect and test excavation Work before the installation of fill and/or other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

3.09 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 31 23 19

EXCAVATION AND FILL FOR STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, backfilling, and compacting for buildings and structures.
2. Fill materials.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4524 - Environmental Import/Export Materials Testing.
3. Section 31 1000 - Site Clearing.
4. Section 31 2200 - Grading.
5. Section 31 2616 - Excavation and Fill for Paving.
6. Section 31 2323 - Excavation and Fill for Utilities.

1.02 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:

1. Fees: Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 SUBMITTALS

A. Imported Soils: A Geotechnical Engineer, retained by the Owner as an Owner Consultant, will obtain initial product Sample for testing in accordance with the terms of Article 3.05 of this Section.

B. Shoring calculations as required in Article 3.03 of this Section.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 4524 - Environmental Import/Export Materials Testing.

1.05 TESTING

A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of OWNER.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.05 of this Section.

1.06 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.01 FILL AND BACKFILL MATERIALS

A. Fill and backfill materials shall be a granular material previously removed from excavation, or imported fill material, free of large clods and stones larger than 3 inches, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and or moisture content shall be blended and/or aerated to stabilize and upgrade the material.

C. Imported Fill Material:

1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.

2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than two percent from air dry to optimum moisture content and not more than six percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

D. Brick rubble and broken concrete originating from the Project site shall be legally disposed of off the Project site No such materials shall be imported from outside the Project site.

E. Permeable Backfill:

1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size	Percentage Passing
3/4 inch	100
3/8 inch	80 to 100
No. 100	0 to 8
No. 200	0 to 3

2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.

3. Provided backing for weep-holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.

4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system, Miradrain by Mirafi, Inc., or equal, may be provided if reviewed and approved by the ARCHITECT.

PART 3 - EXECUTION

3.01 GENERAL

A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Clear the Project site as indicated in Section 31 1000 - Site Clearing.

3.02 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.

B. Protect adjacent existing improvements including landscaping against damage.

C. Shore, crib, or lag excavations and earthen banks as necessary to prevent caving-in, erosion or gullying of sides.

D. Divert or de-water excavations until concrete is placed, forms are removed, and backfilling is complete.

3.03 SHORING

A. Provide shoring as necessary to properly and safely support earth sides of excavations, curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of Cal-OHSA. Remove shoring upon completion of Work, or when no longer needed.

3.04 EXCAVATION

A. Form sides of footings, pads, grade beams, and slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other Work as required.

B. Machine-drill excavation for round footings to size and depth indicated. Provide a collar or casing, or other adequate protection, to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.

C. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.

D. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

E. Calculate excavation quantities based on elevations or depths indicated on Drawings.

F. Provide 2,000 psi concrete for backfill of over-excavated areas to indicated or required elevations.

G. Special preparation of bottom of excavated planes areas: Excavate areas designated on Drawings as bottom of excavated planes (B.E.P.), by excavating and filling to indicated grades and elevations.

3.05 IMPORT/EXPORT OF MATERIALS

A. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

B. In addition to the requirements of this Section, import and/or exported materials shall comply with the requirements of Section 01 4524 - Environmental Import/Export Materials Testing.

C. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.

D. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will obtain both the initial sample and additional samples from the identified site and will submit samples to the approved independent testing laboratory for testing.

E. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

F. The independent approved testing laboratory will perform the required tests and report results of tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, Owner's Authorized Representative, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, and the CBC.

G. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

H. Upon completion of import operations, provide the Owner's Authorized Representative a certification statement attesting that all imported material has been obtained from the identified source site.

3.06 BACKFILLING

A. After concrete has been placed, forms removed and concrete Work inspected, backfill excavations to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish, debris, and other waste materials from excavations before placing backfill.

B. Before installing backfill, adequately cure concrete and provide bracing to stabilize structures. Protect waterproofing or dampproofing against damage during backfilling operations with required protection board. Remove bracing as backfill operation progresses.

C. Do not furnish or install expansive soils for below grade building walls.

D. Install each layer of material in a not to exceed thickness of 6 inches, unless otherwise required.

E. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished. Do not over-saturate or compact by flooding or jetting.

F. Install wall backfill before installing railings and fences on walls.

G. Impervious backfill materials shall be installed in layers along with and by the same methods specified for structure backfill. Impervious backfill materials shall be at the approximate grade and elevation and where exposed to erosion, shall be covered with at least a 12-inch layer of fill material as reviewed by the Geotechnical Engineer.

H. Install weep hole drainage at the backside of walls so the backing completely covers the weep holes, is horizontally centered and extends at least 12 inches above the bottom of the weep opening. Provide an 8-inch square section of 1/4 inch galvanized or aluminum screen, with a minimum wire diameter of 0.03 inch, and install at the backside of each weep hole before installing the backfill material.

I. Where a reviewed drainage matting system is provided instead of permeable backfill for retaining structures, install in accordance with the manufacturer recommendations.

3.07 COMPACTING

A. Compact each layer of fill material by tamping, sheepsfoot rollers or pneumatic-tired rollers, to such extent as to provide specified relative compaction. At inaccessible locations, compact to specified requirements with hand-held, operated and directed compaction equipment.

A. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least 90 percent.

B. Do not compact by flooding or jetting.

C. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.

B. The Geotechnical Engineer will sample imported fill materials from their designated source before delivery to the Project site.

C. Installation of backfill shall be observed by the Geotechnical Engineer.

D. The Geotechnical Engineer will inspect and test excavation Work before the installation of fill and/or other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

F. The Project Inspector will inspect foundation excavations when completed and ready for forms, after forms are in place and before first placement of concrete.

3.09 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 23 23

EXCAVATION AND FILL FOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, backfilling, and compacting utility trenches such as water, gas, irrigation, storm drain, sewer lines, concrete-encased conduits, and manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes and other utility appurtenances.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4524 - Environmental Import/Export Materials Testing.
3. Section 31 1000 - Site Clearing.
4. Section 31 2200 - Grading.
5. Section 31 2316 - Excavation and Fill for Paving.
6. Section 31 2319 - Excavation and Fill for Structures.
7. Section 32 0117 - Pavement Repair.
8. Section 32 1313 - Site Concrete Work.
9. Section 32 8413 - Potable Water Irrigation.
10. Section 33 1100 - Site Water Distribution Utilities.
11. Section 33 3000 - Site Sanitary Sewer Utilities.
12. Section 33 4000 - Storm Drainage Utilities.
13. Division 22 - Plumbing.
14. Division 26 - Electrical.

1.02 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:

1. Fees: Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works construction, current edition except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 4524 - Environmental Import/Export Materials Testing.

1.04 TESTING

A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of OWNER.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.02 of this Section.

1.05 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Bedding material from trench bottom to one foot above the pipe:

1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.

2. Sand complying with the Specifications for cement concrete aggregates.

B. Backfill Materials:

1. Excavated trench material to be installed for backfilling shall be clean, free of large clods, and stones larger than 2 ½-inch in any dimension.

2. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.

3. Imported Fill Material: Imported fill material shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing a 200 mesh sieve. Material shall provide a coefficient of expansion of not more than two percent from air dry to optimum moisture content and not more than six percent from air dry to saturation. Imported materials shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

PART 3 - EXECUTION

3.01 GENERAL

A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Barricade trenches, ditches, pits, sumps, and similar Work outside the barricaded working area with chain link fence as specified in Section 01 5000, Construction Facilities and Temporary Controls, and in accordance with Cal-OSHA standards and requirements.

C. Saw-cut concrete or bituminous paving for trench installation.

D. Trenches over 5 feet in depth shall conform to the Cal-OSHA.

E. Where indicated and required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by

installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.

F. Backfill over excavations to the required elevations with earth, gravel, sand, or concrete and compact as required. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. Slope adjacent grades away from excavations to minimize entry of water.

G. Do not install piping lengthwise under concrete walks without review by the ARCHITECT.

H. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of two horizontal to one vertical, from a line 9 inches above bottom of footings.

1. Unless otherwise indicated on Drawings, depth of excavations outside the buildings shall allow for a minimum coverage above top of pipe, tank, or conduit measured from the lowest adjoining finished grade, as follows:

Steel Pipe	24 inches below finished grade
Copper Water Tube	18 inches below finished grade
Cast-Iron Pressure Pipe	36 inches below finished grade
Plastic Pipe (other than waste)	30 inches below finished grade
Tanks or other structures	36 inches below finished grade
Soil, Sewer & Storm Drain	minimum 18 inches below finished grade, and as required for proper pitch and traffic load. (Install polypropylene sewer pipe with at least 24 inches coverage)
Irrigation Pipe:	nonpressure pipe 12 inches, pressure pipe 24 inches

2. Trench width shall provide ample space for fitting and joining. Excavate for piping bells and fittings, bell and spigot pipe and other fittings.

I. Unless indicated otherwise, excavate trenches to the required depths for utilities, such as pipes, conduit and tanks, with minimum allowances of 6 inches at the bottom and 6 inches at the sides for bedding of unprotected piping or as required for concrete encasement of conduits as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before installing sand bedding or concrete encasement.

J. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

K. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits installed in the same trench or outside surfaces of containers and tanks.

L. Do not install backfill until required inspections and testing is completed.

M. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the Project Inspector.

N. Install backfill materials in layers not exceeding 6 inches in thickness and compact to 90 percent of the maximum density.

O. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grade plus one inch.

P. Install and compact sand bedding to provide a uniform full length bearing under piping and conduits.

Q. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements. Repair pavement as specified in Section 32 0117, Pavement Repair.

3.02 IMPORT/EXPORT OF MATERIALS

A. Provide fill materials as specified in Part 2, Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

B. In addition to the requirements of this Section, import and exported materials shall comply with the requirements of Section 01 4524, Environmental Import/Export Material Testing.

C. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.

D. The Geotechnical Engineer will perform the tests by utilizing an independent approved testing laboratory.

E. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will obtain both the initial sample and additional samples from the identified site and shall submit all samples to the approved independent testing laboratory.

F. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

G. The independent approved testing laboratory will perform the required tests and report results of all tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, Owner's Authorized Representative, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, and the CBC.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the Owner's Authorized Representative a certification statement attesting that imported material has been obtained from the identified source site.

3.03 INSPECTION AND TESTING

A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, observe installation and compaction of fill materials.

B. Compaction test shall be performed in accordance with ASTM D1557, method "C."

3.04 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.05 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 31 23 26

BASE COURSE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Installation of base material.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4524 – Environmental Import / Export Material Testing.
2. Section 31 1000 - Site Clearing.
3. Section 31 2200 - Grading.
4. Section 31 2313 - Excavation and Fill.
5. Section 31 2316 - Excavation and Fill for Paving.
6. Section 32 0117 - Pavement Repair.
7. Section 32 1216 - Asphalt Paving.
8. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials. The CONTRACTOR shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by OWNER'S Office of Environmental Health and Safety (OEHS) prior to importing the material. A statement on company letterhead from the CAB source, stamped by either a California Professional Geologist or Engineer, which states that the subject materials are native rock, do not contain any recycled materials and that the source quarry does not mine ultramafic materials, a source of natural occurring asbestos shall be included in the submittal to OEHS. The CONTRACTOR may request variance from analytical testing required by Section 01 4524 for CAB. To be considered for a variance, the CONTRACTOR shall submit a documentation package for OEHS approval, which includes all of the aforementioned information at least 48 hours in advance of planned import.

B. Product Data: Submit material source, technical information and test data for base materials. Gradation and quality certifications shall be dated within 30 days of the submittal.

C. Sample: Submit sample of proposed base course material.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed Aggregate Base (CAB) materials shall conform to the requirements of the Standard Specifications for Public Works Construction: Section 200 - Rock Materials.

B. Crushed Miscellaneous Base (CMB) or materials generated on site shall not be used as a base course material.

2.02 MATERIAL APPROVAL

A. Base material shall be inspected by the Project Inspector for gradation and material content prior to installation. The OWNER may choose to have additional tests performed by a geotechnical engineer, retained by the OWNER, before installation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install base course material in layers not exceeding 6 inches in thickness, unless required otherwise. Grade and compact to indicated levels or grades, cut and fill, water and roll until the surface is hard and true to line, grade and required section. Provide a relative compaction of at least 90 percent, unless otherwise required.

B. Grade base course to elevations indicated on Drawings, ready to receive surfacing, in accordance with Section 31 2200 - Grading.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 01 17

ASPHALT PAVEMENT REPAIR

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Bituminous Surfacing Repair: Areas removed for utility trenches, heaved by tree roots, cracked areas, protruding areas where pavement meets hard surfaces, depressed areas, holes and areas around new structures, and raveled bituminous pavement.

2. Areas heaved by tree roots, cracked areas, holes and trenches, and areas around new structures.

B. Related Sections:

1. Division 01 - General Requirements.

2. Section 31 2200 - Grading.

3. Section 31 2313 - Excavation and Fill.

4. Section 31 2316 - Excavation and Fill for Paving.

5. Section 31 2319 - Excavation and Fill for Structures.

6. Section 31 2323 - Excavation and Fill for Utilities.

7. Section 31 2326 - Base Course.

8. Section 32 1216 - Asphalt Paving.

9. Section 32 1313 - Site Concrete Work.

10. Section 32 1236 - Seal for Bituminous Surfacing.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating areas to be repaired.

B. Product Data: Submit manufacturer’s technical data for materials and products.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Base course materials: Section 31 2326 - Base Course.

B. Asphalt paving materials: Section 32 1216 - Asphalt Paving.

C. Seal materials: Section 32 1236 - Seal for Bituminous Surfacing.

D. Headers: Section 32 1216 - Asphalt Paving.

2.02 BITUMINOUS MATERIALS

A. Provide materials and products of the class, grade or type indicated, conforming to relevant provisions of Section 203 - Bituminous Materials of the latest Standard Specifications for Public Works Construction.

PART 3 - EXECUTION

3.01 PAVEMENT REMOVAL

A. Remove bituminous and concrete pavement in accordance with applicable provisions of Section 300 - Earthwork of the Standard Specifications for Public Works Construction.

B. Pavement Heaved By Roots: Remove pavement to limits of distortion and expose roots. Trim roots to provide at least 12-inch clearance to pavement. Coordinate with OWNER's Tree Trimming Department for recommendations and approval prior to trimming roots.

C. Remove protruding bituminous surfaces flush with the surrounding grade using a suitable tool or equipment so that adjacent finishes are not blackened.

D. Remove raveled and depressed bituminous pavement to limits indicated or required.

E. Saw cut existing improvements, trim holes and trenches in bituminous and concrete pavement to permit mechanical hand tampers to compact the fill.

F. Remove broken concrete by saw cutting. If the required cut line is within 30 inches of a score or joint line or edge, cut and remove to the score, joint line, or edge.

3.02 EXCAVATING, BACKFILLING AND COMPACTING

A. Conform to requirements in Section 31 2313 - Excavation and Fill; Section 31 2316 - Excavation and Fill for Paving; Section 31 2319 - Excavation and Fill for Structures; or Section 31 2323 - Excavation and Fill for Utilities, as required.

B. Where subgrade or base is deemed to be unstable or otherwise unsuitable, excavate such materials to firm earth, and replace with a required material. Install and compact fill materials in accordance with the requirements of Section 31 2316 Excavation and Fill for Paving.

3.03 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of the adjacent undisturbed grade.

C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid earth a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and devices as required to fasten headers.

3.04 BASE COURSE

A. Unless otherwise indicated, base course shall be crushed aggregate base, fine grade, 3 inches thick or equal to thickness of the existing base, whichever is greater.

B. Fill grade and compact as specified in Section 31 2200 - Grading.

3.05 RESURFACING

A. Utility Trenches: Remove loose dirt and backfill with cement-sand slurry allowing for surfacing one inch thicker than existing. Resurface flush with existing adjoining pavement installing the same type of materials and section provided in existing improvements.

B. Other Areas: Other surface improvements damaged or removed shall be cut to a neat even line and excavated one inch below the bottom of the existing pavement. Resurface by following the original grades and installing the same type of materials provided in existing improvements.

C. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth materials before asphalt cools.

3.06 REPAIRING AND RESEALING EXISTING SURFACES

A. Preparation of Surfaces: Prior to filling cracks, clean existing bituminous surfacing of loose and foreign materials and coat with a film of asphalt emulsion.

B. Repair of Existing Surfacing:

1. Fill cracks 1/2 inch wide and less with RS-1 emulsion and washed plaster sand or other OEHS approved crack filler material. Cracks larger than ½ inch wide shall be filled with Type F/Sheet Mix Asphalt Concrete as specified. Cracks shall be filled to the level of adjacent surfacing.

2. Where low areas, holes, or depressions occur in existing surfacing, refer to Section 32 1216; Asphalt Paving, Article 3.02. Use Type E/School Mix and feather edge joint flush to the level of adjacent surfacing.

C. Testing: Flood test entire area in presence of the Project Inspector. Inspect area after waiting one hour. Entire area tested shall be free of standing water or puddles in excess of 0.01 foot. Practical field measurement: 0.01 foot = two quarters stacked.

D. Surface Seal: After surface has been repaired and tested, install seal coat over entire area indicated. Surface seal shall be as specified in Section 32 1236 - Seal for Bituminous Surfacing.

3.07 CLEANING

A. Remove all stains on the Project site and adjacent properties caused by or attributed to the Work of this section.

B. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Paving for playground, parking areas, areas between buildings, synthetic track surfacing adjacent to planting and turf areas as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 2200 - Grading.
3. Section 32 0117 - Pavement Repair.
4. Section 31 2326 - Base Course.
5. Section 32 1236 - Seal for Bituminous Surfacing.
6. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of paving and accessories.

B. Product Data: Manufacturer's technical data for materials and products.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction.

1.04 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B A copy of the soils report is available for examination in the office of the Architect during regular office hours of the Architect.

PART 2 - PRODUCTS

2.01 BITUMINOUS MATERIALS

A. Provide materials of the class, grade, or type indicated on the Drawings, conforming to relevant provisions of Section 203 - Bituminous Materials of the Standard Specifications for Public Works Construction.

2.02 HEADERS

A. Concrete: Per specification Section 32 1313 - Site Concrete Work.

B. Wood:

1. Redwood, Construction Heart Grade, size 2 by 6, unless otherwise indicated.

2. Stakes: 2 by 4 redwood or 2 by 3 Douglas fir, Construction Grade.

3. Nails: Common, galvanized, 12d minimum.

PART 3 - EXECUTION

3.01 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.

C. Where wood headers are indicated on drawing, fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on center with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and anchorage as required to fasten headers in place.

3.02 CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

A. Thickness of Surfacing: Unless otherwise indicated on Drawings or specified, install bituminous surfacing to a compacted thickness of 2 inches.

B. Provide surfacing material over base course as specified in Section 31 2326 - Base Course.

C. Surfaces of walls, concrete, masonry, or existing bituminous surfacing indicated to be in direct contact with installed bituminous surfacing shall be cleaned, dried and uniformly coated with an asphaltic emulsion film.

D. Thicken edges of bituminous surfacing that do not abut walls, concrete, or masonry, and edges joining existing bituminous surfaces. Remove headers at existing bituminous surfacing where new bituminous surfacing is to be installed. Thicken edges an additional 2 inches and taper to the indicated or specified thickness 6 inches back from such edges.

E. At stairways, adjust thickness of paving such that the first tread is equal in height to all other treads.

F. Provide adequate protection for concrete, planting areas, and other finish Work adjacent to areas indicated to receive bituminous surfacing.

G. Placing:

1. Do not install bituminous surfacing when atmospheric temperature is below 40 degrees F; or when fog or other unsuitable weather conditions are present. Temperature of mixture at time of installation shall not be lower than 260 degrees F in warm weather or higher than 320 degrees F in cold weather.

2. Where 2-inch or 3-inch thick surfacing is indicated or specified, install surfacing in one course. Where surfacing is indicated or specified 4 inches or more in

thickness, except for thickened edges, install bituminous surfacing in courses of approximately equal thickness, each course not exceeding 2 ½ inches in thickness.

H. Stakes or Screeds: Provide grade or screed stakes spaced not more than 15 feet apart in flow lines with grades of less than one percent. Continuous screeds may be provided instead of stakes.

I. Spreading: Install bituminous surfacing in a manner to cause least possible handling of mixture. In open areas and wherever practicable, install by mechanical means with a self-propelled mechanical spreader. In confined or restricted areas, install mixture with hot shovels and rakes, and smooth with lutes.

J. Joints: Provide vertical joints between successive runs. Install joints true to line, grade, and cross section. Lapped joints are not permitted.

K. Rolling:

1. Finish roll with a self-propelled tandem roller weighing at least 8 tons. Break down roll with a self-propelled roller weighing between 1 ½ tons and 8 tons.

2. Roll in a manner that preserves flow lines and the established finished grades. Break down roll in areas adjacent to flow lines parallel to flow lines. Break down roll after bituminous surfacing is installed without shoving or cracking of mixture under roller. Continue finish rolling until surfacing is unyielding, true to grade, and meets requirements for specified smoothness. Areas inaccessible to finish roller may be finish rolled with breakdown roller or tamped with hot tamping irons and smoothed with hot smoothing irons or hand roller.

3. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth to properly compact.

4. Compacted bituminous surfacing shall be provided with a bulk specific gravity of at least 2.31 when tested in accordance with ASTM D1188.

3.03 TOLERANCE

A. Smoothness: Surface of bituminous surfacing after rolling, shall be even, smooth and uniform in texture with no voids or rock pockets, free of roller marks or other irregularities, and not varying by more than 0.03 foot, except at local depressions or raised areas as indicated, when a 10-foot straightedge is placed on surface.

B. Grade: Finished grade shall not vary more than 0.02 foot above or below required grade. Variations within prescribed tolerance shall be compensating so that average grade and cross-section are provided.

C. Premium paving tolerances and requirements for synthetic track:

1. General: Test in-place asphalt concrete courses for compliance with requirements or thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Owner's representative.

2. Thickness: Tolerances for thickness shall be ¼ inch, plus or minus.

3. Planarity: The asphalt substrate shall not vary from the planned cross slope by more than plus or minus 0.1 percent. The finished asphalt shall not vary, plus or minus, under a 10 feet straight edge greater than 1/8 inch. Flood test the surface with the use of a water truck. If, after 30 minutes on a 70 degree F day, "bird

baths" are evident at a depth more than 1/8 inch repair using the best method of correction.

4. Corrective Measures: Determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met notify the Owner in writing of the acceptance of the asphalt paving.

3.04 TESTING

A. After first coat of surface seal has been installed and after a 24 hour period, the flood test shall be completed of the bituminous surfacing in presence of the Project Inspector. Repair areas of standing water or puddles and flood test locally; install surface seal and retest as necessary.

3.05 SURFACE SEALING

A. After bituminous surfacing has passed flood test, clear and allow to dry and provide one more coat of surface seal as specified in Section 32 1236 - Seal for Bituminous Surfacing.

B. Where indicated, provide multiple coats of surface seal to existing bituminous surfacing.

C. Where new bituminous surfacing joins existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.07 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 12 36

SEAL FOR BITUMINOUS SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Surface sealer over bituminous surfacing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 32 0117 - Pavement Repair.
3. Section 32 1216 - Asphalt Paving.
4. Section 32 1723 - Pavement Marking.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product information and application procedures for bituminous surfacing.

1.03 QUALITY ASSURANCE

A. Comply with the Standard Specifications For Public Works Construction, current edition.

B. Agitate bulk materials during transport.

1.04 MAINTENANCE

A. Extra Materials: Provide 10 gallons in unopened containers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide one of the following surface seals:

	Product Name	Manufacturer
1.	Guard-Top	CALMAT / Industrial Asphalt
2.	Over Kote	Diversified Asphalt Product
3.	Park Top	Western Colloid Products
4.	Sure Seal	Asphalt Coating Engineering
5.	Super Drive Top.	SAF– T Seal. Inc.
6.	Equal.	

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Thoroughly wash surfaces with water to remove dirt, debris, excessive oil and grease, or other foreign matter.

3.02 APPLICATION

A. Install seal coat in strict accordance with manufacturer's written directions and recommendations.

B. Install two coats of surface seal to new bituminous surfacing. First coat shall be installed before flood testing. Clean surface and allow to dry before installing second coat. Second coat shall be installed after bituminous surfacing has passed flood test.

C. Where new bituminous surfacing is installed adjacent to existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

D. Where existing bituminous surfacing is indicated to be patched and sealed, install two coats of surface seal after patching. Refer to Section 32 1216 - Asphalt Paving.

3.03 PROTECTION OF SURFACES

A. Protect sealed and unsealed surfaces from damage and traffic during performance of the Work of this section and until surface seal has thoroughly set and cured. Do not permit traffic of any kind for at least 24 hours after completion of installation.

B. Protect the Work of this section until Substantial Completion.

3.04 TESTING

A. OWNER reserves the right to obtain samples, perform tests to ensure compliance with the Specifications, and to review weight slips and invoices of materials delivered to the Project site.

B. After first coat of surface seal has been installed and after a 24-hour period, flood test entire area in presence of the Project Inspector. Inspect area after waiting one hour. Entire area tested shall be free of standing water or puddles in excess of 0.01 foot. Practical field measurement: 0.01 foot = two quarters stacked. Repair areas of standing water or puddles and flood test locally; install surface seal and retest as necessary.

3.05 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 13 13

SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: On-site concrete work:

1. Portland cement concrete pavement, driveways, curbs, gutters and mowing strips.
2. Ramps and stairs on grade.
3. Footings for fence posts, bollards, flagpoles, shade structures, light standards and athletic and playground equipment.
4. Pipe encasements, thrust blocks, and equipment pads.
5. Retaining walls, planter walls and concrete benches.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 1000 - Concrete Forming and Accessories.
3. Section 03 2000 - Concrete Reinforcement.
4. Section 03 3000 - Cast-in-Place Concrete.
5. Section 07 9200 - Joint Sealants.
6. Division 23 - HVAC.
7. Division 26 - Electrical.
8. Section 31 2200 - Grading.
9. Section 31 2316 - Excavation and Fill for Pavement.
10. Section 31 2319 - Excavation and Fill for Structures.
11. Section 31 2326 - Base Course.
12. Section 32 1216 - Asphalt Paving.
13. Section 32 1723 - Pavement Markings.
14. Section 32 3113 - Chain Link Fences and Gates.
15. Section 33 1100 - Site Water Distribution Utilities.
16. Section 33 3000 - Site Sanitary Sewer Utilities.
17. Section 33 4000 - Storm Drainage Utilities.

1.02 REFERENCES

A. Structural work, such as retaining walls, planter walls, cast-in-place benches, equipment pads, and footings for playground equipment, fences, walls, shade structures and flagpoles shall conform to the following Sections:

1. Section 03 1000 Concrete Forming.

2. Section 03 2000 Concrete Reinforcing.

3. Section 03 3000 Cast-in-Place Concrete.

B. Flatwork, such as walkways, driveways, ramps and steps on grade, swales, curbs, mow strips and utility related concrete, conform to:

1. Standard Specifications for Public Works Construction, The “Greenbook”, except reclaimed aggregates and processed miscellaneous base are not allowed.

C. Imported or exported earthwork shall conform to Section 01 4524 Environmental Import / Export Materials Testing.

D. National Ready Mixed Concrete Association (NRMCA):

1. Checklist for the Concrete Pre-Construction Conference.

1.03 QUALITY ASSURANCE

A. Source Limitations for Exposed Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide concrete of consistent quality in appearance and physical properties. Secure material required for the duration of the project as needed to ensure consistent quality in appearance.

B. Pre-Installation Conference:

1. CONTRACTOR shall coordinate and conduct pre-installation conference in conformance to Section 01 3119 Project Meetings.

2. CONTRACTOR shall use the NRMCA “Checklist for the Concrete Pre-Construction Conference” as the meeting agenda.

C. Mockup:

1. Build 8 feet by 8 feet mockups of full-thickness sections of concrete paving using processes and techniques intended for use on permanent work, including curing procedures.

2. Build mockups to demonstrate typical joints; surface finishes and standard of workmanship.

3. Obtain ARCHITECT’s approval of mockup before proceeding with work of this Section.

4. Mockup shall remain through completion of the work for use as a quality standard for finished work.

5. Remove mockup when directed by the Owner’s Authorized Representative.

D. Field applied primers, paintings, sealers, sealants, caulking, leveling and patching compounds, crack/joint repair compounds adhesives and similar products shall be approved by the OWNER’s Office of Environmental Health and Safety (OEHS).

1.04 SUBMITTALS

A. Structural Work: Conform to the applicable requirements of Sections 03 1000 Concrete Forming, 03 2000 Concrete Reinforcing and 03 3000 Cast-in-Place Concrete.

B. Flatwork: Submit mix design in conformance to the Greenbook.

C. Shop Drawings: Submit drawings indicating the locations of concrete joints, including construction joints, expansion joints, isolation joints, and contraction joints.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

B. Packaged materials shall bear the manufacturers and brand name label and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

C. Avoid exposure of reinforcing steel bars, wire, and wire fabric to dirt, moisture or conditions harmful to reinforcing.

D. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated by size and shape.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Work: Conform to the applicable requirements of the following Sections, except as otherwise specified:

1. Section 03 1000 Concrete Forming.
2. Section 03 2000 Concrete Reinforcing.
3. Section 03 3000 Cast-in-Place Concrete.
4. Section 07 9200 Joint Sealants.

B. Flatwork: Conform to the applicable requirements of the Greenbook, Section 201, except as follows:

1. Water/cement ratio for concrete flatwork shall be 0.50 maximum.
2. Base course shall conform to Section 32 3226 Base Course.
3. Reclaimed concrete material shall not be used.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that gradients and elevations of base are correct. Maintain subgrade clean and in a smooth, compacted condition until the concrete is placed.

B. Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. Earth surface shall be kept moist by frequent sprinkling up to the time of placing concrete.

3.02 CONSTRUCTION OF FORMS

A. Flatwork Forming: Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 4 stakes per form placed at intervals not to exceed two feet. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms.

B. Wall Formwork: Forms shall be constructed to conform to final concrete shape, lines and dimensions of members required by Drawings and Specifications. Forms shall be sufficiently tight to prevent leakage of concrete and properly braced or tied together to maintain position and shape.

3.03 STEEL REINFORCEMENT INSTALLATION

A. Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted.

B. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

C. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces, and lace splices with wire.

D. Clean reinforcement of loose rust and mill scale, earth, or bond-reducing materials.

3.04 PREPARATION FOR CONCRETE PLACEMENT

A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.

B. Do not place concrete until forms, reinforcement, pipe, conduits, outlet boxes, anchors, sleeves, bolts, and other embedded materials are securely fastened in place. Maintain a minimum of two inches clearance between said items and any part of the concrete reinforcement.

C. Adjust pull boxes, meter boxes, valve covers and manholes to proposed finish grade prior to placement of concrete. Anchor bolts shall be accurately set and maintained in position by templates while being embedded in concrete.

D. Clean thoroughly the surfaces of metalwork to be in contact with concrete, remove dirt, grease, loose scale and rust, grout, mortar, and other foreign substances before the concrete is placed.

E. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

3.05 CONCRETE PLACEMENT

A. Place, compact, screed, float and trowel concrete as indicated in Section 03 3000 Cast-in-Place Concrete.

B. Finish: After straightedging, when most of the water sheen has disappeared and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

1. Provide medium broom finish on surfaces up to six percent slope by striating surface 1/32 to 3/64 inch deep with a soft bristle broom across concrete surface to provide a uniform fine line texture.

2. Provide heavy broom finish on surfaces over six percent by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom.

3.06 JOINTS

A. Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated. Align curb, gutter, and sidewalk joints.

B. Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour.

1. Continue steel reinforcement across construction joints unless otherwise indicated on the Drawings.

2. Provide tie bars at sides of paving strips where indicated on the Drawings

3. Butt Joints: Use bonding agent or epoxy-bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated on the Drawings.

D. Expansion Joints:

1. Provide premolded joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together. Extend expansion joint fillers full-width and depth of joint, and 1/4" below finished surface where joint filler is indicated. If no joint sealer is indicated place top of premolded joint filler flush with top of concrete or curb.

2. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints to a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Remove grooving-tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

F. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Remove edging-tool marks on concrete surfaces.

G. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting, exposing the aggregate. The hardened surface shall be cleaned of latent foreign material and washed clean, prior to the application of an epoxy bonding agent.

3.07 STAIRS AND RAMPS

A. Install support post sleeves into the perimeter concrete curbing during the installation process of the curbing. Sleeves shall be three-inch diameter, schedule 40 PVC with a cap solvent welded to the bottom of the sleeve. Drill a half-inch weep hole on the bottom of the cap. Sleeve and cap shall be Nibco products or approved equal. Sleeves shall be embedded into concrete a minimum of nine inches and spaced at a maximum of four feet, or as indicated on the Drawings. Fill sleeve with non-shrink grout Quickcrete #1585-01 when setting posts. Provide control joints into the concrete on both sides for each post.

B. Finish step nosings with a safety step edger/groover with a 1/2 inch radius and four grooves spaced equally 3/4 inch on center and a bit depth between 1/4 to 3/8 inch. Paint with contrasting color.

3.08 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

A. Formed Curb and Gutter: Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Finish curve shaped gutters with a standard curb mule or concrete slipformed curb paving equipment.

B. Concrete Finishing: Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter to grade with a wood float.

C. Surface and Thickness Tolerances: Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.09 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project Site.

3.10 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 32 15 40

DECOMPOSED GRANITE SURFACING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Section Includes:

1. Naturally occurring decomposed granite and crushed stone surfacing as shown on Drawings and specified herein. Include sub-grade, edging and related accessories.

B. Related Sections:

1. Section 31 22 19 “Finish Grading”.

1.03 STANDARDS AND REFERENCES

A. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D448 – Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

1.04 QUALITY ASSURANCE

A. Comply with Section 01 40 00.

B. Manufacturer: Company specializing in manufacturing Work of this Section with minimum 25 years documented experience.

C. Single Source Responsibility: Obtain each type of decomposed granite surfacing from single manufacturer.

D. Mock Up: Provide a mock-up for evaluation of surface preparation, installation techniques and quality of application.

1. Install a 4-feet x 4-feet minimum of decomposed granite surfacing, including subbase course and edging, at location approved by Landscape Architect.

2. Do not proceed with remaining work until installation of decomposed granite surfacing is approved by Landscape Architect.

3. Approved mock-up may remain as part of completed Work.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 SUBMITTALS

A. Comply with Section 01 33 00 Submittal Procedures.

B. Shop Drawings: Submit plan layout of all decomposed granite surfacing areas and detail drawings showing the various components of the surfacing system, including subbase and edging.

C. Product Data: Manufacturer’s literature completely describing all components of the decomposed granite surfacing system, including:

1. Preparation instructions and recommendations.

2. Installation methods and application procedures.

D. Samples for Verification:

1. Submit samples of each of the following:

a. Three pound sample of each type and color of decomposed granite surfacing material.

b. Optional: Edging material, each type not less than 12 inches long.

E. Certification:

1. Manufacturer and Installer Qualifications.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 66 00 Product Storage and Handling Requirements.

B. Bagged Materials: Accept delivery of materials only in unopened and undamaged containers bearing the brand name and manufacturer's identification.

C. Bulk Materials: Each load of decomposed granite surfacing material arriving at the job site in bulk shall be accompanied by a delivery ticket containing the following minimum information:

1. Quarry of origin.

2. Amount, weight and type of material.

3. Brand name and manufacturer's identification.

D. Protect decomposed granite surface surfacing materials from contamination until ready for installation. Store under cover.

1.08 PROJECT CONDITIONS

A. Surfaces to receive decomposed granite surfacing shall be frost free and free of oil or any other foreign matter, which may impair the proper installation of the surfacing system.

B. Do not install decomposed granite surfacing when subbase course is muddy or saturated with standing water.

C. Perform work in dry weather when subgrade is sufficiently stable to be properly compacted.

1.09 OPERATION AND MAINTENANCE DATA

Not required.

1.10 EXTRA MATERIALS

Not required.

1.11 RECORD DRAWINGS

Not required.

1.12 WARRANTY

Provide Manufacturer's Standard Warranty in accordance with Section 01 78 36 Warranties.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Manufacturer: Provide "Standard Pathway Mix" decomposed granite surfacing system

by the following: Kafka Granite, LLC. Address: 550 East Hwy 153, Mosinee, WI 54455, Tel: (800) 852-7415 (Toll Free), Fax: (715) 687-2395. Email: kafka@kafkagranite.com Web: www.kafkagranite.com

B. Or Architect approved

2.02 DECOMPOSED GRANITE SURFACING MATERIALS

A. Decomposed Granite and Crushed Stone Aggregate: Provide high quality materials consisting of sound, angular, durable stone particles, free from clay lumps, organic materials, frozen materials, or other deleterious substances.

B. Gradation: Manufacturer's standard mix of well-graded materials in accordance with ASTM C136. Blends of coarse sand and rock dust are not acceptable.

Standard Pathway Optimal Gradation		
Sieve	Sieve Size (mm)	Percent Passing
3/8"	9.51	100%
#4	4.76	80-100%
#8	2.36	65-90%
#16	1.18	40-60%
#30	0.6	25-55%
#50	0.3	15-35%
#100	0.149	10-20%
#200	0.074	7-15%

2.03 SUBBASE COURSE MATERIALS

A. Comply with MTO OPSS 1010 – "Material Specification for Aggregates – Granular A, B, M and Select Subgrade Material" specification for Granular A material.

1. Road Base Material: *A*lso known as road rock, road gravel, aggregate base, AB, asphalt base and 3/4" minus. In California the standard is set by Cal Trans and most common is 3/4" aggregate base Class 2.

2.04 ACCESSORIES

A. Water: Clean and potable, free from contaminants that would be deleterious to the decomposed granite surfacing.

B. Steel Edging: 3/16-inch thick x 4-inch deep with overlapping joints.

1. Stakes: 3/16-inch x 16-inch long x 1 3/4-inch wide at top tapering to point at bottom; locate at 36-inch on center maximum.

C. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Application of the herbicide shall pose no short or long term health threats to the installer or the general public.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Notify Landscape Architect of unsatisfactory preparation before proceeding.

B. Correct conditions detrimental to timely and proper completion of Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Lay out work prior to the commencement of installation.

3.02 PREPARATION

A. Excavation: Excavate to depth required so edges of decomposed granite surfacing will match adjacent grades and have a maximum cross-slope of 2 percent. Ensure edges and bottom of excavation are in a smooth and even line.

B. Subgrade Preparation: Plow, harrow and mix the entire surface of the in-place subgrade to a depth of at least 6-inches. After the material has been thoroughly mixed, the subgrade shall be brought to line and grade and compacted to 95% of the maximum laboratory dry density as determined by the Standard Proctor test.

C. Herbicide: Apply herbicide per manufacturer's written instructions. Limit the application to the area to receive decomposed granite surfacing.

D. Subbase Course Preparation: Place the subbase coarse aggregate free from ridges, depressions or hollows. Rake and compact to 95% Standard Proctor Density.

3.03 INSTALLATION

A. Steel Edging: Install edging flush with the top of the decomposed granite surfacing. Provide sufficient stakes to secure edging in place during and after decomposed granite surfacing material installation.

B. Subgrade: Proof-roll the subgrade with heavy pneumatic-tired equipment to locate unstable areas and to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Landscape Architect, and replace with compacted backfill or fill as directed.

2. The surface of the completed subgrade shall be bladed to a smooth and uniform texture.

3. The finished subgrade shall be uniform and free from deleterious debris such as organic materials, nails, stones and loose soil.

C. Subbase: Install aggregate subbase to a compacted depth of 4 to 6-inches minimum for pedestrian traffic, and 8 to 12-inches minimum for vehicular traffic in accordance with manufacturer's recommendations. Install the subbase in multiple 3 to 4-inch lifts, and compact to a minimum 95% density.

D. Compaction: Compact each lift of the subgrade, subbase and final finish decomposed granite surfacing materials with a one to three-ton roller or compactor. In small areas that are difficult to access with compaction equipment, hand tamping may be performed with multiple passes to achieve the required density.

1. Lightly spray surface area following compaction. Do not disturb aggregate surface with spray action.

3.04 INSTALLATION OF DECOMPOSED GRANITE SURFACING

A. Spread decomposed granite surfacing material in 3 to 4-inch lifts. Spread the pathway mix evenly and smoothly before compacting. Allow for 20-25% compaction. Screed if possible.

B. Wet the mix to ensure water has penetrated the full depth of the decomposed granite surfacing material, and roll each lift to form a uniform, smooth surface with a cross slope of 2% maximum. Compact each lift to a minimum 95% density.

C. Grade and smooth to the required elevation; compact final lift with 1-3 ton drum roller or compactor.

D. Minimum Compacted Thickness:

1. Pedestrian Paths: 3-inches.

2. Vehicular Drives and Roadways: 4-inches.

E. Surface shall follow grades per plans. Remove crown, allow 1-2% cross pitch.

F. Completed surface shall be of consistent quality and shall not have depressions or humps greater than 1/4-inch in 10-feet.

3.05 INSTALLATION TOLERANCES

A. Decomposed Granite Surfacing Thickness: Allow for 20-25% compaction.

1. Subbase Course: Plus or minus 1/2-inch.

2. Surface Course: Plus 1/4-inch, no minus.

B. Decomposed Granite Surfacing Smoothness: Produce a surface smoothness within 1/4-inch tolerance when measured with a 10-foot straightedge.

1. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowed variance from template is 1/4-inch.

3.06 CLEAN-UP AND PROTECTION

A. Thoroughly clean all areas where work has occurred. Remove from site excess material, debris and rubbish.

B. Take all precautions necessary to protect completed work until Substantial Completion of project.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Parking stripes, markings and accessibility symbols.
2. Exterior athletic court markings.
3. Playground markings.
4. Fire lane “No Parking.”
5. Curb marking and red curbs.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 32 1236 - Seal for Bituminous Surfacing.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings, indicating location, extent, color and texture of markings.

B. Material Samples: Submit color Samples.

1.03 PROJECT CONDITIONS

A. Do not install markings when adverse weather conditions are forecasted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Paint: Water emulsion-based traffic paint must be approved by OEHS

1. Dunn Edwards: Vin-L-Stripe.
2. Pervo Paint Company: Acrylic Traffic Paint.
3. Sherwin Williams: Setfast Acrylic Traffic Paint.
4. Vista Paint Corporation: Traffic Paint.
5. Equal.

PART 3 - EXECUTION

3.01 PAVEMENT MARKINGS

A. Application of Paint:

1. Prior to application of paint, allow the pavement to properly cure. Clean and prepare in accordance with paint manufacturer's written recommendations.
2. Provide mechanical equipment to apply paint in a uniform, straight or curved pattern, without gaps, holidays, runs, or other defects.

3. Do not permit traffic until paint has completely cured.

4. Apply two coats in thickness recommended by manufacturer.

5. Playground Markings: Submit Samples to Architect for review. Limited color palettes may be submitted.

B. Marking Width and Color: Unless indicated otherwise, marking width and color are as follows:

Location	Width	Color
Parking stall lines	4 inches	White
Traffic markings		
Striping:	4 inches	Yellow
General	4 inches	Yellow
Accessible Parking	4 inches	Blue
International Symbol of Accessibility (ISA)	2 inches	White on blue background
Athletic Court Lines:	2 inches	*White
Letters and numbers:		As indicated

*Where two sets of lines overlap, one set shall be white and the other set shall be yellow.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 17 26

TACTILE WARNING SURFACING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Conditions apply to this Section.

1.02 SCOPE OF WORK SUMMARY

A. Perform all work required for a complete system, as indicated by the Contract Documents. Furnish all items necessary for the proper installation of the system.

B. System shall consist of precast concrete paving units for Portland Cement mortar-set on an engineered concrete slab for pedestrian or vehicular use installations.

1.03 STANDARDS AND REFERENCES

A. American Society for Testing and Materials (ASTM)

ASTM C33	Concrete Aggregates
ASTM C39	Concrete Compressive Strength
ASTM C144	Aggregate for Masonry Mortar
ASTM C150	Portland cement
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C642	Water Absorption, Density, Voids in Hardened Conc
ASTM C666	Rapid Freeze/Thaw Resistance of Conc
ASTM C979	Pigments for Integrally Colored Concrete
ASTM C1028	Coefficient of Friction

B. Concrete Tile Manufacturer’s Association (CTMA) Handbook for Concrete Tiles.

1.04 SUBMITTALS

A. Samples: Submit two full-sized samples of each type of precast concrete paving units to show the full range of color and texture of unit for selection and approval. If sealer is to be applied to precast concrete paving slab, apply sealer on one sample.

B. Warranty: Provide certified copies of manufacturer's product warranties.

C. Shop drawings (Optional)

1. Layout drawings showing pattern of pavers for each paved area, indicate pavers requiring cutting, indicate setting bed methods in each area, and indicate drainage. Include details of setting beds. Indicate details at curbs and vertical surfaces as applicable.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00 Substitution Procedures.

1.06 MOCK-UP

A. Install a 3 ft x 4 ft minimum paver area as described in Article 3.2. Mock-up area to be used to determine joint sizes, lines, color(s) and texture of the job. Mock-up area to be the standard from which the work will be judged. Consideration will be given with regard to differences in age of materials from time of mock-up construction to the time of actual

product delivery and installation.

1.07 QUALITY ASSURANCE

A. Compliance with Regulations: Comply with requirements of state and local building codes and with rules and regulations relating to building accessibility.

B. Qualifications of Manufacturer: Company specializing in manufacture of precast concrete paving units with a minimum of 10 continuous years of documented experience.

C. Qualifications of Subcontractor: Subcontractor shall submit evidence of skill and not less than 5 years of experience in this product type.

D. Pre-installation Conference: As directed by the Architect

E. Precast concrete paving units shall have a compressive strength of 4,000 PSI minimum.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials to the installation site in the manufacturer's original packaging. Packaging shall contain manufacturer's name, customer name, order, identification number, and other related information.

B. Handle and store precast concrete paving units in accordance with manufacturer's recommendations.

1.09 WARRANTY

A. Provide warranty covering precast concrete paving units against defects in material and workmanship for a period of 5 years. Unusual abuse and neglect are excepted.

PART 2 - PRODUCTS

2.01 MANUFACTURER

Basis of Design Manufacturer: Stepstone, Inc.

17025 South Main Street

Gardena, CA 90248

(310) 327-7474

(800) 572-9029

FAX (310) 217-1424

www.stepstoneinc.com

2.02 MATERIALS

A. Precast concrete paving units shall be California Architectural Pavers, precast concrete, consisting of Portland cement, aggregate, and color admixtures.

1. Portland Cement: ASTM C 150, Type III, high early strength.

2. Aggregate: ASTM C 33.

3. Color Admixture: By Davis Colors, or equal, as required to achieve color as selected.

4. Aggregate for exposed aggregate surface: As selected.

5. Portland Cement Mortar that meets or exceeds ANSI A118.4 requirements when mixed with water or a latex admixture, and is designed for installation of large format tile – Pedestrian Installation.

6. Grout that meets or exceeds ANSI A118.7 when mixed with water or a latex

admixture.

B. Precast concrete paving unit style:

1. Truncated Dome Pavers
2. Pavers shall have radius top edge to reduce chipping.
3. All pavers have drafted sides.

2.03 COLORS AND FINISHES

A. Colors: Davis Colors (or equal), integral color admixture. Integral color shall be throughout entire product. Finish color shall not be added as a face mix.

B. Finishes: Walking surfaces of precast concrete paving units shall have minimum coefficient of friction of 0.60, wet and dry.

1. Light Sandblasted
2. Stipple Finish

C. Field Application of Sealer

1. In geographic regions exposed to freeze-thaw conditions field-applied sealing the entire paving area, including joints, after installation is mandatory.
2. Conform to sealer manufacturer's recommendations for application and maintenance of sealer.

2.04 PHYSICAL PROPERTIES

A. Compressive strength: Minimum 4,000 psi.

A. Size and Finish Schedule:

Size	Stipple	Sandblast
12” X 12” X 2”	X	X

B. Unit size: Within 1/8” of designated length, width and thickness.

C. Pavers shall have radius top edge to reduce chipping.

D. Weight

1. Truncated Dome Paver 2” thick: 22 pounds per square foot.

E. Water absorption: Not more than 6.0 % average, not more than 7.0 % for any individual unit for standard colors.

F. Truncated Dome Pavers will contain on average 5% entrained air, with no individual piece under 4%.

G. Resistance to Freeze-Thaw: Truncated Dome Pavers will resist 300 freeze thaw cycles in accordance with ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

2.05 FABRICATION

A. Truncated Dome Pavers shall be hand-made, wet-cast of cement conforming to ASTM C 150, Type III, aggregates conforming to ASTM C 33, and pigments for integrally colored concrete conforming to ASTM C979.

2.06 SOURCE QUALITY CONTROL

A. Concrete for Truncated Dome Pavers shall be tested frequently to assure that mixes provide units having not less than 4,000 psi compressive strength at 28 days (average

test strength not less than 3,500 psi).

B. Minor chips, hairline cracks, air voids and slight variations in color and finish are normal in precast concrete. When viewed in typical daylight illumination from a distance of 20 feet, minor chips, hairline cracks and air voids that cannot be seen with the naked eye are not grounds for rejection.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine all surfaces.

B. Verify all dimensions of in-place and subsequent construction.

C. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work.

D. Do not proceed with the work until unsatisfactory conditions have been corrected.

E. Installation of precast concrete pavers and associated construction constitutes acceptance of the adjacent and underlying construction.

3.02 INSTALLATION - GENERAL

A. Installation shall comply with requirements of applicable building codes and state and local jurisdictions.

B. Install Truncated Dome Pavers in a mortar bed in accordance with the specifications defined in the CTMA Handbook for Concrete Tiles, available at http://www.stepstoneinc.com/docs/ctma_handbook.pdf. Maintain straight pattern lines.

C. 100% paver bonding coverage is recommended, with a minimum acceptable coverage of 95% for exterior installations or 80% for interior installations. Backbuttering is mandatory to obtain a minimum of 95% coverage.

D. Clean any mortar off the face of the pavers immediately. Never leave a 'cement haze' on the concrete paver’s surface.

E. Provide for expansion and control joints as specified per TCA detail EJ-171-current year. Follow expansion and control joint materials manufacturer’s instructions.

F. Typical joints between mortar-set Truncated Dome Pavers are from 3/16” to 1/4” wide. Refer to Section 2.4.C for standard dimensional paver tolerances. (Note: Recommended minimum spacing at bottom of pavers is 1/16”.”)

G. Place grout between Truncated Dome Pavers in accordance with the specifications defined in the CTMA Handbook for Concrete Tiles, available at http://www.stepstoneinc.com/docs/ctma_handbook.pdf

H. Follow grout manufacturer’s directions for use of grout. Grout shall fill joint completely.

I. Truncated Dome Pavers are concrete and the cementitious material in grout will permanently bond to the pavers. Clean any grout off the face of the pavers immediately. Never leave a ‘cement haze’ on the concrete paver’s surface.

3.03 CLEANING

A. Clean exposed surfaces of precast concrete paving units. Use cleaners appropriate for precast concrete finishes and colors. Acid based cleaners will permanently alter finish and color.

3.04 SEALING

A. Field-applied sealer for the prevention of freeze-thaw is optional in mild climates. If

precast concrete paving units are factory sealed, test for compatibility before applying additional sealer.

B. In geographic regions exposed to freeze-thaw conditions field-applied sealing the entire paving area, including joints, after installation is mandatory in order to maintain Stepstone's warranty. Follow sealer manufacturer’s instructions for application and maintenance of the sealer.

3.05 COMPLETION

A. Protect precast concrete paving units from damage due to subsequent building operations.

B. After installation and before completion, inspect precast concrete paving units for construction damage and obtain new precast concrete paving units if required.

C. Immediately prior to final acceptance of project, clean precast concrete paving units.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 33 1100

SITE WATER DISTRIBUTION UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Site water distribution systems located outside the building perimeter, extending to an existing water line or meter.

B. Related Requirements:

1. Division 01 - General Requirements.

   Division 22 – Plumbing.

2. Section 31 2313 - Excavation and Fill.
3. Section 31 2323 - Excavation and Fill for Utilities.
4. Section 32 0117 - Pavement Repair.
5. Section 32 1313 - Site Concrete Work.
6. Section 33 3000 - Site Sanitary Sewer Utilities.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan indicating locations of lines, valves, and related appurtenances.

B. Product Data: Manufacturer's catalog data for materials. Include technical data for accessories, gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publications have been performed, and the performance requirements have been satisfied.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. American National Standards Institute (ANSI):

   a. ANSI H23.1 - Seamless Copper Water Tube.

2. NSF International (NSF):

   a. ANSI/NSF 61 Drinking Water System Components – Health Effects.

   b. ANSI/NSF 372 Drinking Water System Components – Lead Content.

3. American Society of Mechanical Engineers (ASME):

   a. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

   b. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

   c. ASME B16.26 - Cast Copper Alloy Fitting for Flared Copper Tubes.

d. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings.

4. American Society for Testing and Material (ASTM) International:

a. ASTM A36 – Standard Specification for Carbon Structural Steel.

b. ASTM A240 – Standard Specification for chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

c. ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

d. ASTM A536 - Standard Specification for Ductile Iron Castings.

e. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings.

f. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

g. ASTM B75 - Standard Specification for Seamless Copper Tube.

h. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

i. ASTM B152 – Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar.

j. ASTM 17 – Standard Specifications for Copper Alloy Sand Castings for General Applications.

k. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

l. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

m. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.

n. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

o. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

p. ASTM D3350 - Standard Specification for Polyethylene Plastics and Fittings Materials.

q. ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

r. ASTM F2206 - Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE).

s. ASTM F477 - Standard Specification for Elastomeric Seals for Joining Plastic Pipe.

t. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

5. American Water Works Association (AWWA):

a. AWWA C104/A21.4 - Cement-Mortar Lining For Ductile-Iron Pipe and Fittings.

b. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings

c. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

d. AWWA C115/A21.15 - Standard for Flanged Ductile-Iron Pipe with Threaded Flanges.

e. AWWA C153/A21.53 – American National Standard for Ductile-Iron Compact Fittings for Water Service

f. AWWA C207 – Steel Pipe Flanges for Waterworks Service Sizes 4 In. Through 144 In.

g. AWWA C500 - Metal Seated Gate Valves for Water Supply Service.

h. AWWA C503 - Wet- Barrel Fire Hydrants.

i. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 inches through 24 inches (50-mm through 600-mm) NPS.

j. AWWA C510-89 - Standard for Double Check Valve Backflow-Prevention Assembly.

k. AWWA C511 - Reduced-Pressure Principal Backflow-Prevention Assembly.

l. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

m. AWWA C800 - Underground Service Line valves and Fittings.

n. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 4 In. Through 12 In., for Water Transmission and Distribution.

o. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. Through 3 In., for Water Service.

p. AWWA M23 - PVC Pipe - Design and Installation.

q. AWWA M55 - PE Pipe - Design and Installation.

6. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:

   a. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.

7. Uni-Bell PVC Pipe Association (UBPPA):

   a. UBPPA UNI-PUB-09 - Installation Guide for Gasketed-Joint PVC Pressure Pipe (C900).

8. Underwriters Laboratories Inc. (UL):

   a. UL 246 – Standard for Hydrants for Fire-Protection Service.

   b. UL 262 – Standard for Gate Valves for Fire-Protection Service.

   c. UL 312 – Standard for Check Valves for Fire-Protection Service.

9. National Pollutant Discharge Eliminations System (NPDES):

a. Comply with storm water requirements of general permit for storm water discharges when flushing pipe systems including storm drains and maintaining logs.

10. Plastic Pipe Institute (PPI):

a. TN-38 – Bolt Torque for Polyethylene Flanged Joints.

b. TR-4 – Technical Report requirements of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipes.

c. TR-33 – Technical Report for Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe.

B. Provide valves from the same manufacturer.

C. Manufacturer of plumbing products must be third-party certified to ANSI/NSF Standard 61, Section 9 certification, and ANSI/NSF 372 to demonstrate compliance with the federal requirements for lead contribution to drinking water, the Safe Drinking Water Act SDWA, and the California Health and Safety Code Section 116875. No pipe, pipe fitting, or any other fitting or fixture intended to convey or dispose water for human consumption for drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of Health and Safety Code 116875. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25 percent.

D. Qualifications of Manufacturer: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the ARCHITECT.

1.04 PRODUCT HANDLING

A. Store items above ground on platforms, skids, or other required supports.

B. Protect materials from direct sunlight.

C. Protect coating and linings on piping, fittings, and accessories from damage. Repair and/or replace damaged coatings or linings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipes, Fittings, and Joints:

P-1: Underground water service pipe sizes up to 3-inch shall be Copper water tubing, Type K hard, ANSI H23.1, ASTM B88, IAPMO IS. Manufacturer: Mueller, Cerro Brass, Cambridge-Lee, Halstead, or equal.

An approved protective wrap shall be used to completely isolate and protect underground copper tubing and extend past the surface a minimum 12-inch. The excess wrapping shall be trimmed down and taped to copper tubing with 10 mill PVC pipe tape at grade level of concrete or asphalt.

PF-1a: Copper Press-Connect pressure fittings, comply with ASME B16.51 with Ethylene Propylene Diene Monomer, EPDM O-Ring Seal in each end. Fittings with the sizes of 2-1/2” and larger shall have cross-section Grab Rings and separation rings.

Manufacturer: Viega, Mueller Industries, Apollo, or equal.

PF-1b: Wrought Copper - solder type ASME B 16.22.

Manufacturer: Mueller Brass, Nibco, Lee Brass, or equal.

PF-1c: Grooved end type– ASTM B75 or ASTM B152 and ASME B16.22 Wrought Copper, bronze sand casting per ASTM B584 copper alloy CDA 836 per ASME B16.18. Couplings shall be CTS style 606 supplied with angle pattern bolt pads for rigidity, coated with copper coated alkyd enamel. Gaskets shall be pre-lubricated Flush seal type.

Manufacturer: Victaulic, or equal.

P-3: Underground water service pipe sizes 4-inch and larger shall be C900 water service pipe material complying with AWWA C900, and ASTM D1784 Cell Class 12454B with tracer wire, NSF and UL listed. Piping shall be plain end or gasket bell end, pressure class 305 (DR14) with cast iron pipe equivalent outside diameter.

PF-3: Fire Water Service, Domestic Water and Irrigation Service Line Fittings, Joints and Jointing Materials shall be Ductile-iron with mechanical joints conforming to AWWA C110/A21.10 or AWWA C153/A21.53, C900 compatible, and shall have cement mortar lining conforming to AWWA C104/A21.4, standard thickness unless otherwise indicated on Drawings.

a. Pipe joints shall be push on as specified in ASTM D3139.

b. Joints between pipe and metal fittings, valves, and other accessories shall be mechanical joints as specified in AWWA C111/A21.11.

c. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling installation.

d. Gaskets for push on joints for pipe shall conform to ASTM F477.

e. Gaskets for push on joints and compression type joints or mechanical joints for connections between pipes and metal fittings, valves, and other accessories shall be as specified in AWWA C111/A21.11.

f. Sleeve-type mechanically coupled joints may be provided instead of push-on joints on plain-end PVC plastic joints. Comply with requirements of ASTM D3139.

g. Comply with installation guide UBPPA UNI-PUB-09.

Manufacturer: JM Eagle, Diamond Plastics, North American Pipe, or equal.

B. Water meter will be installed by water purveyor for the area, unless noted otherwise.

C. Backflow Preventer Assemblies:

1. Assembly shall be provided with flanged connections, ductile iron with fusion bonded epoxy coated construction, bronze, or stainless steel.

2. Backflow preventer shall be suitable for cold water working pressure of 175 psi.

3. Internal parts shall be designed for replacement without removing valves from line.

4. Double check backflow preventer assembly shall consist of two independently acting spring cam or poppet style check valves, 2 shut-off valves and 4 test cocks. Check valve shall be designed to provide drip tight closure against reverse flow, low pressure drop at maximum flow capacity. Spring-loaded checks shall cause valve to seal against a higher inlet pressure than outlet pressure when there is no flow.

5. Double check backflow preventer assembly shall meet AWWA Standard C510-89. Assembly shall be Ames 2000ss, Febco 850, Watts 709, Wilkins 350, or equal.

6. Reduced pressure backflow preventer assembly shall consist of two check valves located between two shut-off valves with an area of reduced pressure between two check valves and a relief device arranged to discharge to atmosphere.

   a. Comply with AWWA Standard C511.

   b. Fluctuation in piping pressure shall not cause cycling. Backflow preventer shall automatically maintain low pressure zone to positively prevent backflow of water into system. Assembly shall automatically indicated failure of any part vital to backflow prevention by the continuous discharge relief device.

   c. Reduced pressure backflow preventer assembly shall be Cla-Val Model RP-4, or equal.

7. Backflow prevention assemblies (devices), shall be tested and certified by a certified backflow tester, and a test report shall be provided to the water agency having jurisdiction. Testing shall be performed in the presence of the Project Inspector.

PART 3 - EXECUTION

3.01 EXCAVATION, BACKFILLING AND COMPACTING

A. Conform to requirements in Section 31 2323 - Excavation and Fill for Utilities or Section 31 2313 - Excavation and Fill.

3.02 PIPE INSTALLATION

A. Project site water lines shall terminate approximately 5 feet from buildings, unless otherwise indicated on Drawings. Temporarily cap or plug terminals for future connection to building.

3.03 CLEARANCES OF WATER LINE

A. Building or Structures: Two feet.

B. Parallel to Sewer Line:

1. Water line 4-inch or less in diameter shall not be installed in a common trench with the building sanitary drain unless the bottom of the water line is at least 12 inches above the top of the building sanitary drain or where the water line is installed on a solid shelf excavated on one side of the common trench with a minimum clear horizontal distance of 12 inches from the building sanitary drain.

2. Water lines 6-inch and larger in diameter shall be separated from the Project site sanitary sewer, receiving more than one building sanitary drain or acid pipeline, in accordance with the requirement of the State of California, Human and Welfare Agency, Department of Health Services.

C. Crossing Sewer Line:

1. A water line shall be separated from sanitary sewer in accordance with the requirements of the State of California Administrative Code, Title 22, Section 64630(e)(2).

2. Install water line a minimum of 12 inches clear, above or below a sanitary sewer.

3. A water line 6-inch or greater in diameter, crossing under a Project site sanitary sewer line, shall be installed with joints located at least 10 feet away from each side of the sanitary sewer line.

4. A water line 6-inch or greater in diameter, crossing over a Project site sanitary sewer line, shall be installed with joints located at least 4 feet away from each side of a purple pipe or sanitary sewer line.

D. Install water lines no closer than 10 feet horizontally clear from the edge of sewage leach fields, seepage pits, and septic tanks.

3.04 PIPE INSTALLATION AND JOINING

A. Install all piping and fitting systems according to the manufacturer requirement.

B. Remove fins and burrs from pipe and fittings.

C. Clean piping, fitting, valves, and accessories before installing. Maintain items in a clean condition.

D. Provide proper facilities for lowering sections of pipe into trenches. Do not drop into piping, fittings, or other materials into trenches. Accurately cut pipe and install without springing or forcing. Replace any piping or fitting that does not provide sufficient space for proper installation of joining material.

E. Blocking or wedging between bells and spigots is not permitted. Install bell and spigot pipe with bell end pointing in the direction of flow.

F. Install piping to the lines and grades indicated or required. Low points and dips are not permitted. Support piping at proper elevation and grade with secure and uniform supports. Wood support blocking is not permitted. Where sand cement slurry will not be furnished for backfill, install piping so that full length of each section of pipe and each fitting will solidly rest on pipe bedding. Excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated or required for installation. Provide proper allowances and devices for expansion and contraction of piping and systems.

G. Maintain trenches free of standing water until pipe joints have been installed.

H. At the end of each day close open ends of pipe with temporary caps of the same material as the pipe.

I. Do not install piping when trench or weather conditions prevent proper installation.

3.05 CONNECTIONS TO EXISTING WATER LINES

A. After Project Inspector has inspected installation, perform connections to servicing water lines. Schedule service shutdown for connecting new system at a time causing minimum disruption.

3.06 INSTALLATION OF HDPE WATER SERVICE LINE

A. All HDPE pipe and fittings shall be cut, joined, and installed in accordance with the manufacturer's recommendations. Joining, and laying of polyethylene pipe shall be accomplished by personnel experienced and certified in working with polyethylene pipe systems.

B. Jointing:

1. All HDPE pipe shall be joined to itself by the heat fusion process which produces homogeneous, seal, leak tight joints. Tie-ins between sections of HDPE pipe shall be made by butt fusion whenever possible.

2. The pipe shall be joined by the butt fusion procedure outlined in ASTM F 2620 or PPI TR-33. A record or certificate of training for the fusion operator must be provided that documents training to the fundamentals of ASTM F 2620.

3. The employer of the fusion machine operator is responsible for the fusion joint quality of the fusion weld made by that individual. The employer is responsible for documenting all training and qualification records for that individual, including compliance to any code requirements for fusion/bonder operators.

4. All HDPE fusion equipment operators shall be qualified to the procedure used to perform pipe joining. Fusion equipment operators shall have current, formal training on all fusion equipment employed on the project approved by manufacturer. Training received more than two years prior to operation with no evidence of activity within the past 6 months shall not be considered current.

C. Installation:

1. Buried HDPE pipe and fittings shall be installed in accordance with AWWA Manual of Water Supply Practices M55 Chapter 8. The Design Window identified in AWWA M55 Chapter 5 shall be considered acceptable design and installation conditions.

2. Unless required by design documents, no thrust blocks shall be placed in the HDPE pipe system since the fused system is fully restrained.

3. All appurtenances (tees, elbows, services, valves, etc.), must be independently supported and shall not rely on the pipeline and its connections for this support. Excessive stresses may be encountered when appurtenances are inadequately supported.

3.07 INSTALLATION OF C900 PLASTIC WATER SERVICE LINE

A. Unless otherwise indicated, install pipe and fittings as specified and in accordance with UBPPA UNI-B-09 and AWWA M23, Chapter 7, “Installation”.

B. Jointing:

1. Provide push on joints with elastomeric gaskets specified for this type of joint, furnishing either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push on joint connections, provide pipe with push on joint ends furnished with factory installed bevel; for push on joint connections to metal fittings, valves and other accessories, square cut spigot end off pipe end.

2. Provide push on joint lubricant recommended by manufacturer.

3. Install push on joints for pipe-to-pipe connections in accordance with UBPPA UNI-PUB-09 and AWWA M23, Chapter 7, "Installation."

4. Install push on joints for connection to fittings, valves, and other accessories in accordance with requirements of UBPPA UNI-PUB-09 and with applicable requirements of AWWA C600.

5. Compression-type joints/mechanical-joints with gaskets, glands, bolts, nuts and internal stiffeners shall be installed in accordance with the requirements of UBPPA UNI-PUB-09 and AWWA C600 and Appendix A to AWWA C 111/A21.11.

   a. Square cut spigot off end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.

6. Sleeve-type mechanical couplings shall be provided in strict accordance with coupling manufacturer's recommendations using internal stiffeners as specified for compression-type joints.

C. Provide mechanical thrust restraint devices for anchorage and piping unless thrust blocks are indicated on the Drawings. Thrust blocks shall be installed in accordance with the requirements of UBPPA UNI-PUB-09 except that size and location of blocks shall be as indicated. Thrust blocks shall be provided as specified in Section 32 1313 - Site Concrete Work.

3.08 INSTALLATION OF BACKFLOW PREVENTERS

A. Install reduced pressure backflow preventers to comply with RULE 16D of LADWP in the jurisdictional boundaries of Los Angeles Department of Water and Power.

3.09 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. For complete requirement and procedure refer to section 22 1000, article 3.12.

3.10 ABANDONING WATER LINES AND STRUCTURES

A. Water lines and appurtenances to be abandoned in place shall be cut and removed from areas where new Work is being installed.

B. Cap or plug abandoned existing drain lines below grade in a yard box and according to CBC.

3.11 TESTS AND INSPECTIONS

A. Provide labor, equipment, materials, test equipment and incidentals required for performing required field tests.

B. Tests shall not be performed for five days after concrete thrust blocks have been installed.

C. Testing Procedure: Water service lines shall be tested in accordance with applicable specified standard.

1. Test water service lines in accordance with applicable requirements of AWWA C600. No leakage is permitted.

2. Pressure testing: Before pressure test, fill portion of piping being tested with water for a minimum of 24 hours. Provide hydrostatic pressure of at least 50 psi greater than the maximum working pressure of tested system, but no less than 200 psi hydrostatic test pressure for system piping of 2-inch in diameter and

larger. Provide and maintain hydrostatic test pressure for at least two hours to ensure no leakage of any portion of piping or appurtenances under pressure test.

3.12 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.13 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 33 3000

SITE SANITARY SEWER UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Building Sanitary Sewer Lateral.
2. Closed-circuit television inspection of sewer laterals.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Division 22 – Plumbing.
3. Division 23 - Mechanical.
4. Section 31 2313 - Excavation and Fill.
5. Section 31 2323 - Excavation and Fill for Utilities.
6. Section 32 0117 - Pavement Repair.
7. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan denoting locations of lines, valves, and appurtenances.

B. Product Data: Manufacturer's catalog data for materials. Include technical data for accessories, gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publication have been performed and the results required by design have been met.

D. Closeout Submittal: Submit three DVD's of Closed-circuit television inspections performed. Include the following information:

1. Electronic Media Recordings: Visual and audio record of the entire length of pipe. For existing laterals identify problem areas, such as roots, cracks, fractures, broken pipe, and other unusual conditions found.
2. Digital Photographs of the pipe condition, connections, points of interest and defects found. Indicate distance of defects to a point of reference such as face of building or mainline.
3. Inspection Log: Provide written report including:
    a. Date and time of inspection.
    b. Name of School, Project, CONTRACTOR, and operator name.
    c. Location, material and size of pipe.
    d. Description of defects found.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Standard Specifications for Public Works construction, current edition.
2. California Plumbing Code, CPC, current edition.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Pipeline: Building or Project Site Sanitary Sewer and Vent: Minimum 5 feet away from building boundaries. For piping within 5 feet from building boundaries, and interior piping refer to Division 22 plumbing sections.

a.

1. PVC (Poly Vinyl Chloride) Schedule 40 DWV Pipe, Conforming to ASTM D2665, ASTM F794, and ASTM F1866. Installer of PVC Schedule 40 DWV piping system shall carry ASTM D2855 and ASME B31.3 qualification. Installer shall provide proof of these qualifications to Inspector of Record prior to commencing work. Manufacturer: Charlotte pipe and foundry, Spears Manufacturing Company, Harvel Plastics Inc., or equal.

   a. PVC primer and solvent for chemical weld of pipe and fittings shall be as recommended by pipe manufacturer. Containers for solvent and primer shall be clearly marked with manufacturer's data. Solvent and primer shall not be more than one year old. The safety placards must be visible. Blue or red hot glue shall not be used.

      1) Primer: Weld-On P-70 by IPS, Conforming to ASTM F656.

      2) Cement: Weld-On 711 (gray) by IPS, Conforming to ASTM D2564.

2. Vitrified clay extra strength piping with plain ends. Comply with ASTM C700. Install with mechanical compression couplings. Joints shall comply with ASTM C425. Installation shall be in accordance with ASTM C12.

   Manufacturer: Mission Clay Products, or equal.

3. Acid waste and vent pipeline from building to Sampling Box: Refer to Division 22 for corrosive waste and vent piping.

B. Cleanout Assemblies: Cleanout plug shall be line size.

1. In covered concrete-paved floors: Iron body with UPC recognized plug, top, and adjustable sleeve, cut-off ferrule, polished brass/nickel/bronze, and secured Scoriated cover:

   a. Square:

J.R.SMITH	ZURN	JOSAM	OR EQUAL
4053	Z1400-SZ	57008-Z-1-SQ	

   b. Round:

J.R.SMITH	ZURN	WADE	JOSAM	OR EQUAL
4033	Z1400-BZ	W-6000	57008-Z-1	

2. Outside covered concrete-paved floors: Secured cover, extra heavy-duty, adjustable sleeve, cut-off ferrule, UPC recognized brass type plug, scoriated tractor type cover:

J.R.SMITH	ZURN	OR EQUAL
4233	Z1402-HD	

3. In yard boxes: Raised threaded head brass plug and Cast Iron Body Cleanout.

J.R.SMITH	ZURN	WADE	JOSAM	OR EQUAL

		8590A		

C. Yard Boxes: 14 1/2-inch by 19 3/4-inch by 12-inch, cast concrete, with cast-iron hinged locking traffic cover with the word “SEWER,” embossed on the cover in one inch high upper case lettering.

BROOKS No. 36-HFL Assembly with cast iron hinged locking cover	OR EQUAL

D. Concrete, Mortar and Related Materials: Conform to Section 32 1313 - Site Concrete Work, unless noted otherwise.

E. Metal Covers, Frames and Accessories:

1. Conform to Section 206 – Miscellaneous Metal Items of the Standard Specifications for Public Works Construction.

2. Metal Covers and Frames: Vandal-resistant design and construction.

3. Hot-dip galvanize steel parts after fabrication and prior to assembly in accordance with Section 210 – Paint and Protective Coating of the Standard Specifications for Public Works Construction.

F. Bedding Materials: Conform to the requirements of Section 31 2313 - Excavation and Fill or Section 31 2323 - Excavation and Fill for Utilities, as required.

PART 3 – EXECUTION

3.01 SANITARY SEWER INSTALLATION

A. Install sanitary sewers in a uniform alignment and slope to the point of connection as indicated. Before trench excavation, verify size, material, depth, and location of the point of connection. Minimum depth of below grade sewer lines shall be 24 inches to centerline of pipe

B. Pipe slope shall not be less than ¼ inch per foot or 2 percent unless pipe inverts are indicated. Where invert elevations are indicated, install pipe at a uniform slope between inverts.

C. Join pipes and fittings as recommended by the manufacturer.

D. PVC schedule 40 DWV pipe and fittings shall be solvent welded. PVC pipe ends shall be cut ninety (90) degrees and Beveled from 10°-15° with a proper beveling tool, cleaned and cleared of cutting burrs prior to cementing. Use approved reaming tool. Pipe ends shall be wiped clean and free of dirt, moisture, oil, and other foreign material with a rag. Primer shall be applied until the surface of the pipe and fitting is softened. Cement shall be applied with a light coat on the inside of the fitting and two heavier coats on the outside of the pipe. Pipe shall be inserted into the fitting and given a quarter turn while inserting if possible to help seat the cement while both the inside socket surface and outside surface of pipe are wet with solvent cement. Hold joint in place and undisturbed for 1 minute after assembly. Excess cement shall be wiped from the outside of the pipe.

3.02 CLEARANCE OF SANITARY SEWERS

A. Buildings or Structures: Two feet.

B. Parallel to Water Line:

1. Building sanitary drain, is not permitted to be installed in a common trench with a potable water line unless the bottom of the water line is at least 12 inches above the top of the sanitary sewer.

2. In addition, the potable water line shall be installed on a solid shelf excavated on one side of the common trench with a minimum clear horizontal distance of 12 inches from the sanitary sewer or building sanitary drain.

3. Project site sanitary sewer, receiving more than one building sanitary drain or acid pipeline, shall be separated from a potable water line in accordance with the requirements of the California Health, and Human Services Agency: Department of Public Health.

C. Crossing Water Line:

1. Building sanitary drain shall be installed a minimum of 12 inches below the potable water line.

2. Project site sanitary sewer shall be separated from the potable water main in accordance with the requirements of the State of California Administrative Code, Title 22, Section 64630(e)(2).

3.03 MANHOLES

A. Provide manholes in accordance with the Standard Plans for Public Works Construction, unless otherwise indicated.

B. Adjust manholes in accordance with the sub-section 302-5.8 Manholes (and other structures) of the Standard Specifications for Public Works Construction.

3.04 CLEANOUTS

A. Provide cleanout at the upper terminal for each sanitary pipeline, at intervals not exceeding 100 feet in straight run and any fraction thereof and for each aggregate horizontal change in direction exceeding 135 degrees.

B. Install required cleanouts before back filling of horizontal pipelines.

C. In unpaved and asphalt-paved areas, install cleanouts in yard boxes 2 inches below the yard box cover.

D. In concrete-paved areas, extend cleanouts flush with finish grade.

E. In traffic areas, install countersunk cleanout plugs where raised heads protrude.

3.05 ABANDONED SEWERS AND STRUCTURES

A. Plug or cap every abandoned sanitary sewer within 5 feet of the property line in a code required manner.

B. Demolish abandoned sanitary structures such as cesspool, septic tank, sewage pit, and manholes to a minimum depth of 5 feet below the finish grade, including removal of sewage. Disconnect any piping. After inspection, completely fill with earth, sand, gravel, cement-sand slurry, or other required material.

3.06 TESTING

A. After installation, test each sanitary drain and/or sewer and each section between successive manholes for either infiltration or exfiltration. Test shall be conducted in accordance with Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Where excessive ground water is encountered test the pipeline for infiltration.

C. When infiltration or exfiltration exceeds allowable amounts as set forth in the Section 306 formula, perform repairs or replacements as necessary to comply with the required limits.

3.07 CLOSED-CIRCUIT TELEVISION INSPECTION

A. Coordinate with Owner’s Authorized Representative time and date of inspection. Project Inspector shall be present during the CCTV inspection.

B. Clean laterals by hydraulic jet.

C. Perform internal closed-circuit television inspection of lateral from the building to the public mainline. Record sewer in its entirety with no breaks or interruptions. Move camera at a speed no grater than 30 feet per minute, stopping for a minimum of ten seconds to record pipe connections, defects, and points of interest.

D. Maintain technical quality, sharp focus and distortion free picture. Pan, tilt, and rotate as necessary to best view and evaluate connections, defects and points of interest.

E. Closed-circuit Television Equipment: As a minimum equipment shall include:

1. Television camera specially designed for pipe inspections, and operative in 100 percent humidity conditions.

2. Camera and television monitor capable of producing minimum 470H-line resolution color video picture.

3. Camera capable to inspect laterals as small as three inches up to 70 feet from sewer mainline.

4. Camera lighting shall be suitable to allow clear picture of inner wall at least ten feet in front.

F. Defective Work:

1. New Laterals: Defective Work found shall be repaired at CONTRACTOR's expense. Perform a new closed-circuit television inspection at no cost to OWNER.

2. Existing Laterals:

a. If roots, sludge, or sediment material or other defect not related to the Work of this project impedes inspection, withdraw camera, restart inspection from opposite end and notify Owner's Authorized Representative of defects found.

b. If obstruction or stoppage was caused by Work related to this project, remove obstruction at no cost to OWNER. Perform a new closed-circuit television inspection at CONTRACTOR's expense.

3.08 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.09 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes storm drainage piping; sub-surface drains; metal covers, grates and frames; catch basins; box culverts; manholes, and BMPs.

1. Best Management Practices (BMPs):

a. Catch Basin Inserts.

b. Downspout Filters.

c. Bioretention BMPs

1.02 RELATED REQUIREMENTS

A. Division 01 - General Requirements.

B. Section 01 7416 - Storm Water Pollution Prevention Plan.

C. Section 01 7417 – BMP Implementation Plan.

D. Section 01 7418 – Water Pollution Control.

E. Section 22 1000 - Plumbing.

F. Section 31 2313 - Excavation and Fill.

G. Section 31 2323 - Excavation and Fill for Utilities.

H. Section 32 0117 - Pavement Repair.

I. Section 32 1313 - Site Concrete Work.

1.03 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials.

B. ASME: American Society of Mechanical Engineers.

C. ASTM: American Society for Testing and Materials.

D. BMP: Stormwater Best Management Practice.

E. CBC: California Building Code.

F. CCTV: Closed-Circuit Television.

G. DET: Detention BMP.

H. DWV: Drain, Waste, and Vent.

I. FILT: Filter BMP.

J. GS: Gravity Separator.

K. HDPE: High Density Polyethylene.

L. IAPMO: International Association of Plumbing and Mechanical Officials.

M. IOR: Inspector of Record.

N. NPS: Nominal Pipe Size.

O. OAR: OWNER's Authorized Representative.

P. PE: Polyethylene.

Q. Post Construction BMP: Devices installed by the CONTRACTOR for storm water management to be left on site after construction completion.

R. PP: Polypropylene.

S. PVC: Poly Vinyl Chloride.

T. RET: Retention.

U. SDR: Standard Dimensions Ratio.

V. VEG: Vegetative.

W. OWNER: County of Riverside.

X. SWPPP: Storm Water Pollution Prevention Plan.

1.04 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

1. ASHTO M 252: Geotextile Specification for Highway Applications.

2. AASHTO M 294: Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter.

3. AASHTO M 330: Standard Specification for Polypropylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter.

B. American Society for Testing and Materials International (ASTM):

1. ASTM A888: Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

2. ASTM C14: Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.

3. ASTM C443: Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

4. ASTM C564: Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

5. ASTM C76: Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

6. ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.

7. ASTM C858: Standard Specification for Underground Precast Concrete Utility Structures.

8. ASTM C891: Standard Practice for Installation of Underground Precast Concrete Utility Structures.

9. ASTM D2564: Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

10. ASTM D2665: Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
11. ASTM D2855: Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.
12. ASTM D3034: Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
13. ASTM D3212: Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
14. ASTM D448: Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
15. ASTM F1866: Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings.
16. ASTM F2306: Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
17. ASTM F2418: Standard Specification for Polypropylene Corrugated Wall Stormwater Collection Chambers.
18. ASTM F2764: Standard Specification for 6 to 60 in. [150 to 1500 mm] Polypropylene (PP) Corrugated Double and Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications.
19. ASTM F2787: Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers.
20. ASTM F2881: Standard Specification for 12 to 60 in. [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications.
21. ASTM F2922: Standard Specification for Polyethylene Corrugated Wall Stormwater Collection Chambers.
22. ASTM F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
23. ASTM F656: Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
24. ASTM F794: Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

C. Cast Iron Soil Pipe Institute (CISPI):

1. CISPI 301: Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
2. CISPI 310: Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

D. The International Association of Plumbing and Mechanical Officials (IAPMO):

1. IAPMO IS 6: Hubless Cast Iron Sanitary and Rainwater Systems - Installation Standards.

E. Standard Specifications for Public Works Constructions (Greenbook):

1. Section 202: Masonry Materials.
2. Section 206: Miscellaneous Metal Items.
3. Section 207: Pipe.
4. Section 208: Pipe Joint Types and Materials.
5. Section 210: Paint and Protective Coatings.
6. Section 306: Underground Conduit Construction.

1.05 SUBMITTALS

A. Shop Drawings: Submit site plan denoting locations of lines, valves, and appurtenances.

B. Product Data: Manufacturer's catalog data for all required materials. Include technical data for accessories, information concerning gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publication have been performed and the results required by design have been met.

D. Closeout Documents: At Substantial Completion submit to the Owner's Authorized Representative two CD's and one hard copy of the documents indicated in paragraphs 1 through 5 below:

1. Maintenance Log: Provide Microsoft Excel Spreadsheet including the following information:
   a. Maintenance log and upkeep records of the installed Post Construction BMPs. Include the following headers as a minimum: "Date of Service", "Location of BMP", "Type of Maintenance or Service", "Notes", "Next Scheduled Preventive Maintenance Due", and "Inspector Signature".
   b. Maintenance Requirements: Include the following headers as a minimum: "BMP Description", "Location of BMP and Map Grid Location" and "Type of Maintenance or Service Needed", i.e.; weekly, monthly, quarterly, etcetera. "Stock No.", "Manufacturer Contact Information", along with "Frequency" namely: weekly, monthly, quarterly, etcetera and "Special Instructions".
2. Maintenance Manuals: Provide Maintenance Manual for storm drainage BMP components installed along with requirements, replacement or maintenance schedule and plans with the location of each BMP component. This manual shall include product information cut sheet, shop drawings, vendor information for each component and warranty.
3. Record drawings: 'As-Builts' site plan(s) showing Post Construction BMP. Provide a copy of marked record set with red pencil identifying any variations from design documents.
4. Training Documentation:
   a. OWNER attendees sign off training sheet.
   b. Two DVD's of materials covered in the training and components installed.
5. Post-Construction BMP Maintenance Plan: Submit complete Plan per Attachment "A", edit per As-Built conditions and provide missing information.

6. Records of Closed-Circuit Television Inspection: At Substantial Completion submit to the Owner's Authorized Representative three DVD's of Closed-circuit television inspections performed. Include the following information:

   a. Electronic Media Recordings: Visual and audio record of the entire length of pipe. For existing laterals identify problem areas, such as roots, cracks, fractures, broken pipe, and other unusual conditions found.

   b. Digital Photographs of the pipe condition, connections, points of interest and defects found. Indicate distance of defects to a point of reference such as face of building or mainline. Provide the Digital Photographs after fixing the defective pipes.

   c. Inspection Log: Provide written report including:

      1) Date and time of inspection.

      2) Name of School, Project, CONTRACTOR, and operator name.

      3) Location, material and size of pipe.

      4) Description of defects found and attempts to fix them.

1.06 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic products, pipes, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle all products according to manufacturer's written rigging instructions.

1.08 TRAINING OF OWNER PERSONNEL

A. At Substantial Completion and when the storm drainage system is fully operational, knowledgeable representatives from the CONTRACTOR and manufacturer(s) of the components specified and installed at the site shall provide up to 8 hours of training. Date, time and location for the training shall be coordinated through the project Owner's Authorized Representative. Have OWNER attendees sign off training sheet and provide a copy to the Owner's Authorized Representative.

B. Training period shall cover but not be limited to the following:

   1. Explain the operation of storm drainage system and its design intent.

   2. Explain the maintenance requirements of every component of the system.

   3. Provide recommendations of practices to minimize or eliminate negative impact on the system.

   4. Provide maintenance schedule as recommended by the manufacturers for every component and review it with OWNER's Maintenance and Operations staff.

   5. Conduct a site walk, identify every component of the system and demonstrate its operation.

   6. Training shall be conducted with the use of Maintenance log and Maintenance manual.

1.09 SURPLUS MATERIALS

A. Provide enough additional materials for each component of BMP that requires replacement or service during the first year.

PART 2 – MATERIALS AND PRODUCTS

2.01 PIPING MATERIALS

A. General: Minimum 5 feet away from building boundaries. For piping within 5 feet from building boundaries, and interior piping refer to Division 22 plumbing sections. Provide piping system in conformance with Section 207 - Pipe and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction. All Soil-tight pipes shall be provided with joints that are function of opening size, channel length, and backfill particle size. A backfill material containing a high percentage of fine-graded soils requires investigation for the specific type of joint to be used to guard against soil infiltration, including the requirement for fabric-wrapped joints.

B. Nonreinforced Concrete Pipe (CP): ASTM C14, with bell-and-spigot ends and gasketed joints with ASTM C443 rubber gaskets.

C. Reinforced Concrete Pipe (RCP): ASTM C76, with bell-and-spigot ends and gasketed joints with ASTM C443 rubber gaskets.

1. Approved manufacturers: Thompson Pipe Group, or equal.

D. Cast Iron Soil Pipe (CIP):

1. Hubless, service weight, ASTM A888, CISPI 301, conforming to CISPI 310 and installed in accordance to IAPMO IS 6.

2. Cast iron soil coupling: Hubless, heavy-duty with neoprene gaskets, stainless steel corrugated shields, and 4 bands of stainless-steel clamps. IAPMO, ASTM C564 and CISPI 310.

3. Approved manufacturers: American Foundry, Mission Rubber Company, Tyler, or equal.

E. Corrugated, Dual Wall, High Density Polyethylene Drainage Pipe (HDPE):

1. Corrugated PE Drainage Pipe and Fittings NPS 4 to NPS 10: AASHTO M 252, Type S (double-wall) with smooth waterway for coupling joints.

2. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294 or ASTM F2306, Type S (double-wall) with smooth waterway for coupling joints.

3. Approved manufacturer: ADS, Hancor, JM Eagle, or equal.

F. Corrugated, Dual or Triple Wall, Polypropylene Pipe (PP):

1. Corrugated PP Drainage Pipe and Fittings NPS 12 to NPS 60: ASTM F2764, ASTM F2881, or AASHTO M 330, Type S (double-wall) or Type D (triple-wall), for respective diameters. Provide coupling joints with smooth waterway.

2. Approved manufacturers: ADS, Prinsco, or equal.

G. PVC (Poly Vinyl Chloride) Schedule 40 DWV Pipe:

1. Conform to ASTM D2665, ASTM F794, and ASTM F1866.

2. Installer of PVC Schedule 40 DWV piping system shall carry ASTM D2855 and ASME B31.3 qualification. Installer shall provide proof of these qualifications to Inspector of Recor prior to commencing work.

3. Containers for solvent and primer shall be clearly marked with manufacturer's data. Solvent and primer shall not be more than one year old. The safety placards must be visible.

4. Blue or red-hot glue shall not be used.

5. Approved manufacturers and products:

a. Pipe: Charlotte pipe and foundry, Harvel Plastics Inc., JM Eagle, Spears Manufacturing Company, or equal.

b. Primer: Weld-On P-70 by IPS, Conforming to ASTM F656.

c. Cement: Weld-On 711 (gray) by IPS, Conforming to ASTM D2564.

H. PVC (Poly Vinyl Chloride) SDR-35 Pipe, 6” through 15”:

1. Conform to ASTM D3034.

2. Gasketed Joints: Elastomeric gasket joints conforming to ASTM D3212.

3. Gaskets: Chloroprene conforming to ASTM F477.

4. Approved manufacturers: Charlotte pipe and foundry, Harvel Plastics Inc., JM Eagle, Spears Manufacturing Company, or equal.

2.02 BEDDING MATERIAL FOR PIPE

A. General: Conform to the requirements of Section 31 2313 - Excavation and Fill or Section 31 2323 - Excavation and Fill for Utilities, as required.

B. Approved manufacturers and products:

1. Propex Fabrics, Inc.: Geotex 451.

2. TenCate Geosynthetics Americas: Mirafi 140N.

3. US Fabrics, Inc.: 120NW.

4. Equal products.

2.03 PERFORATED SUBSURFACE DRAIN PIPE

A. Perforations shall be symmetrically located within a maximum arc of 160 degrees. Perforations shall provide a total open area of at least 0.3 square inches per linear foot of pipe, with a minimum of one perforation per linear foot, except for joint areas. Perforation shall be either holes or slots. Hole diameters of ¼-inch minimum to ½-inch maximum. Width of slots of 1/8-inch minimum to 5/16-inch maximum with slot length not exceeding 5 inches.

B. Aggregate Around Perforated Pipe shall be 6 inches of gravel containing no particles finer than a 1/2-inch to 3/4-inch sieve opening size.

2.04 STORMWATER TREATMENT SYSTEMS /BMPS

A. GS-2: Catch Basin Inserts, approved manufacturers and products:

1. AbTech Industries: UUF DI-DO.

2. ADS-FlexStorm: FlexStorm Pure or Catch-it.

3. Aquashield Inc.: Aqua-Guardian.

4. Ecosense International: EcoSense International's Catch Basin Insert.

5. EnviroPod Inc.: LittaTrap.

6. Oldcastle Precast Inc.: FLoGard, or GISB.

7. UltraTech International Inc.: Ultra-Drain Guard.

8. Equal products.

B. GS-3: Downspout Filters, approved manufacturers and products:

1. Oldcastle Precast Inc.: FLoGard +Plus.

2. Equal products.

2.05 MANHOLES

A. Provide round reinforced concrete manhole with an H-20 traffic rated hatch & solid cover of minimum 30-inch in diameter with holes of maximum ½-inch in diameter.

2.06 MISCELLANEOUS MATERIALS

A. Metal Covers, Grates, Frames and Accessories:

1. Conform to Section 206 - Miscellaneous Metal Items of the Standard Specifications for Public Works Construction.

2. Hot-dip galvanize steel parts after fabrication in accordance with Section 210 - Paint and Protective Coatings of the Standard Specifications for Public Works Construction.

3. Grates and Frames:

a. Vandal-proof design and construction.

b. ADA compliant, in conformance to CBC 11B-302.3.

c. Rated for vehicular traffic on areas intended for use by motor vehicles.

d. Hot-dip galvanized.

B. Concrete, Mortar and Related Materials: Conform to Section 32 1313 - Site Concrete Work.

C. Manhole Brick Mortar, Grout, and Plaster: Conform to Standard Specifications for Public Works Construction, Section 202 - Masonry Materials.

D. Underground Concrete Structures: Shall be precast and rated for H-20 traffic loading and applicable soil loads. The materials and structural design of the devices shall be per ASTM C857 and ASTM C858.

2.07 NAMEPLATES

A. Stainless steel or aluminium nameplate permanently fastened to BMP showing the following information:

1. BMP ID number and BMP type.

2. Next service day followed by a 1-inch by 4-inch long blank space.

3. Manufacturer name, model number, telephone number and stock ID number.

4. Installation or production date.

5. 1-inch by 4-inch blank space for OWNER's use.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. CONTRACTOR shall arrange for a preconstruction meeting with the manufacturer's representative to review the basic principles for proper installation of Underground BMP type products prior to any installation.

B. Underground Concrete modules shall be installed in accordance with manufacturer's instructions and the current ASTM C891 procedures.

3.02 EXCAVATION, BACKFILLING AND COMPACTING

A. Conform to the requirements of Section 31 2313 - Excavation and Fill or Section 31 2323 - Excavation and Fill for Utilities, as required.

3.03 INSTALLATION OF PIPE

A. Conform to Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Non-ferrous drainpipe installed with less than 12 inches of cover to finish grade shall be provided with a 4-inch thick concrete pipe encasement.

3.04 DRAINAGE APPURTENANCES

A. Catch basins, junction chambers, manholes, box culverts, outlet chambers and other drainage structures: Construct as indicated on Drawings and as specified in Section 32 1313 - Site Concrete Work, and in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

B. Ensure that Post Construction BMP have a visible identifying manufacturer tag with product identification, manufacturer contact information, date of last service and date of next service due.

C. Provide storm drain stencil per City or County requirements as applicable.

3.05 ABANDONED DRAINAGE LINES AND STRUCTURES

A. Cap or plug existing drain lines that are cut and abandoned and remove existing drainage structures that are abandoned.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

B. Maintain Post Construction BMP after installation and keep a maintenance log to be turned over to Owner's Authorized Representative at Substantial Completion.

3.07 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

THIS PAGE IS INTENTIONALLY BLANK