ARCHITECTURAL ASPHALT SHINGLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes asphalt shingles for steep roofs.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 6 Section "Rough Carpentry" for wood sheathing and framing.
   2. Division 7 Section “Sheet Metal Flashing and Trim” for metal valley flashing, step flashing, drip edges, and other sheet metal work.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.

C. Samples for initial selection in the form of manufacturer's sample finishes showing the full range of colors and profiles available for each type of asphalt shingle indicated.

1.04 QUALITY ASSURANCE

A. Fire-Test-Response Classification: Where products with a fire-test-response classification are specified, provide asphalt shingles identical to those tested according to ASTM E 108 or UL 790 and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify each bundle of asphalt shingles with appropriate markings indicating fire-test-response classification of applicable testing and inspecting agency.

B. Wind-Resistance-Test Characteristics: Where wind-resistant asphalt shingles are indicated, provide products identical to those tested according to ASTM D 3161 or UL 997 and passed. Identify each bundle of asphalt shingles with appropriate markings of applicable testing and inspecting agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's unopened bundles or containers with labels intact.

B. Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job-site storage, handling, and protection.

1.06 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installing asphalt shingles only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements, and when substrate is completely dry.

1.07 WARRANTY

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

B. Special Warranty: Submit a written warranty signed by manufacturer agreeing to repair or replace asphalt shingles that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, deformation or deterioration of asphalt shingles beyond normal weathering.
   1. Warranty Period: Manufacturer's standard but not less than 25 years after date of Substantial Completion.
   2. Roofing contractor shall supply a minimum 3 year labor/worknamship warranty to start after the date of substantial completion

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide Architectural asphalt shingles produced by the following or an Approved Equal:
   1. Owens Corning product "Duration"
   2. Certainteed "Landmark"
   3. GAF-Elk "Timberline Prestique"
   4. Atlas "Pinnacle HP"

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   1. Ridge Vents: Owens Corning product "VentSure" or an approved equal.

2.02 ARCHITECTURAL ASPHALT SHINGLES

A. Colors, Blends, and Patterns: Where manufacturer's standard products are indicated, provide asphalt shingles with the following requirements:
   1. Match colors, textures, and patterns indicated by referencing manufacturer's standard designations for these characteristics.
   2. Colors: To be selected by Owner

B. Architectural style, Fiberglass Strip Shingles: Mineral-surfaced, self-sealing, fiberglass-based, strip asphalt shingles, complying with ASTM D 3018, Type I, and ASTM D 3462. Provide shingles with a Class A fire-test-response classification that pass the wind-resistance-test requirements of ASTM D 3161.
   1. Fungus Resistant: Provide shingles that have been surface treated to remain free of fungus and algae growth, which adversely affects the appearance of the roof, for at least 5 years.

C. Hip and Ridge Shingles: Job-fabricated units cut from actual asphalt shingles used.

2.03 METAL TRIM AND FLASHING

A. Sheet Metal Materials: Furnish the following sheet metal materials:
   1. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003 H14 with mill finish, minimum 0.024 inch (0.6 mm) thick, unless otherwise indicated.

B. Metal Drip Edge: Brake-formed sheet metal with at least a 2-inch (50-mm) roof deck flange and a 1-1/2-inch (38-mm) fascia flange with a 3/8-inch (9.6-mm) drip at lower edge. Furnish the

following material in lengths of 8 or 10 feet (2.5 to 3 m).
1. Material: Aluminum sheets.
2. Material: Galvanized-steel sheets.

C. Metal Flashing: Job-cut to sizes and configurations required.
1. Material: Aluminum sheets.

D. Vent Pipe Flashing: Rubber/Plastic manufactured by Oatey or equal.

2.04 ACCESSORIES

A. Felt Underlayment: Type I, 36-inch- (914-mm-) wide, asphalt-saturated organic felt, complying with ASTM D 226 (No. 30) or ASTM D 4869. Felt shall be equivalent to 30w felt.

B. Ridge Vent: High-density polypropylene, nonwoven modified polyester, or other UV-stabilized plastic designed to be installed under asphalt shingles at ridge. Provide vents with a minimum net free venting area of 17.0 sq. ins. per linear foot.

C. Asphalt Plastic Cement: Non-asbestos fibrated asphalt cement, complying with ASTM D 4586.

D. Nails: Aluminum or hot-dip galvanized steel, 0.120-inch- (3-mm-) diameter barbed shank, sharp-pointed, conventional roofing nails with a minimum 3/8-inch- (9.5-mm-) diameter head and of sufficient length to penetrate 3/4 inch (19 mm) into solid decking or at least 1/8 inch (3 mm) through plywood sheathing.
1. Where nails are in contact with flashing, prevent galvanic action by providing nails made from the same metal as that of the flashing.
2. Caulk all exposed nails head with roofing tar to avoid exposure to weather.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of projections and substances detrimental to application. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with noncorrosive roofing nails.

B. Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

3.03 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" or "The NRCA Steep Roofing Manual."
1. Fasten asphalt shingles to roof sheathing with nails.

B. Felt Underlayment: Apply 1 layer of felt underlayment horizontally over entire surface to receive asphalt shingles, lapping succeeding courses a minimum of 2 inches (50 mm), end laps a minimum of 4 inches (100 mm), and hips and valleys a minimum of 6 inches (150 mm). Fasten felt with sufficient number of roofing nails or noncorrosive staples to hold underlayment in place until asphalt shingle installation.
1. Apply an additional layer of felt underlayment on roof decks with a slope of 2 to 4 inches per

foot (1:6 to 1:3).

C. Flashing: Install metal flashing and trim as indicated and according to details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual" and ARMA's "Residential Asphalt Roofing Manual."

D. Install asphalt shingles, beginning at roof's lower edge, with a starter strip of roll roofing or inverted asphalt shingles with tabs removed. Fasten asphalt shingles in the desired weather exposure pattern; use number of fasteners per shingle as recommended by manufacturer. Use vertical and horizontal chalk lines to ensure straight coursing.
   1. Cut and fit asphalt shingles at valleys, ridges, and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap asphalt shingles at ridges to shed water away from direction of prevailing wind.
   2. Use fasteners at ridges of sufficient length to penetrate sheathing as specified.
   3. Pattern: 1/3 shingle spacing offset at succeeding courses.

E. Ridge Vents: Install ridge vents according to manufacturer's instructions.

3.04 ADJUSTING

A. Replace any damaged materials installed under this Section with new materials that meet specified requirements.

END OF SECTION

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following electrical materials and methods:
   1. Building wire, connectors, and splices for branch circuits and feeders.
   2. Electrical identification.
   3. Electrical demolition.
   4. Cutting and patching for electrical construction.
   5. Meter sockets.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
   1. Submit cut sheets for all metering equipment.

B. Product Data for each type of product specified.

C. Coordination Drawings for electrical installation.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 70 for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
   1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.05 SEQUENCE AND SCHEDULING

A. Coordinate electrical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

C. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

D. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

PART 2 PRODUCTS

2.01 BUILDING WIRE

A. Description: Single conductor, copper. Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

B. Thermoplastic Insulated Wire: Conform to NEMA WC 5.

C. Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for

service indicated. Select to comply with Project's installation requirements.

D. NM cable shall be use for branch circuits in stud walls.

E. Four wire telephone cable shall be furnished and installed to locations indicated. Face plates with connector shall be included.

F. Co-ax television cable shall be furnished and instlled to location indicated. Face plates and connectors shall be provided.

2.02 ELECTRICAL IDENTIFICATION

A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch wide (0.08 mm thick by 25 mm wide).

C. Underground Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
   1. Size: Not less than 4 mils thick by 6 inches wide (0.102 mm thick by 152 mm wide).
      a. Compounded for permanent direct-burial service.
      b. Printed Legend: Indicates type of underground line.

D. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

E. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

2.03 METER SOCKETS

A. Meter sockets comply with serving utility company requirements.

B. Identify each meter base by unit number with stenciled numbers 2” height with black enamel paint . Two coats of paint are required. The paint shall be rated for outdoor use and appropriate for metal.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION REQUIREMENTS

A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.

B. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Give right of way to raceways and piping systems installed at a required slope.

3.02 WIRING METHODS

A. Feeders: Type THHN/THWN, copper conductor, in raceway, except as otherwise indicated.

B. Branch Circuits: Type THHN/THWN, in raceway.

3.03 ELECTRICAL SUPPORTING METHODS

A. Damp Locations and Outdoors: Hot-dip galvanized materials components.

B. Dry Locations: Steel materials.

3.04 INSTALLATION

A. Install wires in raceway according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Conductor Splices: Keep to the minimum and comply with the following:
   1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
   2. Use splice and tap connectors that are compatible with conductor material.

C. Wiring at Outlets: Install with at least 12 inches (300 mm) of slack conductor at each outlet.

D. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

E. Install devices to securely and permanently fasten and support electrical components.

F. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

G. Firestopping: Apply to cable and raceway penetrations of fire-rated floor and wall assemblies. Perform firestopping as specified in Division 7 Section "Firestopping" to reestablish the original fire-resistance rating of the assembly at the penetration.

H. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:
   1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
   2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
   3. In partitions of light steel construction use sheet-metal screws.
   4. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

I. Install identification devices where required.
   1. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

3.05 DEMOLITION

A. Where electrical work to remain is damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work Indicated to Be Demolished: Remove exposed electrical installation in its entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap and patch surface to match

existing finish.

D. Removal: Remove demolished material from the Project site.

END OF SECTION

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.
   1. Piping materials and installation instructions common to most piping systems.
   2. Escutcheons.
   3. Dielectric fittings.
   4. Flexible connectors.
   5. Equipment nameplate data requirements.
   6. Field-fabricated metal and wood equipment supports.
   7. Installation requirements common to equipment specification sections.
   8. Mechanical demolition.
   9. Cutting and patching.
   10. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in Division 15 piping system Sections.

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   1. CPVC: Chlorinated polyvinyl chloride plastic.
   2. PVC: Polyvinyl chloride plastic.
   3. PEX: Cross-linked polyethylene

1.04 SUBMITTALS

A. Product Data: For dielectric fittings, flexible connectors, and identification materials and devices.

B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

1.05 QUALITY ASSURANCE

A. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure to allow for mechanical installations.

C. Coordinate installation of required supporting devices.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work.

E. Coordinate connection of mechanical systems with utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Dielectric Unions:
      a. Capitol Manufacturing Co.
      b. Central Plastics Co.
      c. Eclipse, Inc.; Rockford-Eclipse Div.
      d. Epco Sales Inc.
      e. Hart Industries International, Inc.
      f. Watts Industries, Inc.; Water Products Div.
      g. Zurn Industries, Inc.; Wilkins Div.
   2. Dielectric Couplings:
      a. Calpico, Inc.
      b. Lochinvar Corp.
   3. Dielectric Nipples:
      a. Grinnell Corp.; Grinnell Supply Sales Co.
      b. Perfection Corp.
      c. Victaulic Co. of America.

2.02 PIPE AND PIPE FITTINGS

A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

C. Crimp Fittings: CSA B137.5, NSF approved for potable water use.
   1. ASTM F 1807: Metallic
   2. ASTM F 2159: Polymer

D. Press Fittings: CSA B137.5, ASTM F 877, NSF approved for potable water use.

2.03 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32; “lead-free”, NSF approved for potable water use.

D. Brazing Filler Metals: AWS A5.8.
   1. BCuP Series: Copper-phosphorus alloys.
   2. BAg1: Silver alloy.

E. Solvent Cements: Manufacturer's standard solvent cements for the following:
   1. CPVC Piping: ASTM F 493.
   2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

F. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

2.04 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, and plain types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.05 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
   1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
   2. OD: Completely cover opening.
   3. Cast Brass: One piece, with set screw.
      a. Finish: Polished chrome-plate.
   4. Cast Brass: Split casting, with concealed hinge and set screw.

a. Finish: Polished chrome-plate.
5. Cast-Iron Floor Plate: One-piece casting.
6. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome plated finish.

PART 3 EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping, meeting existing conditions and as required to comply with the design intent.

C. Install components with pressure rating equal to or greater than system operating pressure.

D. Install piping free of sags and bends.

E. Install piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

F. Install piping tight to slabs, beams, joists, columns, walls, and other building elements.

G. Install piping to allow application of insulation plus 1-inch clearance around insulation.

H. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

I. Install fittings for changes in direction and branch connections.

J. Install couplings according to manufacturer's written instructions.

K. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and ceilings according to the following:
1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast brass or stamped steel.
5. Piping in Utility Areas: Cast brass or stamped steel.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 Section "Firestopping" for materials.

M. Verify final equipment locations for roughing-in.

N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

O. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
6. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. CPVC Piping: ASTM D 2846 and ASTM F 493.
    c. PVC Pressure Piping: ASTM D 2672.
    d. PVC Nonpressure Piping: ASTM D 2855.
    e. Comply with manufacturer's installation instructions.

P. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.02 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom.

B. Install equipment according to approved submittal data. The Work shown is only in diagrammatic form. Refer conflicts to Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

E. Install equipment giving right of way to piping installed at required slope.

F. Install flexible connectors on equipment side of shutoff valves.

3.03 PAINTING AND FINISHING

A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.

B. Apply paint to exposed piping according to the following, unless otherwise indicated:
1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish

coats over galvanized metal primer.

3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

C. Do not paint piping specialties with factory-applied finish.

D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.04 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

3.05 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.06 DEMOLITION

A. Disconnect, demolish, and remove Work in its entirety as shown on the drawings.

B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Removal: Remove material and equipment not being turned over to the Owner from the project site.

D. Refer to Division 1 and Architectural sections for additional information.

3.07 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

END OF SECTION

BUILDING INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Concealed building insulation.
   2. Exposed building insulation.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 7 Section "Through-Penetration Firestop Systems" for safing insulation.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of insulation product specified.

C. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

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

1.05 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
   1. Glass-Fiber Insulation:
      a. CertainTeed Corporation.

b. Owens-Corning Fiberglas Corporation.

2.02 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

B. Unfaced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing).
   1. Mineral-Fiber Type: Fibers manufactured from glass.
   2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
   3. R-Value: As indicated on the drawings

C. Faced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type III, Class A (blankets with reflective vapor-retarder membrane facing and flame spread of 25 or less); with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.
   1. Mineral-Fiber Type: Fibers manufactured from glass.
   2. R-Value: As indicated on the drawings.

2.03 AUXILIARY INSULATING MATERIALS

A. Eave Ventilation Troughs: Preformed rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.03 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Apply single layer of insulation to produce thickness indicated.

3.04 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written

instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
   1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Set reflective, foil-faced units with not less than 0.75-inch (19-mm) air space in front of foil as indicated.

E. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
   1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
   2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. For wood-framed construction with faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.

3.05 PROTECTION

A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

CEMENT CONCRETE PAVEMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes exterior portland cement concrete paving for the following:
   1. Curbs and gutters.
   2. Walkways.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 2 Section "Earthwork" for subgrade preparation, grading and subbase course.

1.03 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials, and others if requested by Engineer.

C. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

D. Material certificates in lieu of material laboratory test reports when permitted by Engineer. Material certificates shall be signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements. Provide certification from admixture manufacturers that chloride content complies with requirements.

1.04 QUALITY ASSURANCE

A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
   1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
   2. ACI 318, "Building Code Requirements for Reinforced Concrete."
   3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Concrete Testing Service: Contractor shall engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes. The independent testing agency shall be subject to approval of the owner.

1.05 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves of a 100-foot or less radius.

B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 60, deformed.

B. Welded Steel Wire Fabric: ASTM A 185.
   1. Furnish in flat sheets, not rolls, unless otherwise acceptable to Engineer.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.
   1. Use one brand of cement throughout Project unless otherwise acceptable to Engineer.

B. Fly Ash: ASTM C 618, Type F.

C. Normal-Weight Aggregates: ASTM C 33, Class 4, and as follows. Provide aggregates from a single source.
   1. Maximum Aggregate Size: 1-1/2 inches.
   2. Do not use fine or coarse aggregates that contain substances that cause spalling.
   3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Engineer.

D. Water: Potable.

2.04 ADMIXTURES

A. Provide concrete admixtures that contain no more than 0.1 percent chloride ions.

B. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

F. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

G. Products: Subject to compliance with requirements, provide one of the following:
   1. Air-Entraining Admixture:
      a. Air-Tite or Amex 210; Cormix Construction Chemicals.
      b. Air-Mix or Perma-Air; Euclid Chemical Co.
      c. Darex AEA or Daravair; W.R. Grace & Co.
   2. Water-Reducing Admixture:
      a. Chemtard; ChemMasters Corp.
      b. Type A Series; Cormix Construction Chemicals.
      c. Eucon WR-75; Euclid Chemical Co.
   3. Water-Reducing and Accelerating Admixture:
      a. Q-Set; Conspec Marketing & Manufacturing Co.

b. Gilco Accelerator or Lub NCA; Cormix Construction Chemicals.
c. Accelguard 80; Euclid Chemical Co.

4. Water-Reducing and Retarding Admixture:
   a. Type D Series; Cormix Construction Chemicals.
   b. Eucon Retarder 75; Euclid Chemical Co.
   c. Daratard-17; W.R. Grace & Co.

2.05 CURING MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
   1. Waterproof paper.
   2. Polyethylene film.
   3. White burlap-polyethylene sheet.

C. Clear Solvent-Borne Liquid Membrane-Forming Curing Compound: ASTM C 309, Type I, Class A or B, wax free.

D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

E. Products: Subject to compliance with requirements, provide one of the following:
   1. Evaporation Control:
      a. Aquafilm; Conspec Marketing and Mfg. Co.
      b. Eucobar; Euclid Chemical Co.
      c. E-Con; L&M Construction Chemicals, Inc.
   2. Clear Waterborne Membrane-Forming Curing Compound:
      a. Clear Cure Water Base; Anti-Hydro Co., Inc.
      b. Spartan Cote WB; The Burke Co.
      c. W.B. Resin Cure; Conspec Marketing and Mfg. Co.

2.06 RELATED MATERIALS

A. Boiled Linseed Oil Mixture: Combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.

2.07 CONCRETE MIX

A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.
   1. Do not use the Owner's field quality-control testing agency as the independent testing agency.
   2. Limit use of fly ash to 25 percent of cement content by weight.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28-Day): 3000 psi.
   2. Maximum Water-Cement Ratio at Point of Placement: 0.50.
   3. Slump Limit at Point of Placement: 3 inches.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows with a tolerance of plus or minus 1-1/2 percent:
   1. Air Content: 5.5 percent for 1-1/2-inch maximum aggregate.

2. Air Content: 6.0 percent for 1-inch maximum aggregate.
3. Air Content: 6.0 percent for 3/4-inch maximum aggregate.
4. Air Content: 7.0 percent for 1/2-inch maximum aggregate.
5. Air Content: 2.5 to 4.5 percent.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.02 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork and screeds for grade and alignment to following tolerances:
1. Top of Forms: Not more than 1/8 inch in 10 feet.
2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.

C. Clean forms after each use and coat with form release agent as required ensuring separation from concrete without damage.

3.03 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 JOINTS

A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
   1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as shown on Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows:
   1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
   2. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
   1. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

D. Expansion Joints: Form expansion joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
   1. Locate expansion joints at intervals of 30 feet, unless indicated otherwise.
   2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
   3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
   4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

3.05 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
   1. When concrete placing is interrupted for more than 1/2 hour, place a construction joint.

F. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.

H. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

I. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.

J. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

K. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
   1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
   3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.06 CONCRETE FINISHING

A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by

hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across concrete, perpendicular to line of traffic, to provide a uniform gritty texture finish.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

B. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch.
2. Radius: 3/8 inch.

3.07 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.

B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.08 FIELD QUALITY CONTROL TESTING

A. The Contractor shall employ a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. The testing agency selected shall be subject to the approval of the Owner. Sampling and testing for quality control may include the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    a. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
    b. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of air-entrained concrete.
    c. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. Test one specimen at 7 days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.
2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When total quantity of a given class of concrete is less than 50 cu. yd., Engineer may waive strength testing if adequate evidence of satisfactory strength is provided.
4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

B. Test results will be reported in writing to Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.

C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

D. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.09 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.

B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep

concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION

CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.03 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

B. Comply with NFPA 70.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Deliver wires and cables according to NEMA WC 26.

1.05 COORDINATION

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

B. Thermoplastic Insulation Material: Comply with NEMA WC 5.

C. Conductor Material: Copper.

D. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

2.03 CONNECTORS AND SPLICES

A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 WIRE AND INSULATION APPLICATIONS

A. Service Entrance: Type USE.

B. Feeders: Type THHN/THWN, in raceway.

C. Branch Circuits: Type THHN/THWN, in raceway.

D. Fire Alarm Circuits: Type THHN/THWN, in raceway.

E. Class 1 Control Circuits: Type THHN/THWN, in raceway.

3.03 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Remove existing wires from raceway before pulling in new wires and cables.

C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping."

F. Identify wires and cables according to Division 16 Section "Basic Electrical Materials and Methods."

G. Identify wires and cables according to Division 16 Section "Electrical Identification."

3.04 CONNECTIONS

A. Conductor Splices: Keep to minimum.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

C. Use splice and tap connectors compatible with conductor material.

D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION

CUTTING AND PATCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

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

B. Related Sections include the following:
   1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building for alterations.
   2. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.
   3. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
      a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 15 and 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.03 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.04 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
   6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
   7. Architect's/Engineer's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.05 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their

load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
   1. Primary operational systems and equipment.
   2. Air or smoke barriers.
   3. Fire-protection systems.
   4. Control systems.
   5. Communication systems.
   6. Conveying systems.
   7. Electrical wiring systems.
   8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
   1. Water, moisture, or vapor barriers.
   2. Membranes and flashings.
   3. Equipment supports.
   4. Piping, ductwork, vessels, and equipment.
   5. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.06 WARRANTY

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

PART 2 PRODUCTS

2.01 MATERIALS

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

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

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be

performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 PREPARATION

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

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

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

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.03 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into

another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
b. Where drywall, sub-floors or any other material is removed that depends on support, the existing material must be cut to the closest support stud/beam. The new patch shall extend from stud/beam to stud/beam.

4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION REQUIREMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

PART 2 PRODUCTS

2.01 HARDWARE

A. Hardware Manufacturers:
   1. Hager, HA
   2. Ives, IV
   3. Kwikset Corporation, KW
   4. Pemko, PE
   5. Rockwood Manufacturing, RO
   6. Stanley Hardware, ST
   7. Taco, TA

B. Door Hardware:
   1. Locksets, knobs, levers, and deadbolts shall be UltraMax Security manufactured by Kwikset Corporation as indicated in the Schedule at the end of this Section. No substitutions shall be permitted for locksets, knobs, levers or deadbolts.
   2. Cylinders shall be 6-pin removable core.

C. Key locks to Owner's existing master-key system. Provide key control system, including cabinet.
   1. Deadbolts and locksets for front and rear entry doors shall be keyed alike for each unit and keyed to the Owner's master key system.
   2. Locks for exterior storage rooms, interior mechanical closets, and attic access for all units shall be keyed alike to the Owner's master maintenance key.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount hardware in locations recommended by the Door and Hardware Institute, unless otherwise indicated.

3.02 HARDWARE SCHEDULE

A. Front and Rear Entry Doors Typical Units:

1.	Hinges - 1 ½ pair	RC1842 4X4	US3	HA
2.	Lockset - 1 each	740CAMK	US26D	KW
3.	Deadbolt - 1 each	780MK	US26D	KW
4.	Door Viewer - 1 each	622	US26	RO
5.	Door Bumper - 1 each	441CU	US26D	RO
6.	Weatherstrip - 1 each	315DR 17'	D	PE
7.	Threshold - 1 each	2005AV 36”	AL	PE
8.	Door Shoe - 1 each	216AV 36”	AL	PE

B. Exterior Storage Rooms:

1.	Hinges - 1 ½ pair	RC1842 4X4	US3	HA
2.	Lockset - 1 each	740CAMK	US26D	KW
3.	Threshold - 1 each	2005AV 36”	AL	PE

C. Interior Mechanical Rooms:

1.	Hinges - 1 ½ pair	RC1842 3-1/2X3-1/2	US3	HA
2.	Lockset - 1 each	740CAMK	US26D	KW

D. Bedroom & Bathrooms:

1.	Hinges - 1 ½ pair	RC1842 3-1/2X3-1/2	US3	HA
2.	Privacy Set - 1 each	730CA	626	KW
3.	Hinge Pin Door Stop	70	626	IV

E. Bedroom Closets and Linen Closets:

1.	Hinges - 1 ½ pair	RC1842 3-1/2X3-1/2	US3	HA
2.	Passage Set - 1 each	720CA	626	KW
3.	Hinge Pin Door Stop	70	626	IV

F. Attic Access:

1.	Tee Hinges 4” - 1 pair	904-14 2600	PS	ST
2.	Rim Lock - 1 each	TA-SB923	US4	TA

G. Front and Rear Entry Doors HCP Units:

1.	Hinges - 1 ½ pair	RC1842 4X4	US3	HA
2.	Lockset - 1 each	405DLMK	US26D	KW
3.	Deadbolt - 1 each	780MK	US26D	KW
4.	Door Viewer - 2 each	622	US26D	RO
5.	Door Bumper - 1 each	441CU	US26D	RO
6.	Weatherstrip - 1 each	315DR 17'	D	PE
7.	Threshold - 1 each	2005AV 36”	AL	PE
8.	Door Shoe - 1 each	216AV 36”	AL	PE
9.	Modular Ramp Threshold Assembly			
10.	(Front Door Only)	R1FMRAK	PemKote	PE

H. Bedroom & Bathrooms HCP Units:

1.	Hinges - 1 ½ pair	RC1842 3-1/2X3-1/2	US3	HA
2.	Privacy Set - 1 each	300DL	US26D	KW
3.	Hinge Pin Door Stop	70	626	IV

I. Bedroom Closets and Linen Closets HCP Units:

1.	Hinges - 1 ½ pair	RC1842 3-1/2X3-1/2	US3	HA
2.	Passage Set - 1 each	200DL	US26D	KW
3.	Hinge Pin Door Stop	70	626	IV

END OF SECTION

DOORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Solid-core doors with wood-veneer faces.
   2. Hollow-core doors with wood-veneer faces.
   3. Six-panel steel doors with wood frames.

B. Related Sections include the following:
   1. Division 6 Section "Finish Carpentry" for wood door frames.

1.03 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Retain one standard below. NWWDA I.S.1-A is less restrictive than AWI or WIC; WIC applies only in California, Nevada, and Oregon. See Evaluations. Review standard selected and coordinate its requirements with options selected.

C. Quality Standard: Comply with ANSI/NWWDA I.S.1, AWI Section 1300.
   1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.
   1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
      a. Solid-Core Interior Doors: Life of installation.
      b. Hollow-core Interior Doors: Life of installation.
      b. Steel Exterior Doors: Life of installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by following or an approved equal:
   1. Interior Flush Wood Doors:
      a. Jeld Wen Window & Door Company, “Pro Core” .SCWD or S.L.C with toprail, bottom rail and stiles of solid wood.
      b. Masonite Solid Doors
   2. Exterior Six-Panel Metal Doors with Wood Frame:
      a. Masonite Door Designer, Masonite HD 6 Panel Door with No Glass.
      b. Jeld Wen Window & Door Company

2.02 DOOR CONSTRUCTION, GENERAL

A. Doors for Opaque Finish:
   1. Grade: Economy.
   2. Faces for Exterior Doors: Six-panel HD wood edge, steel entry door.
   3. Faces for Interior Doors: Any closed-grain hardwood of mill option.

2.03 DOORS

A. Exterior Doors:
   1. Core: Insulated core to be poured-in-place polyurethane foam forming a secure attachment to all door components.
   2. Construction: Using 6-piece construction that includes primed white 24 gauge steel facings, wood lock stile, wood hinge stile, wood top rail and rot resistant composite bottom rail. Door facings are to be interlocked to stiles and rails forming a mechanical bond.
   3. Veneers: Metal six-panel, 24 gauge primed veneers.

B. Interior Veneer-Faced Doors:
   1. Core: Either glued or nonglued block or structural composite lumber with wood rails. No MDF will be accepted.
   2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.04 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI

A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Exterior Doors: Exterior doors shall be factory primed and painted with semi gloss exterior grade white paint.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

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

3.02 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
   1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.
      a. Comply with NFPA 80 for fire-rated doors.
   2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

D. Field-Finished Doors: Refer to the following for finishing requirements:
   1. Division 9 Section "Painting."

3.03 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

C. Doors dragging carpet will not be accepted. The Contractor shall adjust all doors accordingly to avoid interference with the carpet or other adjacent finishes.

END OF SECTION

DUCT ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Manual-volume dampers.
   2. Flexible ducts.
   3. Flexible connectors.
   4. Dryer vents and covers.
   5. Duct accessory hardware.

1.03 SUBMITTALS

A. Product Data: For the following:
   1. Manual-volume dampers.
   2. Flexible ducts.
   3. Dryer vents.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:
   1. Special fittings and manual- and automatic-volume-damper installations.

1.04 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:
   1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
   2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

2.02 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

C. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.03 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.

C. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 4-3/8-inch- wide, 0.028-inch- thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.

D. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.
   1. Minimum Weight: 26 oz./sq. yd..
   2. Tensile Strength: 480 lbf/inch in the warp, and 360 lbf/inch in the filling.

2.04 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 2” thick (R5), glass-fiber insulation around a continuous inner liner.
   1. Reinforcement: Steel-wire helix encapsulated in inner liner.
   2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
   3. Inner Liner: Polyethylene film.

C. Pressure Rating: 6-inch wg positive, 1/2-inch wg negative.

2.05 DRYER VENTS AND COVERS

A. Dryer Vent: Molded plastic construction with multi-blade face damper.

B. Vent cover: Stainless steel construction with vandal resistant anchor bolts; equal to Model GDVC-200; contact Eastern Sales and Marketing at (423)479-4408, info@easternsales-marketinginc.com.

2.06 ACCESSORY HARDWARE

A. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

3.02 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION

DUCT INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes duct and equipment insulation.

B. Related Sections include the following:
   1. Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and requirements for penetrations through fire and smoke barriers.

1.03 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.

B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.

C. Cold Surfaces: Normal operating temperatures less than 75 deg F.

D. Thermal Resistivity: “r-values” represent the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between two exposed faces required to cause one Btu to flow through one square foot of material, in one hour, at a given mean temperature.

E. Density: Is expressed in lb/sq.ft.

1.04 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.05 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

1.06 SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Glass Fiber Insulation:
      a. CertainTeed Corporation.

b. Knauf FiberGlass GmbH.
c. Owens-Corning Fiberglas Corp.

2.02 INSULATION MATERIALS

A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.03 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd..
   1. Tape Width: 4 inches.

2.04 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.02 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

E. Keep insulation materials dry during application and finishing.

F. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

G. Apply insulation with the least number of joints practical.

H. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

I. Hangers and Anchors: Seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

J. Insulation Terminations: Seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

K. Apply insulation with integral vapor barrier jackets as follows:
   1. Pull jacket tight and smooth.
   2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
   3. Vapor-Retarder Mastics: Apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

M. Install vapor-retarder mastic on ducts.
   1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.

N. Interior Wall, Partition and Floor Penetrations: Apply insulation continuously through walls, partitions, and floors.

3.03 GLASS FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation in accordance with manufacturer's instructions.
   1. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
   2. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
   3. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round duct elbows with individually mitered gores cut to fit the elbow.
   4. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange spaced 6 inches o.c.
   5. Apply vapor-retarder mastic to open joints, breaks, and punctures.

3.04 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:
   1. Supply- and return-air ductwork.

D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Factory-insulated flexible ducts.
   2. Factory-insulated plenums, casings and air handlers.
   3. Flexible connectors.

4. Vibration-control devices.
5. Testing agency labels and stamps.
6. Nameplates and data plates.
7. Access panels and doors in air-distribution systems.

3.05 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Rectangular, supply-air and return air ducts, concealed.
   1. Material: Glass-fiber blanket.
   2. Thickness: 2 inch.
   3. Number of Layers: One.
   4. Vapor Retarder Required: Yes.

B. Service: Rectangular, supply-air and return air ducts, exposed.
   1. Material: Glass-fiber blanket.
   2. Thickness: 2 inch.
   3. Number of Layers: One.
   4. Vapor Retarder Required: Yes.

3.06 OUTDOOR (ATTIC SPACE) DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Round, supply-air or return air ducts.
   1. Material: Glass-fiber blanket.
   2. Thickness: 3 inches.
   3. Number of Layers: Two.
   4. Vapor Retarder Required: Yes.

B. Service: Rectangular, supply-air or return air ducts.
   1. Material: Glass-fiber blanket.
   2. Thickness: 3 inches.
   3. Number of Layers: Two.
   4. Vapor Retarder Required: Yes.

END OF SECTION

FEDERAL SEVERE USE CASEWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes:
   1. Wood-faced kitchen cabinets.
   2. Plastic-laminate countertops.
   3. Wall mounted metal grease splash.

B. Related sections include the following:
   1. Division 11 section “Residential Appliances” for appliances mounted in kitchen casework.
   2. Division 15 section “Plumbing Fixtures” for sink units mounted in countertops.

1.03 REFERENCE STANDARDS

A. Comply with the following Reference Standards:
   1. Cabinets:
      a. HUD Minimum Property standards for Housing.
      b. ANSI/KCMA A161.1 - Recommended Performance and Construction Stadards for Kitchen and Vanity Cabinets.
      c. Plywood:
         1) ANSI/HPMA HP - Hardwood and Decorative Plywood
         2) US Product Standard PS 1 - Softwood Plywood, Construction and Industrial
      d. Pressure Treating Lumber: AWPA Standard C2 - Lumber, Timbers, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Process.
   2. Cabinet Hardware: ANSI/BHMA A156.9 Cabinet Hardware.
   3. Plastic Laminate Countertops: ANSI 161.2 - Performance Standards for Fabricated High Pressure Decorative Laminate Countertops.
      a. Plastic Laminate: NEMA Standards Publication No. LD 3 - High-Pressure Decorative Laminates.
   4. Joint Sealant:
      a. Federal Specification (FS) TT-S-001543A - Sealing Compound: Silicone Rubber Base (For Calking, Sealing, and Glazing in Buildings and other Structures).
      b. ASTM C920 - Elastomeric Joint Sealants.
   5. Certification:
      a. ANSI Z34.1 - Certification, Third party Certification Program.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Comply with test procedures and required performances of ANSI/KCMA A161.1.
      a. Perform tests on standard 30-inch wall and base cabinets.
   2. Drawers and Drawer Hardware for Federal Severe Use: Apply 75-pond point load to exterior edge of drawer extended 6-inches from its closed position for a period of 15 minutes.

a. Successful Test: No failure in any part of drawer assembly or operating system, and drawer remains operable with no mechanical interference with any part of cabinet assembly.

1.05 SUBMITTALS

A. Submit the following to the Owner in accordance with the Division 1 Section “Submittals”:
   1. Product Data for cabinets, countertops and hardware.
   2. Shop Drawings for cabinets and countertops for each type of kitchen. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, cutouts for plumbing fixtures, and methods of joining countertops.
   3. Samples of following for selection:
      a. Wood veneers with stain finishes.
      b. Plastic laminate patterns and colors.
      c. Cabinet hardware.
      d. Metal grease splash.
   4. Product Certificates: Written certification signed by manufacturer certifying that products furnished comply with requirements.

1.06 QUALITY ASSURANCE

A. Source limitations for cabinets: Obtain cabinets through one source from a single manufacturer.

B. Product Designations: Drawings indicate size, configurations, and finish material of casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes, similar door and drawer configurations, same finish material, and complying with the Specifications may be considered.

C. Quality Standards: Comply with standards listed in the Article “Reference Standards” above.

D. Certifications:
   1. Cabinets: Continuously tested, certified and displaying label or seal of Kitchen Cabinet Manufacturers Association (KCMA) or Southern California Association of Cabinet Manufacturers Association in accordance with ANSI Z34.1.
      a. Federal Severe Use Cabinets: Bear KCMA Certification Seal and additional label indicating conformance to Federal Severe Use specifications.

E. Regulatory Requirements: Comply with following:
   1. Accessibility:
      a. Architectural Barriers Act of 1968 as amended (42 USC 4152-4157) and HUD implementing regulations (24 CFR Part 40).
         1) Uniform Federal Accessibility Standards (UFAS).
      b. Section 504 of the Rehabilitation Act of 1973 as amended (29 USC 794) and HUD implementing regulations24 CFR Part 8.
      c. Fair Housing Accessibility Guidelines (24 CFR Chapter 1).
      d. Americans with Disabilities Act of 1990 (ADA) (28 CFR Part 35).

F. Mock-ups:
   1. Install mock-up of cabinets and countertops in kitchen designated by Owner.
   2. Approved Mock-up shall establish the Standard for rest of work.
   3. Approved Mock-up may remain part of completed project.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Do not deliver cabinets until building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content.
   2. Protect casework and equipment from damage during delivery, storage, installation and subsequent building operations.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Establish Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.

C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing conditions by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes if necessary.

D. Field Measurements for Countertops: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.09 COORDINATION

A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Casework:
      a. Republic Industries, Inc, Marshall, Texas.
      b. Evans Cabinet Corporation, Dublin Georgia.
      c. Armstrong World Industries, Inc., Lancaster PA
   2. Plastic Laminate for Countertops:
      a. Formica Corp.
      b. Nevamar Corp.
      c. Wilson Plastics Co., Wilsonart.

B. Available Products: subject to compliance with requirements, cabinets that may be incorporated into the Work include, but are not limited to, the following:
   1. Crown II; Republic Industries, Inc.
      a. Cabinet Style, Reveal Overlay
      b. Wood Species: Birch
      c. Finish: Light
   2. HUD/CSP; Evans Cabinet Corporation.
      a. Cabinet Style, Reveal Overlay

b. Wood Species: Birch
c. Finish: 648-Wheat-Birch

3. Extreme; Armstrong World Industries, Inc.
   a. Cabinet Style: Coronet
   b. Wood Species: Plantation Hardwood
   c. Finish: Honey

2.02 FEDERAL SEVERE USE CABINETS

A. Wall and Base Cabinets: Comply with requirements under Article “System Description” above.
   1. Construct cabinets as necessary to produce sturdy and rigid construction.
   2. Wall and Base Cabinets and Countertops: Constructed of solid lumber and/or exterior grade plywood with wood veneer core.
      a. Particleboard, flakeboard, fiberboard, or hardboard not allowed.

B. Base Cabinets:
   1. Parts Touching Floor: Pressure treated solid lumber.
   2. Provide integral toe space of minimum 3-inches by 3-inches.
   3. Toe Kicks: 3/4-inch net thickness, pressure treated solid lumber.

C. Face Frames: 3/4-inches net thick kiln dried solid hardwood, free of knots and selected for light uniform color suitable for natural finish.
   1. Frames: Mortised and tenoned, dovetailed or doweled, glued and stapled under pressure and filled and sanded.
   2. Vertical End Members (Stiles): Minimum 1-1/2-inch net width.
   3. Vertical Center Members between Doors and Drawers (Mulls): Minimum 2-inches net width.
   4. Horizontal Members (Rails): 1-3/4-inches net width.
   5. Stiles and Top and Bottom Rails: Dadoed to receive ends, bottoms and tops.

D. Doors and Door Hardware:
   1. Doors: 3/4-inch thick 7-ply A-D grade exterior hardwood plywood with no more than one veneer joint on face.
   2. Edges: Reversed shaped to form continuous finger grip around sides. Filled and sanded smooth prior to finish. May be treated with hot foil transfer. May be covered with 3/8-inch by 3/4-inch reverse shaped hardwood bands.
   3. Acceptable Hardwoods: Beech, birch, maple or oak suitable for natural finish.
   4. Hinges: Manufacturer's standard heavy duty with self-closing feature, face mount or semi-concealed type.

E. Drawers and Drawer Hardware:
   1. Fronts Construction and Finish: Same as doors.
   2. Sides and Backs: Minimum 5/8-inch net thickness Grade C solid lumber with sides dovetailed or mortised and tenoned into fronts.
   3. Backs: Dadoed into sides.
   4. Bottoms: Minimum 1/4-inch softwood or hardwood exterior plywood let into front, sides and back.
   5. Drawer Parts: Glued and nailed or stapled together.
   6. Mount drawers on metal side rails with 75-pound loading capacity.
   7. Cabinet Members or Guides: Attached at rear to 3/4-inch solid lumber hanging rail or 1/2-inch solid lumber or plywood block which is attached to 3/4-inch solid lumber hanging rail by use of metal rear mount brackets or by continuous wraparound method.

F. Installation Cleats: Minimum 3/4-inch by 3-1/2-inches net thickness S4S, Grade C, kiln dried

solid lumber, dadoes to receive bottoms and tops.

1. Provide two horizontal members running full length of cabinet at top and bottom.
2. Base Cabinets with Drawers: Side mount drawer slide bracket(s) rigidly attached to 1/2-inch thick plywood or wood block, which is rigidly attached to top cleat. See Drawers paragraph above for alternate mounting.

G. End Panels:
   1. Exposed End Panels: Minimum 2-2 Grade, 1/2-inch thick 5 ply exterior hardwood plywood, selected for light uniform color.
   2. Ends Not Exposed: May be 1/2-inch exterior softwood plywood, Grade A-D, with Grade A side to inside of cabinet.
   3. Ends: Dadoed minimum of 1/4-inch deep to receive shelves, bottoms and tops. Let into dado in face frame.
   4. Base Cabinet End Panels: Stop 3-1/2-inches above floor and supported by 3/4-inch by 3-1/2-inch pressure treated solid lumber member.

H. Shelves and Wall Cabinet Tops and Bottoms: 1/2-inch thick Grade 2-2 exterior hardwood plywood or Grade A-D exterior softwood plywood with wood banded front edge or 3/4-inch net thickness solid lumber.
   1. Shelves: Let into dadoes of end panels and braced behind mulls.
   2. Bottoms: Let into (rabbet or dado, manufacturers' choice) ends, cleats and front frames.
   3. Shelves and Bottoms: Glued and stapled.
   4. Optional Adjustable Shelves: 3/4-inch thick Grade 2-2 exterior hardwood plywood of Grade A-D exterior softwood plywood with wood banded front edge or 3/4-inch net thickness solid lumber.
   5. Shelves: Support as necessary to comply with shelf deflection provisions of ANSI/KCMA A161.1.
   6. Shelves: When loaded at 15 PSF for seven days shall not deflect more than 1/16-inch per linear foot between supports.
   7. Maximum Deflection:1/4-inch between supports.

I. Backs: Provide on cabinets (optional on sink bases depending on job conditions).
   1. Backs: Minimum 1/4-inch thick Grade 2-2 exterior hardwood plywood or A-D grade exterior softwood plywood. Securely glued and stapled to ends, 3-1/2-inch cleats and shelves of cabinet. May be let into dado of ends and cleats or may be applied flush with ends and cleats.

J. Base Bottoms: 1/2-inch thick Grade 2-2 exterior hardwood plywood or A-C Grade exterior softwood plywood.
   1. Bottoms: Let into (rabbet or dado, manufacturers choice) end panels, front rails and installation cleats. Supported by 3/4-inch net thickness pressure treated solid lumber braces 24-inches on-center running front to rear of cabinet and resting on finished floor.

2.03 COUNTERTOPS

A. Plastic Laminate Countertops: ANSI A161.2.
   1. Type: Post-formed with integral backsplashes.
      a. Front Edges: 180^0 front nose, 1-1/2 inch thick, 1/2 inch top and bottom radius.
      b. Backsplashes: Minimum 4-inches high with cove beveled molding with Type A curved top and scribe edge.
      c. Provide backsplashes at juncture of countertop with back and sidewalls.
   2. Materials: High-pressure plastic laminated to 3/4-inch thick exterior plywood.
      a. Particleboard, flakeboard, fiberboard, or hardboard not allowed.
   3. Plastic Laminate: NEMA LD 3, Type PF42, 0.042-inch thickness.

a. Colors, patterns, finishes as selected from manufacturer's standard offering.
4. Perimeter of Bottom of Countertops and Sink Cutouts: Sealed with varnish.
5. Bathroom counter tops shall be cultured marble with overflow opening.

2.04 WALL MOUNTED METAL GREASE SPLASH

A. Stainless Steel: AISI Type 304, nonmagnetic sheets, free of buckles, waves, and surface imperfections, No. 4 polished finish on exposed surfaces, 24-gage, sanded edges.

2.05 SOURCE QUALITY CONTROL

A. Testing: Performed under Third Party Administrator in compliance with ANSI Z34.1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions:
1. Existing Conditions: Examine spaces to verify that they are ready to receive cabinets and countertops.
2. Verify grounds, blocking and supports for proper location and support of cabinets before beginning installation. Verify location of mechanical and electrical rough-ins to assure proper match with installed equipment.
3. Survey each kitchen and bath to verify dimensions for cabinets and countertops.

3.02 PREPARATION

A. Protection: Protect adjacent elements from damage and disfiguration in accordance with Division 1 Section “Execution Requirements.”

3.03 INSTALLATION

A. General: Deliver, uncrate, place in proper location and assemble cabinets and countertops in accordance with manufacturer's recommendations and approved Shop Drawings.

B. Install casework with no variations in flushness of adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.

C. Install casework without distortion so doors and drawers fit openings and are aligned. Complete installation of hardware and accessories.

D. Install casework and countertop level and plumb to a tolerance of 1/8-inch in 8 feet (3-mm in 2.4-m).

E. Fasten cabinets to adjacent units and to backing.
1. Fasten cabinets through back, near top and bottom, at ends and not less than 24-inches (600mm) on center with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips

F. Fasten plastic-laminate countertops by screwing through corner blocks of base units into underside of countertop.
1. Form seams using splines to align adjacent surfaces, and secure with glue and concealed clamping devices designed for this purpose.
2. Miter inside corner joints.
3. Seal cut edges of plywood at sink opening with spar varnish.
4. Seal joints between countertops and walls with joint sealant.

G. Sinks, Lavatories, and Trim: Provided and installed under Division 15 Section “Plumbing Fixtures.”

3.04 ADJUSTING AND CLEANING

A. Adjust casework and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Clean exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

FINISH CARPENTRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim for field-painted finish.
   2. Shelving and clothes rods.
   3. Stairs and railings.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Division 9 Section "Painting" for priming and backpriming of finish carpentry.

1.03 DEFINITIONS

A. Inspection agencies, and the abbreviations used to reference them, include the following:
   1. AWI - Architectural Woodwork Institute.
   2. NELMA - Northeastern Lumber Manufacturers Association.
   3. NHLA - National Hardwood Lumber Association.
   4. NLGA - National Lumber Grades Authority.
   5. RIS - Redwood Inspection Service.
   6. SCMA - Southern Cypress Manufacturers Association.
   7. SPIB - Southern Pine Inspection Bureau.
   8. WCLIB - West Coast Lumber Inspection Bureau.
   9. WWPA - Western Wood Products Association.

1.04 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Include construction details, material descriptions, dimensions of individual components and profiles, textures, and colors.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
   3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Samples for Verification:
   1. For each species and cut of lumber and panel products with nonfactory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (203 by 250 mm) for panels.

C. Research/Evaluation Reports: Showing that fire-retardant-treated wood complies with building code in effect for Project.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer.

B. Fire-Test-Response Characteristics: Where fire-retardant materials are indicated, provide materials with specified fire-test-response characteristics as determined by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency on surfaces of materials that will be concealed from view after installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

B. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by the American Lumber Standards' Committee Board of Review.
   1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
   2. For exposed lumber, mark grade stamp on end or back of each piece.

B. Softwood Plywood: DOC PS 1.

C. Hardwood Plywood: HPVA HP-1.

2.02 INTERIOR STANDING AND RUNNING TRIM

A. Lumber Trim for Opaque Finish (Painted): Finished lumber (S4S), either finger-jointed or solid lumber, of one of the following species and grades:
   1. Grade Finish or 1 Common eastern white pine; NELMA or NLGA.
   2. Grade 1 Common (Colonial) Idaho white, lodgepole, ponderosa, or sugar pine; NLGA or WWPA.
   3. Grade 1 Common white woods; WWPA.

B. Moldings: Comply with AWI Section 300, Custom Grade.
   1. Moldings for Opaque Finish (Painted): P-grade eastern white, Idaho white, lodgepole, ponderosa, or sugar pine .
   2. Base Pattern: AWI profile shape BAS-1023, 11/16-by-2-1/4-inchbase.
   3. Shoe-Mold Pattern: AWI profile shape 1/2-by-3/4-inch quarter round shoe mold.
   4. Casing Pattern: AWI profile shape CAS-2098, 11/16-by-2-1/4-inch casing.

2.03 SHELVING AND CLOTHES RODS

A. Shelving: 3/4-inch (19-mm) boards of same species and grade indicated above for interior lumber trim for opaque finish.
   1. Shelf Cleats: 3/4-by-5-1/2-inch (19-by-140-mm) boards, of same species and grade indicated above for interior lumber trim for opaque finish.
   2. Shelf Brackets: Prime-painted formed steel with provision to support clothes rod where rod is indicated.

B. Clothes Rods: 1-1/2-inch- (38-mm-) diameter, aluminum tubes.

2.04 STAIRS AND RAILINGS

A. Interior Stairs:
   1. Treads: 1-1/16-inch (27-mm), clear, kiln-dried, edge-glued, poplar stepping with half-round nosing.
   2. Risers: 13/16-inch (21-mm), clear, kiln-dried, edge-glued stock matching treads.
   3. Finished Stringers: 3/4-inch (19-mm) finish boards as specified above for interior lumber trim for opaque finish.

B. Interior Railings: Clear, kiln-dried hard maple or yellow poplar of pattern indicated, either solid or laminated.

C. Balusters: Clear, kiln-dried, hard maple or yellow poplar turned balusters of pattern and size indicated.

2.05 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
   1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.

B. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

C. Flashing: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim" for flashing materials installed in finish carpentry.

D. Sealants: Comply with requirements in Division 7 Section "Joint Sealants" for materials required for sealing siding work.

2.06 FABRICATION

A. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.

B. Back out or kerf backs of the following members, except members with ends exposed in finished work:
   1. Interior standing and running trim, except shoe and crown molds.

C. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation

tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours, unless longer conditioning is recommended by manufacturer.

3.03 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
   1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
   1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
   3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
   4. Install stairs with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and with no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.
   5. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

3.04 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
   1. Match color and grain pattern across joints.
   2. Install trim after gypsum board joint finishing operations are completed.
   3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.05 STAIR AND RAILING INSTALLATION

A. Treads and Risers at Interior Stairs: Secure treads and risers by gluing and nailing to rough carriages.
   1. Closed Stringers: Cope wall stringers to fit tightly over treads and risers.

B. Balusters: Dovetail or mortise balusters into treads, glue, and nail in place. Let into railings and glue in place.

C. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts, and glue. Assemble railings at goosenecks, easements, and splices with rail bolts and glue.

3.06 ADJUSTING

A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.07 CLEANING

A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Portable fire extinguishers.
   2. Smoke detectors
   3. Carbon Monoxide detectors
   4 Carbon Monoxide/Smoke detectors

1.03 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
   1. Fire Extinguishers: Include rating and classification.
   2. Smoke Alarms: Include model number, operating voltage, and rating.
   3. Carbon Monoxide Alarms: Include model number, operating voltage, and ratings.
   4. Carbon Monoxide/Smoke Detectors Alarms: Include model number, operating voltage, and ratings.

B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.

1.04 QUALITY ASSURANCE

A. Fire Extinguishers:
   1. Source Limitations: Obtain fire extinguishers through one source from a single manufacturer.
   2. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
   3. Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction. Provide extinguishers listed and labeled by FM.

B. Smoke Alarms:
   1. Source Limitations: Obtain smoke alarms through one source from a single manufacturer
   2. NFPA Compliance: Fabricate and label smoke alarms to comply with NFPA 72, "National Fire Alarm and Signaling Code."
   3. Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction. Provide smoke alarms listed and labeled by FM

C. Carbon Monoxide/Smoke Alarms:
   1. Source Limitations: Obtain carbon monoxide through one source from a single manufacturer
   2. NFPA Compliance: Fabricate and label smoke alarms to comply with NFPA 72 , "National Fire Alarm and Signaling Code," and NFPA 720, "Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment."
   3. Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction. Provide smoke alarms listed and labeled by FM.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Portable Fire Extinguishers:
      a. J.L. Industries, Inc.
      b. Larsen's Manufacturing Company.
      c. Potter-Roemer; Div. of Smith Industries, Inc.
   2. Smoke Detector/ Carbon Monoxide
      a. Gentex Corp.
      b. Kidde
      c. First Alert

2.02 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.

B. Multipurpose Dry-Chemical Type: UL-rated 1-A:10-B:C, 5-lb (1.1-kg) nominal capacity, in enameled-steel container.

2.03 SMOKE DETECTOR AND CARBON MONOXIDE

A. General: Provide carbon monoxide and smoke detectors as required by code. Detector shall be interconnected and hardwired with battery backup.
B. Provide detectors as shown on drawings.
C. Photoelectric Smoke Alarm Type: UL-listed 217, 120 VAC, 9 VDC battery back-up
D. Photoelectric Carbon Monoxide Type: UL-listed 217/2034 , 120 VAC, 9 VDC battery back-up

2.04 ACCESSORIES

A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher and CO/smoke alarms, of sizes required for types and capacities of extinguishers and CO/alarms indicated, with plated or baked-enamel finish or brackets.
   1. Provide brackets for extinguishers.

B. Batteries: Manufacturer's requirement as back-up in the event building power is lost, Alkaline 9VDC (Duracell M N 1604), shall be verified by the circuit of the smoke/CO alarm.
   1. Provide batteries for smoke alarms and Carbon Monoxide/smoke alarms.

PART 3 EXECUTION

3.01 EXAMINATION

A. Fire Extinguishers
   1. Examine walls and partitions for suitable blocking.
   2. Examine fire extinguishers for proper charging and tagging.
      a. Remove and replace damaged, defective, or undercharged units.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Carbon Monoxide/Smoke Alarms
   1. Examine walls, fixtures, and partitions for interference and blocking.
   2. Examine the battery indicator for low battery power, missing battery, or high impedance.
   3. Inspect mounting brackets for loose, unsecure and unstable connections.

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

3.02 INSTALLATION

A. Fire Extinguishers
   1. Comply with manufacturer's written instructions for installing fire-protection specialties
   2. Install in each unit kitchen at locations and mounting heights indicated or, if not indicated, at locations and heights acceptable to the Owner.
      a. Fasten mounting brackets to structure, square and plumb.

B. Carbon Monoxide/Smoke Alarms
   1. Comply with manufacturer's written instructions for installing fire-protection specialties.
   2. Install in each unit at locations and mounting heights and ceilings indicated or, if not indicated, at locations and heights acceptable to the Owner.
      a. Fasten mounting brackets to structure, square and plumb.

END OF SECTION

FUEL-FIRED DOMESTIC WATER HEATERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following for domestic water systems:
   1. Gas water heaters.
   2. Water heater accessories.
   3. Gas Tank-less Water Heaters

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories. Indicate dimensions, finishes and coatings, required clearances, methods of assembly of components, and piping and wiring connections.

C. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Wiring Diagrams: Power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring.

D. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with specified requirements.

E. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.

F. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

B. ANSI Compliance: Provide gas water heaters that comply with ANSI standards for gas water heaters and related products and that bear AGA certification label.

C. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
   1. household water heaters.

1.05 WARRANTY

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

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include storage tanks and burner assemblies.

2. Warranty Period: From date of Substantial Completion:
   a. Storage Tanks: 8 years.
   b. Parts: Five years.
3. Tank-less Water Heaters
   a. Heat Exchangers: 15 years
   b. All other parts: 3 years

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Provide products by the following (substitutions not allowed):
   1. Household, Storage, Direct-Vent, Gas Water Heaters:
      a. Apollo
      b. Or equal
   2. Household, Flow-Generated, Direct-Vent, Gas Water Heater:
      a. Bosch 520 HN or as noted in the scope of work.
      b. Or equal

2.02.1 HOUSEHOLD, STORAGE, GAS WATER HEATERS

A. Description: Comply with ANSI Z21.10.1.

B. Storage Tank Construction: Steel with 150-psig working-pressure rating.
   1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
   2. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
   3. Insulation: Comply with ASHRAE 90.2. Surround entire storage tank except connections and controls.
   4. Jacket: Steel, with enameled finish.

C. Burner: For use with direct-vent water heaters for natural-gas fuel.
   1. Temperature Control: Adjustable thermostat.
   2. Automatic Ignition: ANSI Z21.20, automatic gas-ignition system and components.

D. Anode Rod: Factory installed, magnesium.

E. Dip Tube: Factory installed, PEX polymer rated for 400 deg. F water, NSF compliant.

F. Drain Valve: ASSE 1005, factory installed.

G. Draft Hood: Low-profile-type, draft diverter; complying with ANSI Z21.12.

H. Direct-Vent System: Through-wall vent assembly with outside exhaust hood and guard.

I. GFWH-1: Apollo Carlisle Associates Inc.-40-NBDS-L.
   1. GFWH-2: Apollo Carlisle Associates Inc.-50-NBDS-L

2.02.2 HOUSEHOLD TANKLESS GAS WATER HEATERS

A. Description: Comply with ANSI 223.1/NFPA 54.

B. Storage Tank Construction: N/A

C. Burner: For use with direct water heaters

   1. Temperature Control: Adjustable Thermostat

2. Automatic Ignition Control: ANSI 223.1/NFPA 54, automatic gas ignition system and components.

E. Drain Valve: ASSE 1005, factory installed.

F. Draft Hood: Low-profile-type, draft diverter; complying with ANSI Z21.12.

G. Direct-Vent System: Through-wall vent assembly with outside exhaust hood and guard.

H. Bosch 520 HN or model listed in the scope of work.

2.03.1 HOUSEHOLD,FLOW-GENERATED, GAS WATER HEATERS

A. Description: Comply with ANSI Z223.1/NFPA 54.

2.03.1 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: According to the following:
1. Gas Water Heaters: ANSI Z21.22, combination temperature and pressure relief valve.

B. Vacuum Relief Valves: According to the following:
1. Gas Water Heaters: ANSI Z21.22.

C. Gas Shutoff Valves: ANSI Z21.15, manually operated. Furnish for installation in piping.

D. Gas Control Valve: ANSI Z21.18, appliance type, factory installed.

E. Sediment Protection: Self-cleaning, corrosion resistant turbulence coil on end of dip tube which wraps partially around bottom of heater.

F. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that is capable of isolating each water heater and of providing balanced flow through each water heater.

G. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE 90.1 or ASHRAE 90.2.

2.03.2 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: According to the following:
1. Gas Water Heaters: ANSI Z21.22, combination temperature and pressure relief valve.

B. Vacuum Relief Valves: According to the following:
1. Gas Water Heaters: ANSI Z21.22.

C. Gas Shutoff Valves: ANSI Z21.15, manually operated. Furnish for installation in piping.

D. Gas Control Valve: ANSI Z21.18, appliance type, factory installed.

E. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that is capable of isolating each water heater and of providing balanced flow through each water heater.

F. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE 90.1 or ASHRAE 90.2.

PART 3 EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances and locations for suitable

conditions. Arrange units so controls and devices needing service are accessible.

B. Install and connect gas water heaters according to ANSI Z223.1/NFPA 54.

C. Storage, Gas:

1. Extend relief valve outlet with water piping in continuous downward pitch and discharge outdoors.

2. Install expansion tank and vacuum relief valves in cold-water-inlet piping.

3. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve in each water heater outlet. Refer to Division 15 Section "Valves" for General-Duty Valves.

4. Install piping-type heat traps on inlet piping of water heater storage tanks.

5. Fill water heaters with water.

B. Flow-Generated, Gas:

1. Install in accordance with

3.02 CONNECTIONS

A. Install piping adjacent to heater to allow service and maintenance.

B. Connect hot- and cold-water piping with shutoff valves and unions.

C. Connect gas piping to gas burner with drip leg, tee, shutoff valve, and union; minimum size same as inlet connection.

D. Make connections with dielectric fittings where piping is made of dissimilar metal.

E. Gas, Water Heater Vent Connections: Install direct vent system in accordance with the manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to perform startup service.

B. In addition to manufacturer's written installation and startup checks, perform the following:
1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment and retest until satisfactory results are achieved.
2. Verify that piping system tests are complete.
3. Check for piping connection leaks.
4. Check for clear relief valve inlets, outlets, and drain piping.
5. Test operation of safety controls, relief valves, and devices.
6. Adjust operating controls.
7. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature; refer to drawings and air handler specifications.
8. Balance water flow through manifolds of multiple-unit installations.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.
1. Train Owner's maintenance personnel on procedures for starting and stopping

troubleshooting, servicing, and maintaining equipment.

a. Review data in maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
b. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

GUTTERING AND ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

This Section includes:

A. Seamless, aluminum guttering.

B. Inlet leaf gutter guards

C. Downspouts and fittings.

1.03 SUBMITTALS

A. Manufacturer’s product data for seamless guttering to include installation instructions.

B. Samples: Provide for approval one (1) sample measuring twenty-four inches (24”) of size, pattern and color of the guttering product to be installed.

C. Product data for inlet leaf guards to include details of construction, dimensions, individual components, profiles and texture.

1.04 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Provide seamless, aluminum guttering from a manufacturer with at lease five (5) years experience in production of the product indicated.

B. Installer’s Qualifications: Install all seamless, aluminum guttering and accessories using an installer with at lease five (5) years experience in the type work required.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver expendable materials to Project site in manufacturer's unopened bundles or containers with labels intact.

B. Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Comply with manufacturer's recommendations for job-site storage, handling, and protection.

1.06 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installing guttering only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements.

B. Access Limitations: Perform all work in an organized and systematic manner suitable to the conditions of the site. Provide protection as may be necessary for residents to be able to continue to access their residences at all times.

1.07 WARRANTY

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

of the Contract Documents.

B. Special Warranty: Submit written warranty(ies) signed by manufacturer and installer agreeing to repair or replace guttering and accessories that fail in materials or workmanship within two (2) years from date of Final Completion of the project.

PART 2 PRODUCTS

2.01 SEAMLESS ALUMINUM GUTTERING

A. Material: Aluminum sheet, minimum 0.027 inch thick, unless otherwise indicated.

B. Finish: Baked-on enamel, white.

C. Fasteners: "Hidden hanger" type, zinc coated, hex-head, screws; minimum 1-1/2" length, spaced maximum 30 inch center to center. Provide screws designed to prevent galvanic action with guttering material.

D. Size: Five inch, nominal.

E. Minimum slope: As recommended by manufacturer or required by code.

2.02 INLET LEAF GUARDS

A. Material: Perforated aluminum sheet, minimum 0.027 inch thick, unless otherwise indicated.

B. Fasteners: Rigid mounted with screws as recommended by manufacturer. Provide protection as may be required from the use of dissimilar materials.

2.03 DOWNSPOUTS AND FITTINGS

A. Material: Aluminum sheet, minimum 0.032 inch thick, unless otherwise indicated.

B. Finish: Baked-on enamel, white.

C. Size: Three inch by four inch, nominal.

D. Fasteners: Aluminum straps, wrapped three sides, to match downspouts. Secure fasteners to building face with drilled and set anchoring screws. Fastener spacing to be a maximum of six feet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of guttering system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordinate installation with other adjoining work to ensure proper sequencing. Do not install guttering until all fascia work and asphalt single installation has been performed in advance of the guttering work.

B. Layout work areas to avoid to the extent practical continued use of premises by other trades and residents.

3.03 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations and with all applicable codes.

B. Install all horizontal guttering components for a single “wing” of the work prior to installing vertical components. Attach, fasten and seal all components as required for a first class and workmanlike installation.

C. Install vertical components in a plumb and workmanlike manner. Verify alignments of all components prior to final attachment of fasteners. Terminate downspouts at a maximum height of six (6) inches above finished ground, or as directed by the Owner’s Representative.

3.04 ADJUSTING

A. Replace any damaged materials installed under this Section with new materials that meet specified requirements.

END OF SECTION

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Interior gypsum wallboard.
   2. Tile backing panels.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for wood framing and furring, and gypsum sheathing applied over wood framing.
   2. Division 7 Section "Building Insulation" for insulation and vapor retarders installed in gypsum board assemblies.

1.03 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.04 SUBMITTALS

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

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

1.05 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory."

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

C. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 square feet in surface area to demonstrate aesthetic effects and qualities of materails and execution.
   1. Install mockups for the following applications:
      a. Surfaces to receive nontextured paint finishes.
   2. Simulate finished lighting conditions for review of mockup.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and

identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Gypsum Board and Related Products:
      a. G-P Gypsum Corp.
      b. National Gypsum Company.
      c. United States Gypsum Co.

2.02 STEEL SUSPENDED CEILING FRAMING

A. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
      b. USG Interiors, Inc.; Drywall Suspension System.

2.03 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Sag-Resistant Gypsum Wallboard: ASTM C 36, manufactured to have more sag resistance than regular-type gypsum board.
   1. Regular Type:
      a. Thickness: 5/8 inch
      b. Long Edges: Tapered.
      c. Location: Ceilings

   2. Moisture Resistant
      a. Thickness: 5/8 inch
      b. Long Edges: Tapered
      c. Location: Bathroom Ceilings

C. Gypsum Wallboard: ASTM C 36
   1. Regular Type:
      a. Thickness: 1/2 inch.
      b. Long Edges: Tapered.
      c. Location: Walls
2. Moisture Resistant
      a. Thickness: 1/2 inch
      b. Long Edges: Tapered

c. Location: Throughout bathrooms and kitchens.

2.04 TILE BACKING PANELS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M.
   1. Available Product: Subject to compliance with requirements, products that may be incurporated into the Work include, but are not limited to, “Dens-Shield Tile Backer” manufacturerd by G-P Gypsum corp.
   2. Core: As indicted below:
      a. Kitchens, toilets and baths - non rated walls: 5/8-inch, regular type.
      b. Kitchens, toilets and baths - rated walls: 5/8-inch Type X

2.05 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc
   2. Shapes:
      a. Cornerbead: Use at outside corners.
      b. LC-Bead (J-Bead): Use at exposed panel edges.
      c. L-Bead: Use where indicated.
      d. U-Bead: Use where indicated.
      e. Expansion (Control) Joint: Use where indicated.

2.06 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.
   5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
   1. Glass-Mat, Water-Resistant Backing Panel: As recommended by manufacturer.

2.07 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Fastening Adhesive:
   1. Wood: ASTM C 557.
   2. Steel: Adhesive recommended for attaching panels to steel framing.

D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

E. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLING STEEL SUSPENDED CEILING FRAMING

A. Suspend ceiling hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
   3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
   4. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.

C. Sway-brace suspended steel framing with hangers used for support.

D. Screw furring to wood framing.

E. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
   1. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from 0.0625-inch- diameter, tie wire and inserted through slot in web of member.

3.03 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. 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.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.

I. Form control and expansion joints with space between edges of adjoining gypsum panels.

J. Cover both faces of steel stud partition 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. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

L. Floating Construction: Where feasible, including where recommended in writing by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.

M. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

N. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

O. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.04 PANEL APPLICATION METHODS

A. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular 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 board.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Tile Backing Panels:
   1. Glass-mat, Water-Resistant Backing Board: Comply with manufacturer's written installation instructions and install at kitchen, toilet and bath walls. Install with 1/4inch gap where panels abut other construction or penetrations.

3.05 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.06 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
   1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
   2. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges at ceilings.
   3. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface at panel surfaces that will be exposed to view; unless otherwize indicated

E. Water-Resistant Gypsum Backing Panels: Finish according to manufacturer's written instructions.

3.07 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Owner and Architect will conduct an above-ceiling observation before installing gypsum board ceilings and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
   1. Notify Owner and Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
   2. Before notifying Owner and Architect, complete the following in areas to receive gypsum board ceilings:
      a. Installation, insulation, and leak and pressure testing of water piping systems.
      b. Installation of air-duct systems.
      c. Installation of air devices.
      d. Installation of mechanical system control-air tubing.
      e. Installation of ceiling support framing.

END OF SECTION

HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes hangers and supports for mechanical system piping and equipment.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for materials for attaching hangers and supports to building structure.

1.03 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.04 PERFORMANCE REQUIREMENTS

A. Design seismic restraint hangers and supports for piping and equipment where required by code.

B. Design and obtain approval from authorities having jurisdiction for seismic restraint hangers and supports for piping and equipment.

1.05 SUBMITTALS

A. Product Data: For each type of pipe hanger and support.

B. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.

C. Shop Drawings: For each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.06 QUALITY ASSURANCE

A. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
   1. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Pipe Hangers:
      a. B-Line Systems, Inc.
      b. Carpenter & Patterson, Inc.
      c. Grinnell Corp.
      d. Michigan Hanger Co., Inc.
      e. PHD Manufacturing, Inc.

2.02 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
   1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
   2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

2.03 MISCELLANEOUS MATERIALS

A. Bolts and Nuts: ASME B18-10 or ASTM A 183, steel, hex head, track bolts and nuts, galvanized.

B. Washers: ASTM F 844, steel, plain, flat washers, galvanized.

C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, galvanized.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Comply with manufacturers of plastic piping for support requirements.

3.02 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support 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. Install supports with maximum spacings complying with MSS SP-69.

C. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.
   1. 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.

D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories and plastic.

E. 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.

F. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

G. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

3.03 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

3.04 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

3.05 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.06 PAINTING

A. Touching Up: Clean abraded areas of shop paint and 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.

B. Touching Up: Cleaning and touchup painting of abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

INTERIOR LIGHTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes interior lighting fixtures, lamps, ballasts, and accessories.

1.03 DEFINITIONS

A. Fixture: A complete lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply.

B. Average Life: The time after which 50 percent fails and 50 percent survives under normal conditions.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data describing fixtures, lamps, and ballasts. Arrange Product Data for fixtures in order of fixture designation. Include data on features and accessories and the following:
   1. Outline drawings indicating dimensions and principal features of fixtures.

1.05 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

C. Coordinate fixtures, mounting hardware, and trim with ceiling system and other items, including work of other trades, required to be mounted on ceiling or in ceiling space.

D. All fixtures shall use fluorescent bulbs, compact fluorescent bulbs or LED bulbs. Incandescent bulbs are not permitted.

1.06 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, fixtures that may be incorporated into the Work include, but are not limited to, the products specified in each Interior Lighting

Fixture Schedule at end of this Section.

B. Products: Subject to compliance with requirements, provide one of the products specified in each Interior Lighting Fixture Schedule at end of this Section.

2.02 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, except as indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass, except as otherwise indicated.
   1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   2. Lens Thickness: 0.125 inch (3 mm) minimum; except where greater thickness is indicated.

F. Fluorescent Fixtures: Conform to UL 1570.

G. Fluorescent Ballasts: Electronic integrated circuit, solid-state, full-light-output, energy-efficient type compatible with lamps and lamp combinations to which connected.
   1. Certification by Electrical Testing Laboratory (ETL).
   2. Labeling by Certified Ballast Manufacturers Association (CBM).
   3. Type: Class P, high power factor, except as otherwise indicated.
   4. Sound Rating: "A" rating, except as otherwise indicated.
   5. Voltage: Match connected circuits.
   6. Lamp Flicker: Less than 5 percent.
   7. Minimum Power Factor: 90 percent.
   8. Total Harmonic Distortion (THD) of Ballast Current: Less than 20 percent.
   9. Total Harmonic Distortion (THD) of Ballast Current: Less than 10 percent.
   10. Conform to FCC Regulations Part 15, Subpart J for electromagnetic interference.
   11. Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.
   12. Multilamp Ballasts: Use 2, 3, or 4 lamp ballasts for multilamp fixtures where possible.
   13. Lamp-ballast connection method does not reduce normal rated life of lamps.

2.03 LAMPS

A. Comply with ANSI C78 series that is applicable to each type of lamp.

B. Fluorescent Color Temperature and Minimum Color-Rendering Index (CRI): 4100 K and 85 CRI, except as otherwise indicated.

C. Noncompact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid start circuits.

2.04 FINISHES

A. Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to requirements of Division 16 Section "Basic Electrical Materials and Methods."

B. Lamping: Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions.

3.02 CONNECTIONS

A. Ground lighting units. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replaced damaged fixtures and components.

B. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source.

C. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

D. Replace fixtures that show evidence of corrosion during Project warranty period.

3.04 ADJUSTING AND CLEANING

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

B. Adjust aimable fixtures to provide required light intensities.

3.05 INTERIOR LIGHTING FIXTURE SCHEDULE

A. Fixture Type: See drawing.

END OF SECTION 16515

JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION REQUIREMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

PART 2 PRODUCTS

2.01 JOINT SEALANTS

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.

B. Elastomeric Sealant: Comply with ASTM C 920.
   1. One-part, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O.
      a. Application: Interior joints in kitchens and bathrooms.
   2. One-part, mildew-resistant silicone sealant, Type S; Grade NS; Class 25; Uses NT, G, A, and O; formulated with fungicide.
      a. a. Application: Bathrooms, caulk all wall mounted fixtures.
   3. One-part, nonsag urethane sealant, Type S; Grade NS; Class 25; and Uses NT, M, A, and O.
      a. Application: Galvanized steel, cast-in-place concrete, masonry.
   4. One-part, pourable urethane sealant, Type S; Grade P; Class 25; Uses T, M, G, A, and O.
      a. Application: Walkways and paving.

C. Latex Joint-Sealant: One-part, nonsag, sealant complying with ASTM C 834.
   1. Application: Interior joints not listed elsewhere.

D. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

E. All DAP Products are not permissible to be used on CHA projects. The products are manufactured with known carcinogenic products that cause cancer in humans.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with ASTM C 1193.

B. Comply with ASTM C 919 for use of joint sealants in acoustical applications.

END OF SECTION

LANDSCAPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Trees.
   2. Shrubs.
   3. Ground covers.
   4. Lawns.
   5. Topsoil and soil amendments.
   6. Fertilizers and mulches.
   7. Stakes and guys.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 2 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
   2. Division 2 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
   1. Manufacturer's certified analysis for standard products.
   2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
   3. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.

C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   1. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of Architect/Engineers and owners, and other information specified.

E. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
   1. Analysis of existing surface soil.
   2. Analysis of imported topsoil.

F. Planting schedule indicating anticipated dates and locations for each type of planting.

G. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
   1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.

B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect/Engineer's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."

D. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.
   1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.

E. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

C. Sod: Harvest, deliver, store, and handle sod according to the requirements of the American Sod Producers Association's (ASPA) "Specifications for Turfgrass Sod Materials and Transplanting/Installing."

D. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Architect/Engineer. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.
   1. Immediately after digging bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

E. Handle balled and burlapped stock by the root ball.

F. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.
   1. Heel-in bare-root stock. Soak roots in water for 2 hours if dried out.
   2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
   3. Do not remove container-grown stock from containers before time of planting.
   4. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.06 PROJECT CONDITIONS

A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Owner and Architect/Engineer before planting.

1.07 COORDINATION AND SCHEDULING

A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

1.08 WARRANTY

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

B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.
   1. Trees.
   2. Shrubs.
   3. Ground covers.

C. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.

D. A limit of one replacement of each plant material will be required, except for losses or replacements due to failure to comply with requirements.

1.09 TREE AND SHRUB MAINTENANCE

A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings. Maintain trees and shrubs for the following period:
   1. Maintenance Period: 3 months following Substantial Completion.

1.10 GROUND COVER AND PLANT MAINTENANCE

A. Maintain ground cover and plants by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings for the following period:
   1. Maintenance Period: 1 month following Substantial Completion.

1.11 LAWN MAINTENANCE

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
   1. Seeded Lawns: 30 days after date of Substantial Completion.
   2. Sodded Lawns: 30 days after date of Substantial Completion.

B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches.
   1. Water lawn at the minimum rate of 1 inch per week.

D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

E. Post fertilization: Apply fertilizer to lawn after first mowing and when grass is dry.
   1. Use fertilizer that will provide actual nitrogen of at least 1 lb. per 1000 sq. ft. of lawn area.

PART 2 PRODUCTS

2.01 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees shall be a minimum height of 5 feet, or a 1-1/2 inch caliper. Shrubs shall be at least 18 inches high with full branches. Trees and shrubs of a larger size may be used if acceptable to Architect/Engineer, with a proportionate increase in size of roots or balls.

C. Label each tree and shrub with securely attached, waterproof tag bearing legible designation of botanical and common name.

D. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.02 SHADE AND FLOWERING TREES

A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required.
   1. Height: 5 feet
   2. Branching Height: 1/3 to 1/2 of tree height.

B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as follows:
   1. Form: Multistem, clump, with 2 or more main stems.
   2. Height: 5 feet
   3. Caliper: 1 inch

C. Provide balled and burlapped trees.
   1. Container-grown trees will be acceptable in lieu of balled and burlapped trees subject to meeting ANSI Z60.1 limitations for container stock.

2.03 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.

B. Provide balled and burlapped broadleaf evergreens.
   1. Container-grown broadleaf evergreens will be acceptable in lieu of balled and burlapped broadleaf evergreens subject to meeting ANSI Z60.1 limitations for container stock.

2.04 GROUND COVERS AND PLANTS

A. Provide ground covers and plants established and well rooted in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated.

2.05 GRASS MATERIALS

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
   1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules at the end of this Section.

B. Sod: Certified turfgrass sod complying with ASPA specifications for machine-cut thickness, size, strength, moisture content, and mowed height, and free of weeds and undesirable native grasses. Provide viable sod of uniform density, color, and texture of the following turfgrass species, strongly rooted, and capable of vigorous growth and development when planted.

1. Species: Provide sod of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules at the end of this Section.

2.06 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
   1. Topsoil Source: Amend existing surface soil to produce topsoil. Supplement with imported topsoil when required.

2.07 SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve.

B. Aluminum Sulfate: Commercial grade, unadulterated.

C. Herbicides: EPA registered and approved, of type recommended by manufacturer.

D. Water: Potable.

2.08 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:
   1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.09 MULCHES

A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:
   1. Type: Pine straw.

2.10 WEED-CONTROL BARRIERS

A. Nonwoven Fabric: Polypropylene or polyester fabric, 3 oz. per sq. yd. minimum.

2.11 STAKES AND GUYS

A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches by length indicated, pointed at one end.

B. Guy and Tie Wire: ASTM A 641, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch in diameter.

C. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch in diameter, black, cut to lengths required to protect tree trunks from damage.

2.12 MISCELLANEOUS MATERIALS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions.

B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4 inches wide minimum, with stretch factor of 33 percent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure Architect/Engineer's acceptance before the start of planting work. Make minor adjustments as may be required.

3.03 PLANTING SOIL PREPARATION

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

B. Mix soil amendments and fertilizers with topsoil at rates recommended by a certified soil analysis. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.

C. For tree pit or trench backfill, mix planting soil before backfilling and stockpile at site.

D. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
   1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.
   2. Apply phosphoric acid fertilizer, other than that constituting a portion of complete fertilizers, directly to subgrade before applying planting soil and tilling.

3.04 LAWN PLANTING PREPARATION

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous materials.

C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.
   1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
   2. Allow for sod thickness in areas to be sodded.

D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:

1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
2. Till surface soil to a depth of at least 6 inches. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.

E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches in any dimension, and other objects that may interfere with planting or maintenance operations.

F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.05 GROUND COVER AND PLANT BED PREPARATION

A. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.

3.06 EXCAVATION FOR TREES AND SHRUBS

A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.
   1. Balled and Burlapped Trees and Shrubs: Excavate approximately 1-1/2 times as wide as ball diameter and equal to ball depth, plus the following setting layer depth:
      a. Setting Layer: Allow 9 inches of planting soil.
      b. Container-Grown Trees and Shrubs: Excavate to container width and depth, plus the following setting-layer depth:
         1) Setting Layer: Allow 6 inches of planting soil.

B. Dispose of subsoil removed from landscape excavations. Do not mix with planting soil or use as backfill.

C. Obstructions: Notify Architect/Engineer if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
   1. Hardpan Layer: Drill 6-inch diameter holes into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect/Engineer if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

E. Fill excavations with water and allow to percolate out, before placing setting layer and positioning trees and shrubs.

3.07 PLANTING TREES AND SHRUBS

A. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
   1. Place stock on setting layer of compacted planting soil.
   2. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
   3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

B. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
   1. Carefully remove containers so as not to damage root balls.
   2. Place stock on setting layer of compacted planting soil.
   3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

C. Dish and tamp top of backfill to form a 3-inch high mound around the rim of the pit. Do not cover top of root ball with backfill.

D. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping.

3.08 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Architect/Engineer, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are size after pruning.

3.09 TREE AND SHRUB GUYING AND STAKING

A. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Guying and Staking: Guy and stake trees exceeding 14 feet and more than 3-inch caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches long, driven to grade. Attach flags to each guy wire, 30 inches above finish grade.

3.10 PLANTING GROUND COVER AND PLANTS

A. Space ground cover and plants as indicated.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil

around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.11 MULCHING

A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

B. Weed-Control Barriers: Install the following weed-control barriers according to manufacturer's recommendations, before mulching. Completely cover area to be mulched, lapping edges a minimum of 6 inches.
   1. Material and Seam Treatment: Nonwoven fabric with seams pinned.

C. Organic Mulch: Apply the following average thickness of organic mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.
   1. Thickness: 3 inches.

3.12 HYDROSEEDING NEW LAWNS

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
   1. Mix slurry with nonasphaltic tackifier.
      a. Apply slurry uniformly to all areas to be seeded in a 1-step process. Apply mulch at the minimum rate of 1500 lb. per acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.13 SODDING NEW LAWNS

A. Lay sod within 24 hours of stripping. Do not lay sod if dormant or if ground is frozen.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
   1. Lay sod across angle of slopes exceeding 1:3.
   2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within 2 hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below the sod.

3.14 RECONDITIONING LAWNS

A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.

B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

C. Where substantial lawn remains, mow, dethatch, core aerate, and rake. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

D. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.

E. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches.

F. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Provide new planting soil as required to fill low spots and meet new finish grades.

G. Hydroseed and protect as required for new lawns.

H. Apply sod as designated on the plan for new lawns.

I. Water newly planted areas and keep moist until new grass is established.

3.15 INSTALLATION OF MISCELLANEOUS MATERIALS

A. Apply antidesiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
   1. When deciduous trees or shrubs are moved in full-leaf, spray with antidesiccant at nursery before moving and again 2 weeks after planting.

3.16 CLEANUP AND PROTECTION

A. During landscaping, keep pavements clean and work area in an orderly condition.

B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

3.18 PLANTING SOIL AMENDMENTS SCHEDULE

A. Provide soil amendments as recommended in soil reports from a qualified soil-testing agency.

3.19 SEED MIXTURES SCHEDULE

A. Seed Mixture: Provide certified grass-seed blends or mixes, proportioned by weight, as follows:
   1. Bermudagrass (Cynodon dactylon): 80 percent
      a. Minimum percentage germination: 80
      b. Minimum percentage pure seed: 85
      c. Maximum percentage weed seed: 0.50
   2. Rye Grass: 20 percent
      a. Miimum percentage germination: 80
      b. Minimum percentage pure seed: 85
      c. Maximum percentage weed seed: 0.50

END OF SECTION

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:
   1. Pipe markers.

1.03 SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

1.04 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.05 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Install identifying devices before installing ceilings and similar concealment.

PART 2 PRODUCTS

2.01 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
   1. Colors: Comply with ASME A13.1, unless otherwise indicated.
   2. Lettering: Use piping system terms and abbreviate only as necessary for each application length.
   3. Markers: Full-band pipe markers extending 360 degrees around pipe at each location.
   4. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

D. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back, ¾ inch minimum width.

PART 3 EXECUTION

3.01 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.02 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
   1. Pretensioned pipe markers. Use size to ensure a tight fit.
   2. Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in equipment rooms and as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
   4. Near major equipment items and other points of origination and termination.

3.03 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.04 CLEANING

A. Clean faces of mechanical identification devices.

END OF SECTION

METAL DUCTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes rectangular and round metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg.

B. Related Sections include the following:
   1. Division 7 Section "Joint Sealants" for fire-resistant sealants for use around duct penetrations in fire-rated floors, partitions, and walls.
   2. Division 15 Section "Duct Insulation".
   3. Division 15 Section "Duct Accessories".
   4. Division 15 Section "Diffusers, Registers, and Grilles."
   5. Division 15 Section "Testing, Adjusting, and Balancing".

1.03 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x deg F at the temperature differences specified. Values are expressed as Btu or W.
   1. Example: Apparent Thermal Conductivity (k-Value): 0.26.

1.04 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.05 SUBMITTALS

A. Product Data: For sealing materials.

B. Shop Drawings: Show details of the following:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Fittings.
   3. Reinforcement and spacing.
   4. Seam and joint construction.
   5. Penetrations through fire-rated and other partitions.
   6. Hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.
   7. Retain paragraph below if Drawings do not include detailed reflected ceiling plans or if Project involves unusual coordination requirements.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

D. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

B. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts.

2.02 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
   1. Joint and Seam Tape: 2 inches wide; glass-fiber fabric reinforced.
   2. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with tape to form a hard, durable, airtight seal.
   3. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.
   4. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.03 HANGERS AND SUPPORTS

A. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
   1. Strap Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness.

B. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

2.04 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
   1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
   2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
   1. Supply Ducts: 3-inch wg, positive pressure.
   2. Return Ducts: 2-inch wg, negative pressure.
   3. Exhaust Ducts: 2-inch wg, positive pressure.

C. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

2.05 ROUND DUCT FABRICATION

A. Round Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

PART 3 EXECUTION

3.01 DUCT INSTALLATION, GENERAL

A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct.

F. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

J. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.

3.02 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as

described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Seal externally insulated ducts before insulation installation.

3.03 HANGING AND SUPPORTING

A. Install rigid round and rectangular metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Support horizontal ducts within 12 inches of each elbow and within 24 inches of each branch intersection.

C. Support vertical ducts at a maximum interval of 10 feet and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

3.04 CONNECTIONS

A. Connect equipment with flexible connectors according to Division 15 Section "Duct Accessories."

B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.05 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. Conduct tests, in presence of Architect, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Determine leakage from entire system or section of system by relating leakage to surface area of test section.

D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.

E. Remake leaking joints and retest until leakage is less than maximum allowable.

F. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

3.06 ADJUSTING

A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow.

B. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for detailed procedures.

3.07 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.

END OF SECTION

METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   3. Metal plates and supports for sidewalk trench drains.

B. Related Sections include the following:
   1. Division 5 Section "Pipe and Tube Railings" for metal pipe and tube handrails and railings.
   2. Division 6 Section "Rough Carpentry" for metal framing anchors and other rough hardware.

1.03 SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
   1. Provide templates for anchors and bolts specified for installation under other Sections.

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

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.05 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.06 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.02 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Gray-Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

C. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.03 PAINT

A. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
      b. Tneme-Zinc 90-97; Tnemec Company, Inc.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.04 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3.

E. Lag Bolts: ASME B18.2.1.

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1.

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.05 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.06 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. 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.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.07 PORCH HANDRAILS AND RAILINGS

A. Use molded handrails, rails shall be 25.4 pounds at 20 feet with 1”x1/2”x1/8” bar channel and 11 gauge 1” tubing. Pickets shall be solid.

B. Railings shall be primed and painted.

2.08 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates after fabrication.

2.09 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

2.10 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.

C. Galvanize shelf angles to be installed in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports indicated and as necessary to complete the Work.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches wide by 1/4 inch thick by 8 inches long at 24 inches o.c., unless otherwise indicated.
   2. Furnish inserts if units must be installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural-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. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.

C. Galvanize miscellaneous steel trim in the following locations:
   1. Exterior.
   2. Interior, where indicated.

2.13 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
   1. ASTM A 123, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1,

" for shop painting.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

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

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

D. 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.

E. 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.

3.02 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

3.04 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair

galvanizing to comply with ASTM A 780.

END OF SECTION

METAL SCREEN DOORS

PART 1 GENERAL

1.01 SECTION REQUIREMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

PART 2 PRODUCTS

2.01 STEEL SECURITY SCREEN DOORS AND FRAMES

A. Manufacturer:
   1. Armoured Guard Security Screen Door, Series 5000, Model "A"

B. Steel Doors:
   1. Masterframe: Roll formed, tubular, lock-seam construction formed from 22 gauge hot-dipped galvanized steel. Mitered joint construction, rigidly fastened and welded on both sides.
   2. Frame Liner: Extruded aluminum designed to receive flexible weather seal. Head of frame liner shall be designed to function as a drip cap. Bottom of frame shall have and adjustable expander to accept vinyl door sweep.
   3. Kick Panel: 18 gauge embossed galvanized sheet steel. Formed in one continuous piece and secured on all sides.
   4. Wirecloth Retainer Spline: 18 gauge formed galvanized steel angle with #8 screws at 4-inches on center.
   5. Wirecolth: Stainless steel alloy 12 X 12 mesh, .028 diameter providing a minimum 43% open area.
   6. Hardware:
      a. Hinges: Five (5) hinges with nonremovable pins.
      b. Latch: No key push button type for standard units, lever set SK700BB for Handicapped adaptable units.
      c. Adjustable door closer, and chain with hold-up spring.
      d. Weatherstripping.
      e. Vinyl door sweep.

C. Finishes:
   1. Exposed surfaces of metal parts formed from hot-dipped galvanized steel shall be free of surface blemishes. Sections, either assembled or fabricated in factory, shall have wash coats and finish coat applied after such assembly or fabrication is completed.
   2. Exposed areas of wirecloth and frame parts shall have a five (5) stage chemical pre-treatment process applied, with a finish polyester powder paint coat, electrostatically applied, and baked for a minimum of 30 minutes at 400° Fahrenheit. Powder coating shall be abrasion and corrosion resistant.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install doors accurately in frames, within clearances specified in ANSI/SDI 100.

END OF SECTION

METERS AND GAGES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

. A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes temperature gages/thermometers for mechanical systems.

1.03 SUBMITTALS

A. Product Data: Include scale range and ratings for each gage specified.

B. Shop Drawings: Include schedule indicating manufacturer's number, scale range, fittings, and location for each gage.

C. Product Certificates: Signed by manufacturers of gages certifying accuracies under specified operating conditions and compliance with specified requirements.

D. Maintenance Data: For gages to include in maintenance manuals specified in Division 1.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bimetal Dial Thermometers:
      a. Dresser Industries, Inc.; Instrument Div.; Ashcroft Commercial Sales Operation.
      b. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
      c. Ernst Gage Co.
      d. Marsh Bellofram.
      e. Tel-Tru Manufacturing Co., Inc.
      f. Trerice: H. O. Trerice Co.
      g. Weiss Instruments, Inc.
      h. Weksler Instruments Corp.

2.02 THERMOMETERS, GENERAL

A. Scale Range: Temperature ranges for services listed are as follows:
   1. Domestic and Heating Hot Water: 20 to 240 deg F, with 2-degree scale divisions.

B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.03 BIMETAL DIAL THERMOMETERS

A. Description: ASME B40.3; direct-mounting, universal-angle dial type.

B. Case: Stainless steel with 5-inch- diameter, glass lens.

C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Element: Bimetal coil.

E. Scale: Satin-faced nonreflective aluminum with permanently etched markings.

F. Stem: Stainless steel, maximum 2-1/2” length.

G. Manufacturer and Model:
   1. Weksler AF/AU-02 Series or approved equal.

2.04 THERMOMETER WELLS-SEPARABLE SOCKETS

A. Description: Fitting with protective well for installation in threaded pipe fitting to hold test thermometer.
   1. Material: Brass, for use in copper piping.

PART 3 EXECUTION

3.01 GAGE INSTALLATION, GENERAL

A. Install gages, and accessories according to manufacturer's written instructions for applications where used.

3.02 THERMOMETER INSTALLATION

A. Install thermometers and adjust vertical and tilted positions.

B. Install thermometer wells-separable sockets in vertical position in piping tees where thermometers are indicated.

3.03 ADJUSTING AND CLEANING

A. Adjust faces of gages to proper angle for best visibility.

B. Clean windows of gages and clean factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION

NATURAL GAS PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes piping, specialties, and accessories for natural gas systems within building and to gas meters.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 15 Section "Basis Mechanical Materials and Methods"for basic piping installation.
   2. Division 15 Section "Hangers and Supports"for pipe hanger and support devices.

1.03 DEFINITIONS

A. Low-Pressure Natural Gas Piping: Operating pressure of 0.5 psig (14-inches wg) or less.

B. Gas Service: Operating pressure indicated.

C. Gas Delivery Point: Gas meter and service pressure regulator outlet.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working-Pressure Ratings: Except where otherwise indicated, minimum pressure requirements are as follows:
   1. Low-Pressure Natural Gas Piping: 2 psig.

B. Approximate values of natural gas supplied for these systems are as follows:
   1. Heating Value: 1000 Btu/cu. ft..
   2. Specific Gravity: 0.6.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of natural gas specialty and special-duty valve. Include pressure rating, rated capacity, and settings of selected models.

C. Coordination Drawings for natural gas piping, including required clearances and relationship to other services for same work areas.

D. Test reports specified in "Field Quality Control" Article in Part 3.

E. Maintenance data for natural gas specialties and special-duty valves to include in the operation and maintenance manual specified in Division 1 Section "Contract Closeout."

1.06 QUALITY ASSURANCE

A. Comply with NFPA 54, "National Fuel Gas Code," for gas piping materials and components; installations; and inspecting, testing, and purging.

B. Product Options: Drawings indicate size, profiles, connections, dimensional requirements, and characteristics of natural gas piping equipment, specialties, and accessories and are based on specific types and models indicated. Other manufacturers' equipment and components with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.08 SEQUENCING AND SCHEDULING

A. Notification of Interruption of Service: Notify each affected user when gas supply will be turned off.

B. Work Interruptions: Leave gas piping systems in safe condition when interruptions in work occur during repairs or alterations to existing gas piping systems.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Gas Stops, 2-Inch NPS and Smaller:
      a. Hammond Valve Corp.
      b. Jomar International, Ltd.
      c. Maxitrol Co.
      d. McDonald: A.Y. McDonald Mfg. Co.
      e. Milwaukee Valve Co., Inc.
      f. Mueller Co.
      g. National Meter.
   2. Gas Valves, 2-Inch NPS and Smaller:
      a. Conbraco Industries, Inc.; Apollo Div.
      b. Core Industries, Inc.; Mueller Steam Specialty Div.
      c. Huber: J.M. Huber Corp.; Flow Control Div.
      d. McDonald: A.Y. McDonald Mfg. Co.
      e. Milliken Valve Co., Inc.
      f. Milwaukee Valve Co., Inc.
      g. Mueller Co.
      h. National Meter.
      i. Nordstrom Valves, Inc.
      j. Olson Technologies, Inc.
      k. 3. Corrugated, Stainless-Steel Tubing Systems:
         1) Omega Flex, Inc.
         2) Titeflex Corp.
         3) Tru-Flex Metal Hose Corp.
         4) Ward Manufacturing Inc.
   3. PIPES AND TUBES
   4. Steel Pipe: ASTM A 53; Type E, electric-resistance welded or Type S, seamless; Grade B; Schedule 40; galvanized.
   5. PIPE AND TUBE FITTINGS
   6. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
   7. Unions: ASME B16.39, Class 150, malleable-iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
   8. Joint Compound and Tape: Suitable for natural gas.

9. JOINING MATERIALS
10. Common Joining Materials: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not included in this Section.
11. VALVES
12. Manual Valves: Conform to standards listed or, where appropriate, to ANSI Z21.15.
13. Gas Stops, 2-Inch NPS and Smaller: AGA-certified, bronze-body, plug type with bronze plug, for 2 psig or less natural gas. Include AGA stamp, flat or square head or lever handle, and threaded ends conforming to ASME B1.20.1.
    a. Locking Device: Include locking (tamperproof) feature.
14. Gas Valves, 2-Inch NPS and Smaller: ASME B16.33, 125 psig WOG, cast-iron body, bronze plug, straightaway pattern, square head, tapered-plug type, with threaded ends conforming to ASME B1.20.1.
15. CORRUGATED, STAINLESS-STEEL TUBING SYSTEMS
16. Description: Comply with AGA LC 1 and include the following:
    a. 1. Tubings: Corrugated stainless steel with plastic jacket or coating.
    b. 2. Fittings: Copper alloy with ends made to fit corrugated tubing. Include ends with.
        1) threads according to ASME B1.20.1 if connection to threaded pipe or fittings is required
    c. 3. Striker Plates: Steel, designed to protect tubing from penetrations.
    d. 4. Manifolds: Malleable iron or steel with protective coating. Include threaded connections
        1) according to ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
17. PIPING SPECIALTIES
18. Flexible Connectors: ANSI Z21.24, copper alloy.

PART 3 - EXECUTION

3.01 List Level 3

A. PREPARATION

B. Close equipment shutoff valves before turning off gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

C. Comply with NFPA 54 Paragraph "Prevention of Accidental Ignition."

D. SERVICE ENTRANCE PIPING

E. Extend natural gas piping and connect to gas distribution system (gas service) piping in location and size indicated for gas service entrance to building.

F. Install shutoff valve, downstream from gas meter, outside building at gas service entrance.

G. PIPING APPLICATIONS

H. General: Unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating may be used in applications below, except where otherwise indicated.

I. Low-Pressure, Natural Gas Systems: Use the following:

1. 1-Inch NPS and Smaller: Steel pipe, malleable-iron threaded fittings, and threaded joints.
2. VALVE APPLICATIONS
3. Use gas stops for shutoff to appliances with 1-inch NPS or smaller low-pressure gas supply.
4. Use gas valves for mainline shutoff.
5. Use gas valves of sizes indicated.
6. PIPING INSTALLATIONS
7. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.
8. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of gas meters and at appliances. Locate where readily accessible to permit cleaning and emptying.
    a. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
9. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
10. Install unions in pipes 1-inch NPS and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated.
11. Install strainers on supply side of each control valve and elsewhere as indicated.
12. Install dielectric unions with ferrous and brass or bronze end connections, separated by insulating material, where piping of dissimilar metals is joined.
13. Install corrugated, stainless-steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.
14. JOINT CONSTRUCTION
15. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
16. Use materials suitable for natural gas service.
    a. Brazed Joints: Make joints with brazing alloy having melting point greater than 1000 deg F. Brazing alloys containing phosphorus are prohibited.
17. VALVE INSTALLATION
18. Install valves in accessible locations, protected from damage.
19. Install gas valve upstream from each appliance.
20. HANGER AND SUPPORT INSTALLATION
21. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices.
22. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
    a. 1/2-Inch NPS: Maximum span, 48 inches; minimum rod size, 3/8 inch.
    b. 3/4- and 1-Inch NPS: Maximum span, 60 inches; minimum rod size, 3/8 inch.
23. CONNECTIONS
24. Install gas piping next to appliances using gas valves or stops to allow service and maintenance.
25. Connect gas piping to appliances using gas with shutoff valves and unions. Install gas valve upstream from and within 12 inches of each appliance using gas. Install union downstream from valve. Include flexible connectors when allowed by Code.

26. Sediment Traps: Install tee fitting with capped nipple in bottom forming drip, as close as practical to inlet for appliance using gas.
27. FIELD QUALITY CONTROL
28. Inspect, test, and purge piping according to NFPA 54, Part 4 "Gas Piping Inspection, Testing, and Purging" and requirements of authorities having jurisdiction.
29. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
30. Report test results promptly and in writing to Architect and authorities having jurisdiction.
31. Verify capacities and pressure ratings of gas meters, regulators, valves, and specialties.
32. Verify correct pressure settings for pressure regulators.
33. Verify that specified piping tests are complete.
34. ADJUSTING
35. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION

PACKAGED HEAT PUMP UNITS (2 TON)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged heat pump unit.

B. Unit controls.

1.02 REFERENCE STANDARDS

A. ARI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2006.

B. ARI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2002.

1.03 PERFORMANCE REQUIREMENTS

A. Heat Pump Heating:
   1. Rated heating output (Low temp): 12,900 Btu/hr (3780 W).
   2. Rated outdoor air temperature: 17 degrees F (-8.8 degrees C) DB and 15 degrees F (-9.4 degrees C) WB.
   3. Rated air temperature entering indoor coil: 70 degrees F (21 degrees C).
   4. Coefficient of performance (at low temperature): Minimum 2.24.
   5. Heating seasonal performance factor: Minimum 8.0

B. Cooling Capacity:
   1. Rated cooling output (ARI): 23,800 Btu/hr (6970 W).
   2. Air entering evaporator coil: 80 degrees F (27 degrees C) DB, 67 degrees F (19 degrees C) WB.
   3. Condenser ambient air: 95 degrees F (35 degrees C).
   4. Energy efficiency ratio (ARI): Minimum 12.
   5. Seasonal energy efficiency ratio at ARI conditions: Minimum 14.

C. Supply Air:
   1. Air flow (ARI): 850 cfm (401 L/sec).

D. Return Air:
   1. Air flow: 850 cfm (401 L/sec).

E. Unit Sound Rating: Maximum 76.

F. Refrigerant: R410A.

1.04 SUBMITTALS

A. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

B. Buy American documentation: Provide documentation to owner which certifies that the equipment is manufactured in America in accordance with the Buy American Requirements of the Owner and the American Recovery and Reinvestment Act of 2009.

C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and

include start-up instructions.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out 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.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until the system and site is ready for immediate installation of units.

1.07 WARRANTY

A. Provide a 10 year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation - www.carrier.com

B. Trane Inc - www.trane.com.

C. Rheem - www.rheem.com.

D. York – www.york.com

E. Tempstar – www.tempstar.com

F. Heil – www.heil-hvac.com

G. Goodman – www.goodmanmfg.com

H. Ruud - www.ruud.com

2.02 AIR CONDITIONING UNITS

A. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, electric heating elements, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

B. Electrical Characteristics:
1. 10 KW auxiliary electric heater kit and single point wiring.
2. 240 volts, single phase, 60 Hz.
3. 46 minimum circuit amps.
4. 50 amperes maximum overcurrent protection.
5. Verify minimum circuit ampacity and maximum overcurrent protection with actual equipment provided. Coordinate requirements with Electrical Contractor and actual field conditions.
6. Disconnect switch provided by the Electrical Contractor.

2.03 FABRICATION

A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gage (1.20 mm), with access doors or panels of minimum 20 gage (0.90 mm).

B. Insulation: one inch (25 mm) thick neoprene coated glass fiber with edges protected from erosion.

C. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, and rubber isolated hinge mounted motor or direct drive as indicated. Isolate complete fan assembly.

D. Air Filters: 1 inch (25 mm) thick glass fiber disposable media in metal frames.

E. Filter kit: Provide unit mounted filter housing accessory where applicable and when filter return grilles are not installed.

2.04 ELECTRIC HEATING COIL

A. Supplemental electric heat strip: easily accessible with automatic reset thermal cut-out, built-in magnetic contactors, galvanized steel frame, control circuit transformer and fuse, manual reset thermal cut-out, airflow proving device, 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.

2.05 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 (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons (26 kw) cooling capacity and larger.

2.06 COMPRESSOR

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 gage ports, and filter drier.

B. Five minute timed off circuit to delay compressor start.

C. Outdoor thermostat to energize compressor above 35 degrees F (2 degrees C) ambient.

D. For heat pump units, provide reversing valve, suction line accumulator, flow control check valve, and solid-state defrost control utilizing thermistors.

2.07 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.

2.08 OPERATING CONTROLS

A. Thermostat: Provide low voltage, electronic, non-programmable thermostat for two stage heating, single stage cooling. Include fan "ON-AUTO" and system selector (COOL-OFF-HEAT-EMERGENCY).

B. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Provide service clearances per manufacturer's recommendations.

D. Mount unit on 4" concrete pad.

3.03 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate operation to Owner's maintenance personnel.

END OF SECTION

PAINTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes surface preparation and field painting of the following:
   1. Exposed exterior items and surfaces.
   2. Exposed interior items and surfaces.
   3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color-coding), hangers, exposed steel and ironwork, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Architectural woodwork and casework.
      b. Finished mechanical and electrical equipment.
      c. Light fixtures.
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Foundation spaces.
      b. Furred areas.
      c. Pipe spaces.
      d. Duct shafts.
   3. Finished metal surfaces include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Chromium plate.
      d. Copper.
      e. Bronze and brass.
   4. Operating parts include moving parts of operating equipment and the following:
      a. Valve and damper operators.
      b. Linkages.
      c. Sensing devices.
      d. Motor and fan shafts.
   5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:
   1. Division 2 Section "Hot-Mix Asphalt Paving" for traffic-marking paint.

2. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
3. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
4. Divisions 15 and 16: Painting of mechanical and electrical work is specified in Divisions 15 and 16, respectively.

1.03 DEFINITIONS

A. General: Standard-coating terms defined in ASTM D 16 apply to this Section.
   1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
   3. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
   4. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.04 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.
   1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
   2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
   3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean

condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.07 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.

2.02 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Match Owner's samples.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.02 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
      a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
      b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
   3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
      a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
      b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
      c. When transparent finish is required, backprime with spar varnish.
      d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
      e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
   4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or

mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
   2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
   3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.03 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
   1. Paint colors, surface treatments, and finishes are indicated in the schedules.
   2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
   3. Provide finish coats that are compatible with primers used.
   4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
   5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
   7. Paint backsides of access panels and removable or hinged covers to match exposed surfaces.
   8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
   9. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

C. Insert restrictions or limits on use of spray equipment if necessary to suit special Project conditions.
   1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
   2. Omit primer on metal surfaces that have been shop primed and touchup painted.
   3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness

equivalent to that of flat surfaces.

4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
   1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

E. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

F. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in occupied spaces.

G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
   1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
   1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.06 EXTERIOR PAINT SCHEDULE

A. Concrete and Masonry Units: Provide the following finish systems over exterior concrete and masonry units:
   1. Low-luster Acrylic Finish: 2 finish coats over a primer and block filler.
      a. Block Filler: Factory-formulated high-performance latex block fillers applied at a dry film thickness of not less than 7.0 to 14.5 mils (0.178 to 0.368mm)
         1) ICI Paint Stores Inc.: Ultra-Hide Bloxfil 3010-1200 Interior/Exterior Heavy Duty Acrylic Block Filler.
         2) Rose Talbert: #690 Premium Vinyl Block Filler.
      b. Primer: Exterior, alkyd- or alkali-resistant, acrylic-latex primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.6 mils (0.041 mm).
         1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Primecoat 2010.
         2) Rose Talbert: #200 Bondaplex Acrylic House & Trim Paint.
      c. First and Second Coats: Low-luster (eggshell or satin), exterior, acrylic-latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
         1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Satin Finish 2412-0100.
         2) Rose Talbert: #200 Bondaplex Acrylic House & Trim Paint

B. Wood: Provide the following finish systems over exterior wood surfaces:
   1. Low-Luster Acrylic Finish: 2 finish coats over a primer.
      a. Primer: Exterior, alkyd or latex, wood primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.6 mils (0.041 mm).
         1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Primecoat 2010.
         2) Rose Talbert #120 Premium Reinforced Primer.
      b. First and Second Coats: Low-sheen (eggshell or satin), exterior, latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
         1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Satin Finish 2412-0100.
         2) Rose Talbert: #200 Bondaplex Acrylic House & Trim Paint.

C. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
   1. Low-Luster Acrylic Finish: 2 finish coats over a rust-inhibitive primer.
      a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.2 mils (0.056 mm).
         1) ICI Paint Stores Inc. Devflex 4020 DTM Interior/Exterior Waterborne Primer and Finish.
         2) Rose Talbert: #78 Corrosion Resistant Metal Primer.

b. First and Second Coat: Low-sheen (eggshell or satin), exterior, acrylic-latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
   1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Satin Finish 2412-0100.
   2) Rose Talbert: #200 Bondaplex Acrylic House & Trim Paint.

D. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:
   1. Low-Luster Finish: 2 finish coats over a galvanized metal primer.
      a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.6 mils (0.041 mm).
         1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Primecoat 2010.
         2) Rose Talbert:#76 Zinc Chromate Metal Primer.
      b. First and Second Coat: Low-luster (eggshell or satin), exterior, acrylic-latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
         1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Satin Finish 2412-0100.
         2) Rose Talbert:#200 Bondaplex Acrylic House & Trim Paint..

E. Aluminum Surfaces: Provide the following finish systems over exterior aluminum surfaces:
   1. Low-Luster Finish: 2 finish coats over a galvanized metal primer.
      a. Primer: Rust-inhibitive, acrylic- or alkyd-based, metal primer, as recommended by the manufacturer for use over aluminum, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.6 mils (0.041 mm).
         1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Primecoat 2010.
         2) Rose Talbert: #76 Zinc Chromate Metal Primer.
      b. First and Second Coats: Low-luster (eggshell or satin), exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
         1) ICI Paint Stores Inc., Ultra-Hide Duras Exterior Acrylic Satin Finish.
         2) Rose Talbert:#200 Bondaplex Acrylic House & Trim Paint..

3.07 INTERIOR PAINT SCHEDULE

A. Gypsum Board Walls and Ceilings: Provide the following finish systems over interior gypsum board surfaces:
   1. Walls and Ceilings, (unless noted otherwise): Flat acrylic-latex finish, 2 finish coats over primer.
      a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.9 mils (0.048 mm).
         1) ICI Paint Stores Latex Primer 1030.
         2) Rose Talbert #690 Premium Vinyl Emulsion Primer.
      b. First and Second Coats: Flat, latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
         1) ICI Paint Stores Ultra-Hide Latex Flat Interior Wall Paint 1210.
         2) Rose Talbert: #600 Premium Velvet Vinyl Latex Interior.
   2. Kitchens, Baths, Dryer Walls and Ceilings: Semi-gloss latex enamel, 2 finish coats over primer.
      a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.8 mils (0.046 mm).
         1) ICI Paint Stores, Aquacrylic Gripper 3210

2) Rose Talbert: #690 Premium Vinyl Emulsion Primer.

b. First and Second Coats: Latex-based, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

1) ICI Paint Stores, Ultra-Hide Latex Semi-Gloss Interior Wall and Trim Enamel 1416.

2) Rose Talbert: #400 Premium Acrylic Semi Gloss Enamel.

B. Interior Wood Doors and Trims: Semi-Gloss, Latex Enamel Finish, 2 Finish coats over Primer.

1. Primer: None

a. Stain with Minwax Golden Oak or Equal.

b. Apply two (2) coats of polyurethane, lightly sanding in between applications.

C. Interior Metal Door Frames: Semi-Gloss, Latex Enamel Finish, 2 Finish Coats over Primer.

1. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.8 mils (0.046 mm).

a. ICI Paint Stores, Aquacrylic Gripper 3210.

b. Rose Talbert: #690 Premium Vinyl Emulsion Primer.

c. First and Second Coats: Latex-based, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

1) ICI Paint Stores, Ultra-Hide Latex Semi-Gloss Interior Wall and Trim Enamel 1416.

2) Rose Talbert: #400 Premium Acrylic Semi Gloss Enamel.

3.08 SCHEDULE - COLORS

A. Colors as selected by the Columbia Housing Authority. Paint sheens shall be flat unless otherwise noted.

Typically as follows:

1. Columbia Housing Authority Bone White:
   a. Interior walls (Bathrooms and kitchens shall receive semi gloss)
2. Ceiling White
   a. All interior ceilings.
   b. All interior trim and shelves (Shall be semi gloss)
3. Interior Doors and Handrails
   a. Stain with Minwax Golden Oak

END OF SECTION

PAVEMENT JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Expansion and contraction joints within portland cement concrete pavement.

B. Related Sections include the following:
   1. Division 2 Section "Hot-Mix Asphalt Paving" for constructing joints between concrete and asphalt pavement.
   2. Division 2 Section "Portland Cement Concrete Paving" for constructing joints in concrete paving.

1.03 SUBMITTALS

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

B. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
   2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

2.02 COLD-APPLIED JOINT SEALANTS

A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

B. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

C. Products: Subject to compliance with requirements, provide one of the following:
   1. Type NS Silicone Sealant for Concrete:
      a. Roadsaver Silicone-SL; Crafco Inc.
      b. 888; Dow Corning.
   2. Type SL Silicone Sealant for Concrete and Asphalt:
      a. 890-SL; Dow Corning.

2.03 HOT-APPLIED JOINT SEALANTS

A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.

B. Products: Subject to compliance with requirements, provide one of the following:
   1. Elastomeric Sealant for Concrete:
      a. Superseal 444/777; Crafco, Inc.
      b. POLY-JET 3406; W.R. Meadows, Inc.
   2. Sealant for Concrete and Asphalt:
      a. ROADSAVER 221; Crafco Inc.
      b. Product #9005; Koch Materials Company.
      c. Product #9030; Koch Materials Company.
      d. SEALTIGHT HI-SPEC; W.R. Meadows, Inc.

2.04 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

2.05 PRIMERS

A. Primers: Product recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended by joint sealant manufacturer. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of backer materials.
   2. Do not stretch, twist, puncture, or tear backer materials.
   3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses provided for each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealants from surfaces adjacent to joint.
   2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.04 CLEANING

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

3.05 PROTECTION

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

END OF SECTION

PIPE INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes preformed, flexible pipe insulation.

1.03 SUBMITTALS

A. Product Data: Identify thermal conductivity and thickness.

B. Samples: For each type of insulation and jacket. Identify each Sample, describing product and intended use. Submit Samples in the following sizes:
   1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.

C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, and attachments with requirements indicated. Include dates of tests.

D. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer material containers with appropriate markings of applicable testing and inspecting agency.
   1. Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.06 COORDINATION

A. Coordinate size and location of supports and hangers specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

1.07 SCHEDULING

A. Schedule insulation application after testing piping systems.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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

following:

1. Flexible Elastomeric Thermal Insulation:
    a. Armstrong World Industries, Inc..
    b. Rubatex.

2.02 INSULATION MATERIALS

A. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534, Type I for tubular materials. Provide adhesive as recommended by the manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

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

3.02 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.03 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation in either wet or dry state.

D. Apply insulation with longitudinal seams at top of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings, valves, and specialties, with continuous thermal integrity. Refer to special instructions for applying insulation over fittings, valves, and specialties.

J. Apply adhesives at the manufacturer's recommended coverage rate.

K. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

L. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestopping."
2. FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION
3. Apply insulation to straight pipes and tubes as follows:
    a. Follow manufacturer's written instructions for applying insulation.
    b. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
4. Apply insulation to fittings and elbows as follows:
    a. Apply mitered sections of pipe insulation.
    b. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
5. Apply insulation to valves and specialties as follows:
    a. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
    b. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
    c. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.04 PIPING SYSTEM APPLICATIONS

A. Insulation thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
1. Flexible connectors.
2. Drainage piping located in crawl spaces, unless otherwise indicated.
3. Below-grade piping, unless otherwise indicated.
4. Chrome-plated pipes and fittings, unless potential for personnel injury.

3.05 FIELD QUALITY CONTROL

A. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:
1. Inspect fittings and valves randomly selected by Engineer
2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.
3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.

B. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

C. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

3.06 INSULATION APPLICATION SCHEDULE, GENERAL

A. Application schedules identify piping system and indicate pipe size ranges and thickness requirements.

3.07 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic cold water.
   1. Operating Temperature: 50 to 80 deg F.
   2. Insulation Thickness: 1/2 inch.

B. Service: Condensate drain piping.
   1. Operating Temperature: 35 to 75 deg F.
   2. Insulation Thickness: 1/2 inch.

C. Service: Hot-water piping.
   1. Operating Temperature: 100 to 200 deg F.
   2. Insulation Thickness: 1/2 inch.

3.08 EXTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Refrigerant suction.
   1. Operating Temperature: 35 to 50 deg F.
   2. Insulation Thickness: 1/2 inch.

B. Service: Hot-water piping.
   1. Operating Temperature: 100 to 220 deg F.
   2. Insulation Thickness: 1 inch.
   3. Service: Domestic Cold Water
      a. Operating Temperature: 50 to 80 deg F.
      b. Insulation Thickness: 3/4 inch.

END OF SECTION

VINYL PLANK FLOORING

PART 1 GENERAL

1.01 THIS SECTION INCLUDES

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 RELATED DOCUMENTS

A. Manufactures fact sheets and installation guideline

1.03 RELATED SECTIONS

A. Other Division 9 sections for floor finishes related to this section but not the work of this section.

B. Division 3 Concrete; not the work of this section.

C. Division 6 Wood and Plastics; not the work of this section.

D. Division 7 Thermal and Moisture Protection; not the work of this section.

1.04 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Select an installer who is competent in the installation of resilient sheet flooring.

B. If required, provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.

C. If required, provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:

a. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.

b. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

1.05 SUBMITTALS

A. Submit manufacturer's technical data, installation and maintenance instructions for flooring and accessories.

B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.

C. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

1.06 ENVIRONMENTAL CONDITIONS

A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer.

B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF (18ºC) and a maximum temperature of 100ºF (38ºC) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55ºF (13ºC) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

D. Install flooring and accessories after the other finishing operations, including painting, have been

completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

PART 2 PRODUCTS

2.01 VINYL PLANK FLOORING MATERIALS

A. Provide vinyl plank flooring having a nominal total thickness of 0.118 in. (3.0 mm). The wear layer shall have a nominal thickness of 0.005 in. (0.15 mm). Vinyl plank flooring shall conform to the requirements of ASTM F 1700-04 Class III, Type A or B solid vinyl floor tile. Plank flooring shall be Rapture Plank by Earth Werks or equal and installed per manufacturer recommendation. Color to be SRP712 or equal.

2.02 WALL BASE MATERIALS

A. Provide 9/16” x 3 ¼” Colonial style wood base and ¾” Quarter round.

2.03 ADHESIVES

A. Provide a Pressure Sensitive Adhesive Rated for Vinyl Plank.

2.04 ACCESSORIES

A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), for large areas provide Armstrong S-183 Fast-Setting Cement-Based Underlayment, for smaller areas provide S-194 Fast-Setting Cement-Based Patch and Underlayment.

B. For wood substrate surfaces use ¼” plywood underlayment.

C. Provide caulking for sealing joints between the top of wall base and irregular wall surfaces such as masonry or gypsum board walls according to the manufacturer's recommendations.

D. Provide transition/reducing strips tapered to meet abutting materials.

E. Provide threshold of thickness and width as needed and per manufacturer’s instructions.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

C. Report conditions contrary to contract requirements that would prevent a proper installation. 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 subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.02 PREPARATION

A. Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with Armstrong S-183 Fast-Setting Cement-Based Underlayment. Smaller areas require patching use S-194 Fast-Setting Cement-Based Patch and Underlayment as recommended by the flooring manufacturer. Where wood substrate is used provide ¼” thick plywood underlayment and install per manufacturer’s instructions.

B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.

C. Perform subfloor Calcium Chloride Tests (and Bond Tests) as described in publication F-5061, "Armstrong Guaranteed Installation System," to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring.

D. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.03 INSTALLATION OF PLANK FLOORING

A. Install flooring in strict accordance with the manufacturer’s specifications/instructions.

B. Install flooring wall to wall before the installation of floor-set cabinets, casework. Extend flooring into toe spaces, door recesses, closets, and similar openings.

C. Scribe, cut, and fit or flash cove to permanent fixtures, columns, walls, and cabinets.

D. Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound (45.36 kilogram) roller in the field areas. Hand-roll flooring at the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.

E. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for color shading and pattern at the seams in compliance with the manufacturer's recommendations.

F. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

G. Prepare seams with Seam Cleaner and then apply protective Seam Coating. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas. Protect seams from dust, debris, and foot traffic as recommended by manufacturer.

3.04 INSTALLATION OF ACCESSORIES

A. Install baseboard and quarter round to walls, columns, casework, and other permanent fixtures in areas where base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.

B. Fill voids with caulk filler along the top edge of the wood baseboard on masonry surfaces or other similar irregular substrates.

C. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

D. Apply metal edge strips where required. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.05 CLEANING AND PROTECTION

A. Perform initial maintenance according to the manufacturer’s instructions.

B. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION

PLUMBING FIXTURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes plumbing fixtures and trim, faucets, other fittings, tub and shower surrounds and related components.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 7 Section "Joint Sealants" for sealing between fixtures and walls, floors, and counters.
   2. Division 15 Section "Valves" for general-duty valves used as supply stops.
   3. Division 15 Section "Plumbing Specialties" for other specialties not specified in this Section.

1.03 DEFINITIONS

A. Accessible: Plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped, disabled, and elderly people.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, traps and waste pipes. Pipe fittings, tube fittings, and general-duty valves are included where indicated.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each plumbing fixture category and type specified. Include selected fixture, trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

C. Maintenance data for plumbing fixtures and components to include in the operation and maintenance manuals specified in Division 1.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category from one source and by a single manufacturer.

B. Regulatory Requirements: Comply with requirements of CABO A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; regarding plumbing fixtures for physically handicapped people.

C. Regulatory Requirements: Comply with requirements of Architectural and Transportation Barriers Compliance Board's (ATBCB) "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" regarding plumbing fixtures for physically handicapped people.

D. Energy Policy Act Requirements: Comply with requirements of Public Law 102-486, "Energy Policy Act," regarding water flow rate and water consumption of plumbing fixtures.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are

compatible.

F. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing fixtures and are based on specific types and models indicated. Other manufacturers' fixtures with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.

B. Store plumbing fixtures on elevated platforms in dry location.

1.07 PROJECT CONDITIONS

A. Field Measurements: Coordinate roughing-in and final fixture locations and verify that plumbing fixtures can be installed to comply with original design and referenced standards.

PART 2 PRODUCTS

2.01 PLUMBING FIXTURE STANDARDS

A. Comply with applicable standards below and other requirements specified.
   1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
   2. National Sanitation Foundation Construction: NSF 2.
   3. Slip-Resistant Bathing Surfaces: ASTM F 462.
   4. Stainless-Steel Fixtures Other than Service Sinks: ASME A112.19.3M.
   5. Vitreous-China Fixtures: ASME A112.19.2M.
      a. Exception: ASME A112.19.9M, semivitreous, ceramic fixtures, except water-closet bowls and urinals with integral traps, may be furnished instead of vitreous-china fixtures.
   6. Water-Closet, Flushometer Tank Trim: ASSE 1037.

B. Acrylic/Fiberglass Tub with 3 piece surround

C. Lavatory top molded top with integral sink by Virginia Marble or equal.

2.02 LAVATORY/SINK FAUCET STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for lavatory, sink, and similar-type-fixture faucet fittings. Include hot- and cold-water indicators; 2.5-gpm- maximum flow rate; and polished, chrome-plated finish; except where otherwise indicated. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
   1. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
   2. Faucet Hose: ASTM D 3901.
   3. Hose-Connection Vacuum Breakers: ASSE 1011.
   4. Hose-Coupling Threads: ASME B1.20.7.
   5. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
   6. Pipe Threads: ASME B1.20.1.
   7. Sink Spray Hoses: ASTM D 3573.

2.03 BATHTUB/SHOWER FAUCET STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for bathtub and shower faucet fittings. Include hot- and cold-water indicators; 2.5-gpm- maximum flow rate; and polished, chrome-plated finish; except where otherwise indicated. Coordinate faucet inlets with supplies and outlet with diverter valve; tub spout; and shower head, arm, and flange. Shower head shall have a 1.75 gpm maximum flow rate.

1. Combination, Pressure-Equalizing- and Thermostatic-Control, Antiscald Faucets: ASSE 1016.
2. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
3. Pipe Threads: ASME B1.20.1.
4. Thermostatic-Control Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

2.04 MISCELLANEOUS FITTING STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for fittings, other than faucets. Include polished, chrome-plated finish, except where otherwise indicated. Coordinate fittings with other components and connectors.
   1. Atmospheric Vacuum Breakers: ASSE 1001.
   2. Automatic Flow Restrictors: ASSE 1028.
      a) Shower Head 1.75 gpm maximum flow rate
      b) Lavatory Faucet 1.5 gpm maximum flow rate
      c) Kitchen Faucet 1.5 gpm maximum flow rate
   3. Brass and Copper, Supplies and Tubular Brass: ASME A112.18.1M.
   4. Fixed Flow Restrictors: ASSE 1034.
   5. Manual-Operation Flushometers: ASSE 1037.

2.05 MISCELLANEOUS COMPONENT STANDARDS

A. Comply with applicable standards below and other requirements specified for components for plumbing fixtures, equipment, and appliances.
   1. Grab Bars: ASTM F 446.
   2. Hose-Coupling Threads: ASME B1.20.7.
   3. Pipe Threads: ASME B1.20.1.
   4. Plastic Toilet Seats: ANSI Z124.5.
   5. Supply and Drain Insulation Kits: CABO A117.1.
   6. Supports: ASME A112.6.1M.

2.06 FITTINGS

A. Fittings for Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for materials for supplies, supply stops, supply risers, traps, and other fittings.

B. Fittings for Equipment Specified in Other Sections: Fittings include the following:
   1. Supply Inlets: Brass pipe or copper tube, size required for final connection.
   2. Supply Stops: Chrome-plated brass, angle or straight; compression, wheel-handle type; same size as supply inlet and with outlet matching supply riser.
   3. Supply Risers: 3/8-inch NPS rigid brass tube with 1/4-inch NPS offset, knob-end tailpiece. Use chrome-plated tube for exposed applications.
   4. Traps: Tubular brass with 0.045-inch wall thickness, slip-joint inlet, cleanout, wall flange, escutcheons, and size to match equipment. Use chrome-plated tube for exposed applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in for potable, hot-, tempered- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures.

Use manufacturer's roughing-in data when roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Include supports for plumbing fixtures according to the following:
   1. Carriers: For fixtures supported from wall construction.
   2. Reinforcement: For lavatories and sinks that require securing to wall.
   3. Fabricate reinforcement from 2-by-4-inch or 2-by-6-inch fire-retardant-treated-wood blocking between studs or 1/4-by-6-inch steel plates attached to studs, in wall construction, to secure fixtures to wall. Include length that will extend beyond ends of fixture mounting bracket and attach to at least 2 studs.

B. Include fitting insulation kits for accessible fixtures according to the following:
   1. Lavatories: Cover tempered-, and cold-water supplies, stops and handles, drain, trap, and waste to wall.
   2. Sinks: Cover tempered-, and cold-water supplies, stops and handles, drain, trap, and waste to wall.
   3. Fixtures with Offset Drain: Cover tempered and cold-water supplies, offset drain, trap, and waste to wall.
   4. Other Fixtures: Cover exposed fittings below fixture.

3.03 PLUMBING FIXTURE INSTALLATION

A. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.

B. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.

C. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

D. Install toilet seats on water closets.

E. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

F. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction.

G. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

H. Fasten wall-mounted fittings to reinforcement built into walls.

I. Fasten counter-mounting plumbing fixtures to casework.

J. Secure supplies to supports or substrate within pipe space behind fixture.

K. Set shower receptors in leveling bed of cement grout.

L. Install individual stop valve in each water supply to fixture. Use ball valve where specific stop valve is not specified.

M. Install water-supply stop valves in accessible locations.

N. Install faucet, laminar-flow fittings with Code specified flow rates and patterns in faucet spouts

when faucets are not available with required rates and patterns. Include adapters when required.

O. Install supply, flow-control fittings with Code specified flow rates in fixture supplies at stop valves.

P. Install faucet, flow-control fittings with Code specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

Q. Install shower, flow-control fittings with Code specified maximum flow rates in shower arms.

R. Install traps on fixture outlets. Omit traps on fixtures having integral traps.

S. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

T. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant according to sealing requirements specified in Division 7 Section "Joint Sealants." Match sealant color to fixture color.

U. Install tub and shower surrounds per manufacturer's written instructions. Seal all joints and seams as described above unless otherwise recommended by the manufacturer.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
   1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Division 15 Sections.

B. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for fitting sizes and connection requirements for each plumbing fixture.

C. Supply and Waste Connections to Equipment Specified in Other Sections: Connect equipment with supply inlets, supply stops, supply risers, and traps specified in this Section. Use fitting sizes required to match connected equipment. Connect fittings to plumbing piping.

3.05 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.06 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and shower valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

D. Clean fixtures, faucets, surrounds and other fittings with manufacturers' recommended cleaning methods and materials. Include the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.07 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

3.08 WATER CLOSET SCHEDULE

A. Water Closet WC-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:
   1. Products: Provide the manufacturer listed below (substitutions not allowed):
   2. Vitreous-China Water Closet:
      a. Mansfield Model Number 160 or equal.
   3. Toilet Seat:
      a. Bemis or equal.
   4. Fixture Color: White.
   5. Bowl Type and Operation: Round front, siphon jet.
   6. Mounting and Outlet: Floor mounted, floor outlet.
   7. Fixture Bolt Caps: White, plastic or china.
   8. Rim Height: 14 to 15.5 inches.
   9. Tank: Close coupled. 1.28 gpf
   10. Supply Inlet: 3/8-inch NPS with wall flange.
   11. Supply Stop: ¼ turn stops.
   12. Supply Riser: 3/8-inch NPS, flexible riser with collar end.
   13. Toilet Seat: Solid-plastic, water-closet seat with bumpers and hardware, compatible with water closet and as follows:
      a. Color: White.
      b. Class: Residential.
      c. Size: Round front.
      d. Pattern: Closed front with cover.
   14. Manufacturer and Model No: Mansfield #160, round front toilet with bowl and tank, fill valve, tank cover, polished chrome trip lever and Bemis white seat and cover.

3.09 LAVATORY SCHEDULE

A. Lavatory LAV-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:
   1. Products: Provide the manufacturer listed below (substitutions not allowed):
   2. Solid Wood Lavatory/Vanity.
      a. Built to Standard Use Casework Specifications.
   3. Faucet:
      a. Wolverine.
   4. Fixture Color: Chrome
   5. Fixture Dimensions: Field Verify
   6. Fixture Faucet-Hole Spacing: 3 holes, centered and 2 inches each side of center.
   7. Mounting: Secure back rails of cabinet to studs using screws long enough to penetrate sheetrock and studs.
   8. Faucet Construction: Center set with inlets on 4-inch centers, cast brass underbody escutcheon, with pop-up waste.
   9. Faucet Valve Operation: Manual, ON-OFF.

10. Faucet Mounting Position: Centered on fixture deck.
11. Faucet Components: Include the following:
    a. Accessible-Fixture Operation: Manual.
    b. Handle: Single, push-pull and twist.
    c. Spout: Integral with body.
    d. Spout Outlet: Manufacturer's 1.5 gpm aerator
12. Supply Inlets: 3/8-inch NPS, copper tubing.
13. Supply Stops: Manufacturer's standard brass, angle or straight, compression, loose-key type, same size as supply inlet and with outlet matching supply riser.
14. Supply Risers: 3/8-inch NPS flexible with knob end.
15. Supply, Flow-Control Restrictors: 3/8-inch NPS
16. Drain: Pop-up with 1-1/4-inch NPS tailpiece, included with faucet.
17. Tubular Trap: 1-1/4-inch NPS, PVC.
18. Fixture Support: N/A
19. Manufacturer and Model No: Wolverine Faucet Model #85200, with pop-up drain.
20. Lavatory:
    a. Culture Marble by Virginia Marble or an approved equal.

3.10 BATHTUB SCHEDULE

A. Tub/Shower: Where plumbing fixtures of this designation are indicated, provide products complying with the following:
    1. Products: Provide the manufacturer listed below (substitutions not allowed):
    2. Fiberglass Tub/Shower Surround:
        a. Swan Fiberglass Molding Corp. or equal (3 piece tub and surround)
    3. Antiscald Bathtub Faucet:
        a. Wolverine
    4. Fixture and Surround Color: White.
    5. Fixture Dimensions: 60” x 31 -1/2” x 16”
    6. Bathing Surface: Slip resistant.
    7. Surround: 3 piece fiberglass surround.
    8. Faucet Construction: Cast-brass, thermostatic-control, with high-temperature-limit control, single-handle mixing valve with check stops, and escutcheon.
    9. Faucet Components: Include the following:
        a. Handle: Single-lever, chrome-plated brass.
        b. Tub Filler Spout: Manufacturer's standard.
        c. Shower Diverter Valve: Manufacturer's standard.
        d. Shower Head, Arm, and Flange: Manufacturer's standard with manual flow control in head.
    10. Supplies: 1/2-inch NPS copper tubing.
    11. Waste and Overflow Fitting: 1-1/2-inch NPS, wall thickness, PVC (glued). Include lever-operated, pop-up waste and overflow with universal-type outlet connection on waste tee; and 1-1/2-inch NPS, wall thickness, tubular waste. Slip joints are prohibited.
    12. Trap: 1-1/2-inch NPS PVC; glued.
    13. Manufacturer and Model No: Swan Fiberglass Molding Corp. or equal.

3.11 SINK SCHEDULE

A. Kitchen Sink (KS): Where plumbing fixtures of this designation are indicated, provide products complying with the following:
    1. Products: Provide the manufacturer listed below:
    2. Stainless-Steel Sink:
        a. Project Source

b. Moen

3. Faucet:
   a. Wolverine.
4. Fixture Dimensions: 2 compartments: 33" by 22” by 6” D overall.
5. Fixture Stainless-Steel Gauge: 22 gauge.
6. Fixture Faucet-Hole Spacing: 3 holes, centered and 4 inches each side of center.
7. Fixture Mounting: Counter, self-rimming.
8. Faucet Construction: Center set with inlets on 8-inch centers, and cast-brass underbody and brass escutcheon.
9. Faucet Mounting: Centered on fixture deck.
10. Faucet Components: Include the following:
    a. Accessible-Fixture Operation: Manual.
    b. Handle: Single-lever toggle.
    c. Spout: Swing gooseneck.
    d. Spout Outlet: Manufacturer's standard aerator.
    e. Spout-Outlet, Flow-Control Fitting: 1-1/2 gpm .
11. Supply Inlets: 1/2-inch NPS, brass pipe or copper tubing.
12. Supply Stops: Manufacturer's standard brass, angle or straight, compression, wheel-handle type, same size as supply inlet and with outlet matching supply riser.
13. Supply Risers: 3/8-inch NPS flexible with knob end.
14. Supply, Flow-Control Restrictors: 1/2-inch NPS, 1 gpm.
15. Drain: 3-1/2-inch grid strainer with 3-1/2-inch removable, stainless-steel crumb cup with 1-1/2-inch NPS tubular-brass tailpiece.
16. Continous Waste: 1-1/2-inch NPS, PVC.
17. Tubular Trap: 1-1/2-inch NPS, 0.045-inch wall thickness, tubular brass with slip-joint inlet and wall flange.

END OF SECTION

PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes plumbing specialties for the following:
   1. Water distribution systems.
   2. Soil, waste, and vent systems.

B. Related Sections include the following:
   1. Division 1 Section “Closeout Procedures” for operations and maintenance manual requirements.
   2. Division 7 Section “Sheet Metal Flashing and Trim” for flashing of piping pasing through roofs with counterflashing or commercially made flashing.
   3. Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, basic installation requirements, and labeling and identifying requirements; and escutcheons, dielectric fittings, sleeves, and sleeve seals that are not in this Section.
   4. Division 15 Section "Valves" for general-duty ball, check, and globe valves.
   5. Division 15 Section “Water Distribution Piping” for water-supply piping and connection.
   6. Division 15 Section “Sanitary Waste and Vent Piping” for drainage and vent piping and connections.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
   1. Water Distribution Piping: 125 psig.
   2. Soil, Waste, and Vent Piping: 10-foot head of water.

1.04 SUBMITTALS

A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
   1. Water tempering valves.
   2. Hose bibbs.
   3. Washing machine boxes.
   4. Cleanouts.
   5. Vent caps, vent terminals, and roof flashing assemblies.

B. Reports: Specified in "Field Quality Control" Article.

C. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include the following:
   1. Water tempering valves.
   2. Hose bibbs.
   3. Washing machine boxes.

1.05 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing specialties and are based on the specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.

C. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.
   1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.
   2. Listing and Labeling Agency Qualifications: "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

D. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

E. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Provide products by the following:
   1. Water Tempering Valves (substitutions not allowed):
      a. Honeywell-Sparco
   2. Washing Machine Boxes:
      a. Guy Gray Manufacturing Co., Inc.
   3. Hose bibbs:
      a. JR Smith
      b. Woodford
      c. Zurn Industries, Inc.
   4. Potable Water Expansion Tanks
      a. Amtrol, Inc.
      b. State Industries
      c. Taco
   5. Roof Flashing Assemblies (substitutions not allowed):
      a. Elmdor/Stoneman Manufacturing Co.

2.02 WATER TEMPERING VALVES

A. General: Manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting.

B. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited antiscald protection. Include threaded inlets and outlet; set temperature at 120 deg. F.
   1. Finish: Rough bronze.

C. Limited-Volume, Water Tempering Valves: Solder-joint inlets and 3/4-inch NPS inlets and outlet.

D. Manufacturer and Model: Sparco “Aquamix” AM101C.

2.03 WASHING MACHINE BOXES

A. General: Recessed-mounting outlet boxes with fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

B. Clothes Washer Outlet Boxes: With hose connections, drain, and the following:
   1. Box and Faceplate: 16 Ga. Steel with baked enamel finish.
   2. Shutoff Fittings: 2 hose bibbs.
   3. Drain Fitting: 2-inch NPS drainage piping P-trap with 2-inch NPS standpipe extending from floor to outlet box and 2-inch NPS waste.
   4. Guy Gray Model B150 with all metal accessories and bronze valves or approved equal.

2.04 POTABLE WATER EXPANSION TANKS

A. IAMPO approved; steel tank with liner; butyl diaphragm; 150 psi at 200 deg. F; air charging valve; 3/4-inch MPT water connection.

2.05 MISCELLANEOUS PIPING SPECIALTIES

A. Hose Bibbs: Freezeproof with bronze body, with renewable composition disc, 1/2-inch NPS threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker. J.R. Smith #5609 QT or approved equal.
   1. Finish: Rough brass.
   2. Operation: Key.

B. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.
   1. Vent Cap: Open top, without cap.

C. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

2.06 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
   1. General Use: 4 lb/sq. ft. or 0.0625-inch thickness.
   2. Vent Pipe Flashing: 3 lb/sq. ft. or 0.0469-inch thickness.
   3. Burning: 6 lb/sq. ft. or 0.0937-inch thickness.

B. Copper Sheet: ASTM B 152, of the following minimum weights and thicknesses, unless otherwise indicated:
   1. General Applications: 12 oz./sq. ft..
   2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Fasteners: Metal compatible with material and substrate being fastened.

D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

E. Solder: ASTM B 32, NSF approved, lead-free alloy.

F. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 EXECUTION

3.01 PLUMBING SPECIALTY INSTALLATION

A. General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.

B. Install hose bibbs with integral vacuum breaker.

C. Install cleanouts in aboveground piping and building drain piping, according to the following:
   1. Size same as drainage piping up to 4-inch NPS. Use 4-inch NPS for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping 4-inch NPS and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil and waste stack.

D. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

E. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

F. Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.

G. Secure supplies to supports or substrate.

H. Install individual stop valve in each water supply to plumbing specialties. Use ball valve if specific valve is not indicated.

I. Install water-supply stop valves in accessible locations.

J. Install traps on plumbing specialty drain outlets.

K. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.

L. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

M. Include wood-blocking reinforcement for recessed and wall-mounting plumbing specialties.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
   1. Install piping connections between plumbing specialties and piping specified in other Division 15 Sections.
   2. Install piping connections indicated between appliances and equipment specified in other Sections; connect directly to plumbing piping systems.
   3. Install piping connections indicated as indirect wastes from appliances and equipment specified in other Sections, to spill over receptors connected to plumbing piping systems.

B. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated.

C. Drainage Runouts to Plumbing Specialties: Install drainage and vent piping, with approved trap, of sizes indicated.

3.03 FLASHING INSTALLATION

A. Fabricate flashing manufactured from single piece.

B. Burn joints of lead sheets where required.

C. Solder joints of copper sheets where required.

D. Set flashing on floors and roofs in solid coating of bituminous cement.

E. Secure flashing into sleeve and specialty clamping ring or device.

F. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

G. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.04 COMMISSIONING

A. Before startup, perform the following checks:
   1. System tests are complete.
   2. Damaged and defective specialties and accessories have been replaced or repaired.
   3. Clear space is provided for servicing specialties.

B. Before operating systems, perform the following steps:
   1. Close drain valves and hose bibbs.
   2. Open general-duty valves to fully open position.
   3. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.

C. Adjust operation and correct deficiencies discovered during commissioning.

3.05 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to perform startup services and train Owner's maintenance personnel as specified below:
   1. Review data in the maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
   2. Schedule training with Owner with at least 7 days' advance notice.

3.06 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 REFERENCE STANDARDS

A. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc.; 2004.

1.03 SUBMITTALS

A. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Buy American documentation: Provide documentation to owner which certifies that the equipment is manufactured in America in accordance with the Buy American Requirements of the Owner and the American Recovery and Reinvestment Act of 2009.
   3. Provide electrical characteristics and connection requirements.

B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

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.

1.05 CERTIFICATIONS

A. Water Heaters: NSF approved.

B. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

A. Provide ten year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATER MANUFACTURERS

A. Rheem Manufacturing Company; Model 83XR40-2: www.rheem.com.

B. Bradford White Corporation; Model M-2-HE40S6DS: www.bradfordwhite.com

C. A.O. Smith Corporation; Model ECRT-40: www.hotwater.com

2.02 RESIDENTIAL ELECTRIC WATER HEATERS

A. Type: Automatic, high efficiency, electric, vertical storage.

B. Performance:
   1. Minimum Energy Factor:.91.
   2. Storage capacity: 40 gal (151 L).
   3. First Hour Rating: 55 gal/hr (208 L/hr).
   4. Heating element size: 4.5 kW.
   5. Number of heating elements: 2.
   6. Minimum recovery rate: 21 gal/hr (79 L/hr) with 90 degrees F temperature rise.
   7. Maximum working pressure: 150 psig (1000 kPa).

C. Electrical Characteristics:
   1. 240 volts, single phase.
   2. Disconnect switch provided by Electrical Contractor.
   3. Coordinate electrical requirements with Electrical Contractor and actual field conditions.

D. Tank: Glass lined welded steel, thermally insulated with two inch (50 mm) thick foam plastic (R16 minimum); encased in corrosion-resistant steel jacket; baked-on enamel finish.

E. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F (49 to 77 degrees C), 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.

F. Accessories: Provide:
   1. Water Connections: Brass.
   2. Dip tube: Brass.
   3. Drain Valve.
   4. Anode: Magnesium
   5. Temperature and Pressure Relief Valve: ASME labelled.
   6. Additional accessories as required by code for complete installation of system, to include antisiphon device, vacuum relief valve, disconnect switch, shut-off valves, external heat traps, drain pan and relief valve discharge piping.

G. Seismic Bracing: Provide seismic anchors or straps in accordance with the 2006 International Residential Code, P2801.7, or the 2006 International Building Code and ASCE 7, whichever code is applicable for the installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related electrical work to achieve operating system.

END OF SECTION

POWER DISTRIBUTION UNITS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes lighting and power panel-boards and associated auxiliary equipment rated 600 V and less.

B. Related Sections include the following:
   1. Division 16 Section "Basic Electrical Materials and Methods" for general materials and installation methods.

1.03 SUBMITTALS

A. Product Data: For each type of panel-board, accessory item, and component specified.

B. Shop Drawings: For panel-boards. Include dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:
   1. Enclosure type with details for types other than NEMA 250, Type 1.
   2. Bus configuration and current ratings.
   3. Short-circuit current rating of panel-board.
   4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.
   5. Wiring Diagrams: Details of schematic diagram including control wiring and differentiating between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For panel-board components to include in the maintenance manuals specified in Division 1. Include manufacturer's written instructions for testing circuit breakers.

1.04 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NFPA 70.

C. Comply with NEMA PB 1.

D. Comply with UL-489: Molded-Case Circuit Breakers, Switches, and Circuit Breaker Enclosures, UL-1699: Arc Fault Circuit Interrupters, and UL-1998: Software in Programmable Components

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Eaton Corp.; Westinghouse & Cutler-Hammer Products.
   2. General Electric Co.; Electrical Distribution & Control Div.

3. Siemens Energy & Automation, Inc.

2.02 LOAD CENTERS

A. Overcurrent Protective Devices: Plug-in, full-module circuit breaker.
   1. Circuit Breakers for Switching Lights at Panelboards: Indicated as Type SWD.
   2. Circuit Breakers for Equipment Marked Type HACR: Indicated as Type HACR.

B. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.03 ARC FAULTS

A. Combination Circuit Interrupters: Overvoltage protection and neutral bus terminal; Indicated as Type SWD and Type HACR.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, handle lockable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Load Centers:

   1. Install panel-boards and accessory items according to NEMA PB 1.1.

   2. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

   3. Mounting: Plumb and rigid without distortion of box. Mount flush panel-boards uniformly flush with wall finish.

   4. Circuit Directory: Type directory to indicate installed circuit loads after balancing panel-board loads. Obtain approval before installing.

   5. Install filler plates in unused spaces.

   6. Provision for Future Circuits at Flush Panel-boards: Stub four 1-inch (27-GRC) empty conduits from panel-board into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

   7. Wiring in Panel-board Gutters: Arrange conductors into groups, and bundle and wrap with wire ties after completing load balancing.

B. Arc Faults:

   1. Install in compliance with DET-719 “Applying 1-pole Combination AFCI’s to Shared Neutral Circuits”.

   2. Circuitry: Secure pigtail to neutral bus terminal. Connect hot wire to circuit breaker terminals.

   3. Mounting: Plug in or bolt on circuit breaker into compatible pole positions directed by load center.

4. Testing: Reset circuit breaker to test condition

      a. If breaker trips with all loads OFF: Check permanent electrical circuit wiring, arcing, poor insulation, shorted wires, wet connections, wet conduit, a neutral lead pinched to a grounded metal box, receptacle leakage, loose connections, or other faults that could

cause safety features in the breaker to open the circuit.

b. Switch ON one of the original loads. Reset the breaker. If breaker does not trip with this load ON, switch on an additional load. Repeat until breaker trips. Examine last additional load for possible faults.

5. Loads and/or wiring suspected of having faults should not be installed to service.

6. Refer to DET-719, “Applying 1-pole Combination AFCIs to Shared Neutral Circuits”.

C. Provide arc faults circuit breaker on any circuit that enters a sleeping room.

3.02 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods."

3.03 GROUNDING

A. Make equipment grounding connections for panel-boards as indicated.

B. Provide ground continuity to main electrical ground bus as indicated.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
1. Make insulation-resistance tests of each panel-board bus, component, and connecting supply, feeder, and control circuits.
2. Make continuity tests of each circuit.

3.06 CLEANING

A. On completion of installation, inspect interior and exterior of panel-boards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16470

POWER VENTILATORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Ceiling-mounted ventilators.

1.03 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

B. Fan Unit Schedule: The following information is described in an equipment schedule at the end of this Section.
   1. Fan performance data including capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data including rated capacities of each unit, weights, furnished specialties, accessories, and the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound power ratings.
   3. Motor ratings and electrical characteristics plus motor and electrical accessories.
   4. Material gages and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

D. Wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

E. Maintenance data for power ventilators to include in the operation and maintenance manual specified in Division 1 and in Division 15 Section "Basic Mechanical Requirements."

1.05 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

C. AMCA Compliance: Provide products that meet performance requirements and are licensed to use the AMCA Seal.

D. NEMA Compliance: Provide components required as part of fans that comply with applicable NEMA standards.

E. UL Standard: Provide power ventilators that comply with UL 705.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements. Verify clearances.

B. Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated, and fans have been commissioned.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ceiling-Mounted Ventilators:
      a. Broan Mfg. Co., Inc.
      b. Cook (Loren) Co.
      c. Dayton Electric Mfg. Co.
      d. Fasco Industries, Inc.
      e. Nutone
      f. Greenheck Fan Corp.

2.02 CEILING-MOUNTED VENTILATORS

A. Description: Centrifugal fans designed for installing in ceiling or wall, or for concealed in-line applications.

B. Housing: Galvanized steel lined with acoustical insulation.

C. Fan Wheel: Forward curved type.

D. Grille: Decorator style, molded plastic.

E. Accessories: Transition fittings for connection to existing exhaust ductwork.

2.03 SOURCE QUALITY CONTROL

A. Testing Requirements: The following factory tests are required as indicated:
   1. Sound Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA Seal.
   2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions for compliance with requirements of installation tolerances and other conditions affecting performance of the power ventilators. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install power ventilators according to manufacturer's written instructions.
   1. Ceiling Units: Suspend units from structure using steel wire or metal straps.

B. Install units with clearances for service and maintenance.

3.03 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of ducts and duct accessories.

B. Electrical: Conform to applicable requirements in Division 16 Sections.

C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 CLEANING

A. After completing installation, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

B. Clean fan interiors to remove foreign material and construction debris. Vacuum clean fan wheel and cabinet.

3.05 COMMISSIONING

A. Final Checks before Startup: Perform the following operations and checks before startup:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections for piping, ducts, and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnects.
   3. Perform cleaning and adjusting specified in this Section.
   4. Lubricate moving parts with factory-recommended lubricants.

B. Starting procedures for fans are as follows:
   1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
   2. Measure and record motor voltage and amperage.

C. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for procedures for air-handling-system testing, adjusting, and balancing.

3.06 DEMONSTRATION

A. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

B. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout."

C. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

D. Demonstrate operation of power ventilators. Conduct walking tour of the Project. Briefly identify location and describe function, operation, and maintenance of each power ventilator.

3.07 SCHEDULE

A. EF-1: Greenheck SP-7, ceiling exhaust fan, 95 cfm at 0.5" SP, 950 rpm, 80 watts, 120/1/60, 2.7 sones. Provide with backdraft damper and roof cap (where required).

END OF SECTION

RACEWAYS AND BOXES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
   1. Raceways include the following:
      a. RMC.
      b. EMT.
      c. FMC.
      d. LFMC.
      e. RNC.
   2. Boxes, enclosures, and cabinets include the following:
      a. Device boxes.
      b. Outlet boxes.
      c. Pull and junction boxes.

B. Related Sections include the following:
   1. Division 7 Section "Firestopping."
   2. Division 16 Section "Basic Electrical Materials and Methods" for raceways and box supports.
   3. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. LFMC: Liquidtight flexible metal conduit.

D. RNC: Rigid nonmetallic conduit.

1.04 QUALITY ASSURANCE

A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NECA's "Standard of Installation."

C. Comply with NFPA 70.

1.05 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

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ensure adequate headroom, working clearance, and access.

PART 2 PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

B. EMT and Fittings: ANSI C80.3.
   1. Fittings: Compression type.

C. FMC: Zinc-coated steel.

D. LFMC: Flexible steel conduit with PVC jacket.

E. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.02 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Schedule 40.

2.03 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

2.04 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 WIRING METHODS

A. Outdoors: Use the following wiring methods:
   1. Exposed: Rigid steel.
   2. Concealed: Rigid steel.
   3. Underground, Single Run: RNC.
   4. Underground, Grouped: RNC.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Indoors: Use the following wiring methods:
   1. Exposed: RMC.
   2. Concealed: EMT.
   3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
   4. Damp or Wet Locations: Rigid steel conduit.
   5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
      a. Damp or Wet Locations: NEMA 250, Type 3R, stainless steel.

3.03 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written

instructions.

B. Minimum Raceway Size: 3/4-inch trade size (DN21).

C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Install raceways level and square and at proper elevations. Provide adequate headroom.

F. Complete raceway installation before starting conductor installation.

G. Use temporary closures to prevent foreign matter from entering raceways.

H. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

I. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

J. Use raceway fittings compatible with raceways and suitable for use and location.

K. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

L. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
   1. Run parallel or banked raceways together, on common supports where practical.
   2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

M. Join raceways with fittings designed and approved for the purpose and make joints tight.
   1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
   2. Use insulating bushings to protect conductors.

N. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

O. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

P. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

Q. Telephone and Signal System Raceways, 2-Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

R. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install

separate ground conductor across flexible connections.

1. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.

3.04 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.05 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 16130

REGISTERS AND GRILLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:
   1. Division 15 Section "Duct Accessories" for volume-control dampers not integral to diffusers, registers, and grilles.
   2. Division 15 Section "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

1.03 DEFINITIONS

A. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

B. Register: A combination grille and damper assembly over an air opening.

1.04 SUBMITTALS

A. Product Data: For each model indicated, include the following:
   1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
   2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
   3. Schedule of registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
   4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

1.05 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. NFPA Compliance: Install registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Registers, and grilles are scheduled at the end of this Section.

2.02 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas where registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers and air extractors.

D. Install supply registers with directional throws as indicated on the drawings; i.e., one way, two way, three way or four way throw.

3.03 ADJUSTING

A. After installation, adjust registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.04 CLEANING

A. After installation of registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace registers, and grilles that have damaged finishes.

3.05 DIFFUSER SCHEDULE

3.06 SELECTION

A. Manufacturer shall be responsible for verification of proper selection for capacity, throw and noise. Sizes indicated on the drawings are for general information only to assist the contractor in the approximate sizes expected. Submit schedule showing all relevant data for each room. Manufacturer's standard selection table is not acceptable.

3.07 REGISTER SCHEDULE

A. Ceiling or Sidewall Register CR and SR:
   1. Products: Subject to compliance with requirements, provide model equal to Hart & Cooley model 821 or 831.
   2. Material: Steel.
   3. Finish: Baked enamel, white.
   4. Vertical or horizontal adjustable face bars on ¾ inch centers; with vertical or horizontal adjustable multi-shutter valve.
   5. Mounting: Surface.

3.08 GRILLE SCHEDULE

A. Filter Return Grille FRG.

1. Products: Subject to compliance with requirements, provide model equal to Hart & Cooley model 659.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Fixed horizontal; 1/3 inch spacing; 20 degrees.
5. Mounting: Surface.
6. Accessories: 1 inch thick filters; Farr 30/30 or equal.

END OF SECTION

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Range hoods.
   2. Installation of Owner Furnished Appliances

B. Related Sections include the following:
   1. Division 1 Section “Summary” for owner furnished products.
   2. Division 15 Section "Water Distribution Piping" for plumbing connections to residential appliances.
   3. Division 15 Section "Sewerage and Vent Piping" for drainage plumbing connections to residential appliances.
   4. Division 15 Section "Plumbing Fixtures" for kitchen sinks.
   5. Division 16 Section "Conductors and Cables" for services and connections to residential appliances.

1.03 SUBMITTALS

A. Product Data: For each appliance type required indicating compliance with requirements. Include complete operating and maintenance instructions for each appliance.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the residential appliance manufacturer for both installation and maintenance of appliances required for this Project.

B. Source Limitations: Obtain residential appliances through one source from a single manufacturer.

C. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of residential appliances and are based on the specific types and models indicated.

D. Electrical Appliances: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

1.05 DELIVERY

A. Deliver appliances only after utility rough-in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

1.06 WARRANTIES

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

B. Special Warranties Written warranties, executed by manufacturer of each appliance specified agreeing to repair or replace residential appliances or components that fail in materials or workmanship within the manufacturer's standard warranty period.

PART 2 PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

A. Products: Appliances that may be incorporated into the Work include, are those indicated in the Residential Appliance Schedule at the end of Part 3.

2.02 RESIDENTIAL APPLIANCES

A. Exhaust Hood: Wall-mounted, undercabinet exhaust hood, listed by UL, and complying with requirements specified in the Residential Appliance Schedule.

B. Electric Ranges: Owner furnished

C. Electric Refrigerators: Owner furnished

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in for plumbing, mechanical, and electrical services, with Installer present, to verify actual locations of services before residential appliance installation.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Refer to Divisions 15 and 16 for plumbing and electrical requirements.

3.03 ADJUSTING AND CLEANING

A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

3.04 RESIDENTIAL APPLIANCE SCHEDULE

A. Exhaust Hood: Provide and install exhaust hoods complying with the following:

1. Products: Provide the following products:
    a. 30” Ductless Range Hood, Model #413001, manufactured by Broan.
2. Type: Wall-mounted recirculating, nonventing range hood.
3. Fan Control: Two-position rocker switch.
4. Finish: Baked enamel.
    a. Color: White
5. Standard features include the following:
    a. Permanent washable filter.
    b. Built-in lighting.

END OF SECTION

ROUGH CARPENTRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section

1.02 SUMMARY

A. This Section includes the following:
   1. Framing with dimension lumber.
   2. Wood blocking, cants, and nailers.
   3. Utility shelving.
   4. Wood furring and grounds.
   5. Sheathing.
   6. Subflooring and underlayment.

B. Related Sections include the following:
   1. Division 6 Section "Metal-Plate-Connected Wood Trusses."
   2. Division 6 Section "Interior Architectural Woodwork" for nonstructural carpentry items exposed to view and not specified in another Section.

1.03 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Exposed Framing: Dimension lumber not concealed by other construction.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NELMA - Northeastern Lumber Manufacturers Association.
   2. NLGA - National Lumber Grades Authority.
   3. RIS - Redwood Inspection Service.
   4. SPIB - Southern Pine Inspection Bureau.
   5. WCLIB - West Coast Lumber Inspection Bureau.
   6. WWPA - Western Wood Products Association.

1.04 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
   3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. 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 American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Power-driven fasteners.
   4. Powder-actuated fasteners.
   5. Expansion anchors.
   6. Metal framing anchors.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Gypsum Sheathing Board:
      a. G-P Gypsum Corporation.
      b. National Gypsum Company.
      c. United States Gypsum Co.
   2. Metal Framing Anchors:
      a. Simpson Strong-Tie Company, Inc.
      b. Southeastern Metals Manufacturing Co., Inc.
      c. United Steel Products Company, Inc.

2.02 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
   1. Factory mark each piece of lumber with grade stamp of grading agency.

2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.
5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

B. Wood Structural Panels:
1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Comply with "Code Plus" provisions in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."
4. Factory mark panels according to indicated standard.

2.03 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no chromium or arsenic.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches (460 mm) above grade.
4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.04 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.

2. Use type with a listed flame spread of 25 or less when tested in accordance with ASTM E 84.
3. Use treatment that does not promote corrosion of metal fasteners.
4. Use Exterior type for both exterior and interior locations and where indicated.

2.05 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

B. Non-Load-Bearing Interior Partitions: Construction or or No. 2 grade and any of the following species:
   1. Mixed southern pine; SPIB.
   2. Eastern softwoods; NELMA.

C. Exterior and Load-Bearing Walls: Construction or No. 2 grade and any of the following species:
   1. Douglas fir-south; WWPA.
   2. Hem-fir; WCLIB or WWPA.
   3. Mixed southern pine; SPIB.
   4. Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.

D. Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade and any of the following species:
   1. Douglas fir-south; WWPA.
   2. Hem-fir; WCLIB or WWPA.
   3. Mixed southern pine; SPIB.
   4. Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.

E. Joists, Rafters, and Other Framing Not Listed Above: Construction or No. 2 grade and any of the following species:
   1. Douglas fir-south; WWPA.
   2. Hem-fir; WCLIB or WWPA.
   3. Southern pine; SPIB.
   4. Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.

2.06 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Cants.
   3. Nailers.
   4. Furring.
   5. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:
   1. Mixed southern pine; SPIB.
   2. Eastern softwoods; NELMA.
   3. Northern species; NLGA.
   4. Western woods; WCLIB or WWPA.

C. For exposed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Finish or 1 Common grade; NELMA, NLGA, WCLIB, or WWPA.

2. Mixed southern pine, B & B Finish grade; SPIB.

D. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine, No. 2 grade; SPIB.
   2. Eastern softwoods, No. 2 Common grade; NELMA.
   3. Northern species, No. 2 Common grade; NLGA.
   4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.07 SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing.
   1. Span Rating: Not less than 16/0.
   2. Thickness: As indicated.

B. Paper-Surfaced Gypsum Wall Sheathing: ASTM C 79/C 79M, with water-resistant material incorporated into the core and with water-repellent paper bonded to core's face, back, and long edges.
   1. Type and Thickness: Regular, thickness as indicated.
   2. Edge and End Configuration: V-shaped, tongue-and-groove long edges; square ends.
   3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical.

C. Plywood Roof Sheathing: Exterior, Structural I sheathing.
   1. Span Rating: Not less than 24/16.
   2. Thickness: As indicated.

2.08 SUBFLOORING AND UNDERLAYMENT

A. Plywood Subflooring: Exterior, Structural I single-floor panels or sheathing.
   1. Span Rating: Not less than 16
   2. Thickness: As indicated.

B. Underlayment, General: Provide underlayment I nominal thickness indicated or, if not indicated, not less than 1/4-inch over smooth subfloors and not less than 3/8” over board or uneven subfloors.

C. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exterior B-C Underlayment 1/4-inch thick with fully sanded face.

D. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, 3/4-inch thick, for ceramic tile set in epoxy mortar.

2.09 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.10 METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
   1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
   2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

C. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.
   1. Thickness: 0.050 inch (1.3 mm).

D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
   1. Strap Width: 1-1/2 inches (38 mm)
   2. Thickness: 0.050 inch (1.3 mm).

E. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
   1. Width: 1-1/4 inches (32 mm).
   2. Thickness: 0.050 inch (1.3 mm).
   3. Length: As required.

F. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

G. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick by 36 inches (914 mm) long.

H. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
   1. Bolt Diameter: 5/8 inch (15.8 mm).

2. Width: 2-1/2 inches (64 mm).
3. Body Thickness: 0.108 inch (2.8 mm).
4. Base Reinforcement Thickness: 0.108 inch (2.8 mm).

I. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches (29 mm) wide by 9/16 inch (14 mm) deep by 0.034 inch (0.85 mm) thick with hemmed edges.

J. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch (24 by 24 by 1 mm) thick with hemmed edges.

2.11 MISCELLANEOUS MATERIALS

A. Building Paper: Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.

B. Sheathing Tape: Pressure-sensitive plastic tape for sealing joints and penetrations in sheathing and recommended by sheathing manufacturer for use with type of sheathing required.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in the International Building Code.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.02 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.03 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
   1. Fire block furred spaces of walls, at each floor level and at ceiling, with wood blocking or noncombustible materials accurately fitted to close furred spaces.

B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

3.04 WOOD FRAMING INSTALLATION, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Do not splice structural members between supports.

C. Where built-up beams or girders of 2-inch nominal- (38-mm actual-) dimension lumber on edge are required, fasten together with 2 rows of 20d (100-mm) nails spaced not less than 32 inches (812 mm) o.c. Locate one row near top edge and other near bottom edge.
   1. For continuous members locate end joints over supports.

3.05 WALL AND PARTITION FRAMING INSTALLATION

A. General: Arrange studs so wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Anchor or nail plates to supporting construction, unless otherwise indicated.
   1. For exterior walls, provide 2-by-4-inch nominal- (38-by-89-mm actual-)] size wood studs spaced 16 inches (406 mm) o.c., unless otherwise indicated.
   2. For interior partitions and walls, provide 2-by-4-inch nominal- (38-by-89-mm actual-) size wood studs spaced 16 inches (406 mm) o.c., unless otherwise indicated.

B. Construct corners and intersections with three or more studs. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

C. Fire block concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where fire blocking is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal- (38-mm actual-) thick lumber of same width as framing members.

D. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.
   1. Provide double-jamb studs for openings 72 inches (1800 mm) and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

E. Provide bracing in exterior walls, at both walls of each external corner, full-story height, unless otherwise indicated. Provide one of the following:
   1. Plywood panels not less than 48 by 96 inches (1219 by 2438 mm) applied vertically.
   2. In lieu of bracing at corners or at locations indicated, continuous gypsum sheathing may be provided in panels not less than 48 by 96 inches (1219 by 2438 mm) applied vertically.

3.06 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as follows:
   1. Where supported on wood members, by toe nailing or by using metal framing anchors.
   2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches (76 mm) and do not embed more than 4 inches (102 mm).

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches (1200 mm).

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches (50 mm) from top or bottom.

E. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist over supports.

G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch (6.4-by-32-mm) metal strap anchors spaced not more than 96 inches (2438 mm) o.c., extending over and fastening to 3 joists. Embed anchors at least 4 inches (102 mm) into grouted masonry with ends bent at right angles and extending 4 inches (102 mm) beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
   1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

J. Provide bridging of type indicated below, at intervals of 96 inches (2438 mm) o.c., between joists.
   1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- (19-by-64-mm actual-) size lumber, double-crossed and nailed at both ends to joists.

3.07 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements

specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (19-by-184-mm actual-) size or 2-by-4-inch nominal- (38-by-89-mm actual-) size stringers spaced 48 inches (1200 mm) o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against valley rafters.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- (19-by-140-mm actual-) size boards between every third pair of rafters, but not more than 48 inches (1219 mm) o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.08 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:

1. Stringer Size: 2-by-12-inch nominal- (38-by-286-mm actual-) size, minimum.
2. Notching: Notch stringers to receive treads, risers, and supports; leave at least 3-1/2 inches (89 mm) of effective depth.
3. Stringer Spacing: At least 3 stringers for each 36-inch (914-mm) clear width of stair.

B. Provide stair framing with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.

3.09 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

1. Comply with "Code Plus" provisions in above-referenced guide.

B. Fastening Methods: Fasten panels as indicated below:

1. Subflooring:
   a. Nail or screw to wood framing.
   b. Space panels 1/8 inch (3 mm) apart at edges and ends.
2. Sheathing:
   a. Nail or screw to wood framing.
   b. Space panels 1/8 inch (3 mm) apart at edges and ends.
3. Underlayment:
   a. Nail or screw to subflooring.
   b. Space panels 1/32 inch (0.8 mm) apart at edges and ends.

c. Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.

3.10 GYPSUM SHEATHING

A. General: Fasten gypsum sheathing to supports with galvanized roofing nails; comply with GA-253 and manufacturer's recommended spacing and referenced fastening schedule. Keep perimeter fasteners 3/8 inch (9.5 mm) from edges and ends of units.

B. Install 48-by-96-inch (1219-by-2438-mm) and longer sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not occur over framing. Fit units tightly against each other.

3.11 BUILDING PAPER APPLICATION

A. Apply building paper horizontally with 2-inch (50-mm) overlap and 6-inch (150-mm) end lap; fasten to sheathing with galvanized staples or roofing nails. Cover upstanding flashing with 4-inch (102-mm) overlap.

END OF SECTION

SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes sanitary drainage and vent piping inside building and to locations indicated.

B. Related Sections include the following:
   1. Division 1 Section “Unit Pricing” for video taping of existing sanitary waste piping.
   2. Division 2 Section “Earthwork” for excavating, trenching and backfilling
   3. Division 2 Section “Sanitary Sewerage” for exterior sanitary sewer piping.
   4. Division 15 Section “Basic Mechanical Materials and Methods” for basic piping installation.
   5. Division 15 Section “Hangers and Supports” for pipe hanger and support devices.
   6. Division 15 Section “Plumbing Fixtures” for drainage and vent piping fixtures.
   7. Division 15 Section "Plumbing Specialties" for drainage and vent piping system specialties.

1.03 DEFINITIONS

A. Drainage and Vent Piping: Piping inside building that conveys waste water and vapors from fixtures and equipment throughout the building.

B. The following are industry abbreviations for plastic and other piping materials:
   1. ABS: Acrylonitrile-butadiene-styrene.
   2. EPDM: Ethylene-propylene-diene polymer, rubber.
   3. NBR: Acrylonitrile-butadiene rubber.
   4. PVC: Polyvinyl chloride.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
   1. Soil, Waste, and Vent Systems: 10-foot head of water.

1.05 SUBMITTALS

A. Test Results and Reports: Specified in "Field Quality Control" Article.

1.06 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 PRODUCTS

2.01 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. Hub-and-Spigot, Cast-Iron Soil Pipe: ASTM A 74, Service and Extra Heavy classes. Include ASTM C 564 rubber gasket, with dimensions required for pipe class, for each hub.

C. Hubless, Cast-Iron Soil Pipe: ASTM A 888 or CISPI 301.

D. PVC Plastic Pipe: ASTM D 2665, Schedule 40.

2.02 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Hub-and-Spigot, Cast-Iron, Soil-Pipe Fittings: ASTM A 74, Service and Extra Heavy classes, hub and spigot. Include ASTM C 564 rubber gastket, with dimensions required for pipe class, for each hub.

C. Hubless, Cast-Iron, Soil-Pipe Fittings: CISPI 301.

D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311 drain, waste, and vent pipe patterns.

E. PVC Plastic, Tubular Fittings: ASTM F 409 drainage pattern, with ends as required for application.

2.03 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.

C. Hubless, Cast-Iron, Soil-Piping Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve or gasket with integral, center pipe stop. Include with compact stainless-steel couplings.

D. Compact, Stainless-Steel Couplings: CISPI 310 with ASTM A 167, Type 301, or ASTM A 666, Type 301, stainless-steel corrugated shield; and stainless-steel bands. Include sealing sleeve.
   1. Clamp Width: 2-1/8 inches wide with 2 clamps, for piping 1-1/2 to 4 inch NPS.

E. Compact Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; and 2 stainless-steel machine screws. Include gasket.

PART 3 EXECUTION

3.01 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Aboveground, Soil, Waste, and Vent Piping: Use the following:
   1. 4 Inch NPS and Smaller: PVC plastic pipe, PVC socket fittings, and solvent-cemented joints.
   2. 4 Inch NPS and Smaller: Hub-and-spigot, cast-iron soil pipe, Service class; hub-and-spigot, cast-iron, soil-pipe fittings, Service class; and compression joints.
   3. 4 Inch NPS and Smaller: Hubless, cast-iron soil pipe; hubless, cast-iron, soil-pipe fittings; and one of the following hubless, cast-iron, soil-piping couplings:
      a. Couplings: Compact, Type 304, stainless steel.

C. Underground, Soil, Waste, and Vent Piping: Use the following:
   1. 2- to 4-Inch NPS: PVC plastic pipe, PVC socket fittings, and solvent-cemented joints.

3.03 PIPING INSTALLATION, GENERAL

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

B. Remove any existing galvanized sanitary waste and vent piping where piping is not indicated as being removed on the drawings, and install new pipe in accordance with this section of the specifications.

C. Remove all existing p-traps and install new traps.

D. Remove all existing damaged piping and install new pipe in accordance with this section of the specifications.

3.04 SERVICE ENTRANCE PIPING INSTALLATION

A. Refer to Division 2 Section "Sanitary Sewerage" for exterior sanitary sewer piping.

B. Extend building sanitary drain piping and connect to sanitary sewer piping in sizes and locations indicated for service entrances into building.

3.05 DRAINAGE AND VENT PIPING INSTALLATION

A. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not make change in direction of flow greater than 90 degrees. Use proper size of standard increasers and reducers if different sizes of piping are connected. Reducing size of drainage piping in direction of flow is prohibited.

C. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

D. Install drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   1. Sanitary Building Drain: 2 percent downward in direction of flow for piping 3-inch NPS and smaller; 1 percent downward in direction of flow for piping 4-inch NPS and larger.
   2. Horizontal, Sanitary Drainage Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

E. Install PVC plastic drainage piping according to ASTM D 2665.

F. Install underground, PVC plastic drainage piping according to ASTM D 2321.

3.06 JOINT CONSTRUCTION

A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Compression Joints: Make with rubber gasket matching class of pipe and fittings.
   2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

B. PVC Piping Joints: Join drainage piping according to ASTM D 2665.

C. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling during joining of plastic pipe and fittings.

3.07 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
   1. Short pipe strap, MSS SP-69 Type 26.
   2. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
   3. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs 100 feet and less.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for PVC plastic piping with the following maximum spacing and minimum rod diameters:
   1. 2-Inch NPS and Smaller: Maximum horizontal spacing, 48 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.
   2. 4-Inch NPS: Maximum horizontal spacing, 48 inches with 5/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.

F. Support piping not listed above according to MSS SP-69 and manufacturer's written instructions.

3.08 CONNECTIONS

A. Connect service entrance piping to exterior sewerage and drainage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage piping to service entrance piping, and extend to and connect to the following:
   1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."

2. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
3. Equipment: Connect drainage piping as indicated.

3.09 FIELD QUALITY CONTROL

A. Inspect drainage and vent piping as follows:
   1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
   2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
      a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
   3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
   4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
   3. Roughing-In Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with 2 coats of water-based latex paint.

3.11 SPECIAL REQUIREMENTS

A. Pressure flush existing below slab sanitary piping using minimum 12 GPM @ 4,000 PSI water stream.

B. After pressure flushing, video tape interior of piping to assure quality and condition of piping. Video shall indicate date, time and distance along pipe from approximately 10 feet beyond the exterior wall outdoors to where the piping turns up. Perform this work as directed by CHA and in accordance with the unit pricing schedule. Refer to Division 1, Section 01270- Unit Prices.

C. Provide CHA a copy of video tape within 48 hours of video taping (exclude weekends and holidays).

END OF SECTION

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION REQUIREMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

PART 2 PRODUCTS

2.01 SHEET METAL

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), 3003-H14, mill finish, minimum thickness of 0.040 inch (1.0 mm).

B. Galvanized Steel Sheet: ASTM A 653, G90 (ASTM A 653M, Z275), commercial quality, lock-forming quality, hot-dip galvanized, mill phosphatized where indicated for painting; at least 0.0396 inch (1.0 mm) thick.

2.02 FLASHING AND TRIM

A. Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Water Diverter: Fabricate from aluminum sheet, SMACNA plate number 24.

C. Roof Penetrations: Fabricate from galvanized steel sheet, SMACNA plate number 63.

D. Shingle Roof Flashing: Fabricate from aluminum sheet, SMACNA plate number 66.

E. Finish aluminum exposed units with baked-on, white-acrylic shop finish; 1.0-mil (0.025-mm) dry film thickness.

2.03 ACCESSORIES

A. Solder: ASTM B 32, Grade Sn50.

B. Solder for Stainless Steel: ASTM B 32, Grade Sn60.

C. Asphalt Mastic: SSPC-Paint 12, asbestos free, solvent type.

D. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with SMACNA's "Architectural Sheet Metal Manual." Allow for thermal expansion; set true to line and level. Install Work with laps, joints, and seams permanently watertight and weatherproof; conceal fasteners where possible.
   1. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

B. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

C. Fabricate nonmoving seams in sheet metal with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

1. Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), unless pre-tinned surface would show in finished Work.

D. Separations: Separate noncompatible metals or corrosive substrates with a coating of asphalt mastic or other permanent separation.

END OF SECTION

SMALL SPLIT-SYSTEM HEATING AND COOLING (2 TON)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source heat pumps

B. Indoor air handler (fan & coil) units for duct connection

C. Controls

1.02 REFERENCE STANDARDS

A. ARI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2006.

B. ARI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

C. ASHRAE Std 90.1 - Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2004.

D. ASHRAE Std 90.2 - Energy-Efficient Design of New Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2002.

F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2006.

1.03 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Buy American documentation: Provide documentation to owner which certifies that the equipment is manufactured in America in accordance with the Buy American Requirements of the Owner and the American Recovery and Reinvestment Act of 2009.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

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.

1.05 WARRANTY

A. Provide ten year manufacturers warranty for compressors.

B. Provide five year manufacturers warranty for indoor coil and electric heating element.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation; Model 25HCB5024 outdoor unit with FX4CNF024-005 indoor unit: www.carrier.com.

B. Trane Inc; Model 4TWB4024E1 outdoor unit with 4TEB30C05A1: www.trane.com.

C. Rheem; Model RPQL-024JAZ outdoor unit with RHKL-HM2417JA indoor unit: www.rheem.com.

2.02 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator coil in central ducted indoor unit; auxiliary electric heat.
   2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
   3. Refrigerant suction lines shall be insulated with a thermal resistivity of at least R-4 and have external surface permeance not exceeding 0.05 perm when tested in accordance with ASTM E96.
   4. Refrigerant: R410A.

B. Performance Requirements:.
   1. Efficiency:
      a. Seasonal Energy Efficiency Ratio: 14, minimum.
      b. Heating Seasonal Performance Factor: 9.0, minimum.
   2. Air Handling:
      a. Air Flow (ARI): 850 cfm (378 L/s).
   3. Heating Performance Requirements (ARI):
      a. Heating Output (Low temp): 13,900 Btuh (4100 W).
      b. Outdoor air temperature: 17 degrees F (-8.5 degrees C).
      c. Indoor air temperature: 70 degrees F (21 degrees C).
   4. Cooling Performance Requirements (ARI):
      a. Evaporator Cooling Output: 24,200 Btuh (7.1 kW).
      b. Air Temperature Entering Evaporator:
         1) Dry Bulb: 80 degrees F (26.5 degrees C).
         2) Wet Bulb: 67 degrees F (19.5 degrees C).
      c. Outdoor Unit Rated Cooling Output: 24200 Btuh (7.1 kW).
      d. Condenser Ambient Air Temperature: 95 degrees F (35 degrees C).

C. Electrical Characteristics:
   1. 5 kW auxiliary electric heater on indoor unit, 28 MCA, 30 MOCP.
   2. 240 volts, single phase, 60 Hz.
   3. Outdoor unit: 18 MCA, 30 MOCP.
   4. Indoor unit blower motor: 4.0 MCA, 15 MOCP.
   5. Verify minimum circuit ampacity and maximum overcurrent protection with actual equipment provided. Coordinate requirements with electrical contractor and field conditions.
   6. Disconnect switches provided by Electrical Contractor.

2.03 INDOOR UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories.
   1. Air Flow Configuration: As required for specific installation.

2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, 1" glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
   1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
   2. Motor Electrical Characteristics:
      a. 1/3 hp (.249 kW).
      b. 240 volts, single phase, 60 Hz.

C. Air Filters: 1 inch (25 mm) thick glass fiber, disposable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.
   2. Manufacturers: System manufacturer.

2.04 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
   2. Construction and Ratings: In accordance with ARI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.

B. Compressor: ARI 520; hermetic, 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

D. Accessories: Filter drier, outdoor thermostat, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.
   2. Provide heat pump reversing valves.

E. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.
   2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

2.05 ACCESSORY EQUIPMENT

A. Thermostat: Provide low voltage, electronic, non-programmable thermostat for two stage heating, single stage cooling. Include fan "ON-AUTO" and system selector (COOL-OFF-HEAT-EMERGENCY).

B. Refrigerant Line Sets: Soft-annealed copper suction and liquid lines, factory cleaned, dried, pressurized and sealed; factory-insulated suction line with flared fittings at both ends.

C. External Filter Base: Provide accessory filter base for 1" filters for installations without filter return grilles.

D. Provide condensate pump and auxiliary condensate drain pan with moisture switch wired to switch off system in the event of condensate overflow. Route all condensate piping according to the 2006 International Residential Code or 2006 International Mechanical Code, whichever is applicable for the installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Provide service clearances per manufacturer's recommendations.

C. Mount outdoor unit on 4" concrete pad.

D. Install in accordance with NFPA 90A and NFPA 90B.

END OF SECTION

SOLID SURFACE FABRICATIONS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.2 SUMMARY

A. This Section includes the following horizontal and trim solid surface product types:

1. Windowsills

B. Related Sections include the following:

1. Division 6 Section “Rough Carpentry” for Blocking.
2. Division 7 Section “Joint Sealants”

C. Alternates:

1. Refer to Division 1 Section “Alternates” for description of work in this Section affected by alternates.

1.3 DEFINITION

A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

A. Product data:

1. For each type of product indicated.
2. Product data for the following:
    a. Windowsills

B. Shop drawings:

1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
    a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
    b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
    c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.

C. Samples:

1. For each type of product indicated.
    a. Submit minimum 6-inch by 6-inch sample in specified gloss.
2. Approved samples will be retained as a standard for work.

D. Product data:

1. Indicate product description, fabrication information and compliance with specified performance requirements.

F. Manufacturer certificates:

1. Signed by manufacturers certifying that they comply with requirements.

G. Maintenance data:
1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
a. Maintenance kit for finishes shall be submitted.
2. Include in project closeout documents.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
B. Fabricator/installer qualifications:
1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
C. Applicable standards:
1. Standards of the following, as referenced herein:
a. American National Standards Institute (ANSI)
b. American Society for Testing and Materials (ASTM)
c. National Electrical Manufacturers Association (NEMA)
d. NSF International
2. Fire test response characteristics:
a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
1) Flame Spread Index: 25 or less.
2) Smoke Developed Index: 450 or less.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation.
B. Store components indoors prior to installation.
C. Handle materials to prevent damage to finished surfaces.
1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 WARRANTY

A. Provide manufacturer's warranty against defects in materials.
1. Warranty shall provide material and labor to repair or replace defective materials.
2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

C. Manufacturer's warranty period:
1. Ten years from date of substantial completion.

1.8 MAINTENANCE

A. Provide maintenance requirements as specified by the manufacturer.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. Subject to compliance with requirements, provide products by one of the following:

a. Corian® surfaces from the DuPont company (basis of design).
b. Virginia Marble
c. Fountain Head.

2.2 MATERIALS

A. Solid polymer components
1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness:
1. ½ inch

C. Edge treatment:
1. Ease exposed edges both surface and underside

I. Performance characteristics:

Property	**Typical Result**	**Test**
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	1.5 x 10^{-6} psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	1.2 x 10^{-6} psi	ASTM D 790
Hardness	>85	Rockwell "M" Scale ASTM D 785
	56	Barcol Impressor ASTM D 2583
Thermal Expansion	3.02 x 10^{-5} in./in./°C (1.80 x 10^{-5} in./in./°F)	ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact Resistance: Sheets	No fracture—½ lb. ball: ¼" slab—36" drop ½" slab—144" drop	NEMA LD 3-2000 Method 3.8
Weatherability	ΔE^*_{94}<5 in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (¾") 0.6% (½") 0.8% (¼")	ASTM D 570

Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test ("LC50"Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

† Approximate weight per square foot: 1⁄4" (6 mm) 2.2 lbs., 1⁄2" (12.3 mm) 4.4 lbs.
Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.
NEMA results based on the NEMA LD 3-2000

2.3 ACCESSORIES

A. Joint adhesive:
   1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:
   1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

2.4 FACTORY FABRICATION

A. Shop assembly
   1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
   2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
      a. Reinforce with strip of solid polymer material, 2" wide.
   3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
   4. Rout and finish component edges with clean, sharp returns.
      a. Rout cutouts, radii and contours to template.
      b. Smooth edges.
      c. Repair or reject defective and inaccurate work.

2.5 FINISHES

A. Select from the manufacturer's standard color chart.
   1. Color: To be selected from standard color chart.

B. Finish:
   1. Provide surfaces with a uniform finish.

      a. Matte; gloss range of 5–20.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
1. Provide product in the largest pieces available.
2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
a. Exposed joints/seams shall not be allowed.
3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
4. Cut and finish component edges with clean, sharp returns.
5. Rout radii and contours to template.
6. Anchor securely to base cabinets or other supports.
7. Carefully dress joints smooth, remove surface scratches and clean entire surface.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.
B. Remove adhesives, sealants and other stains.

M. Windowsills:
1. Surfaces of material adhesively joined with inconspicuous seams.
Color
b. Horizontal Thickness: ½"
d. Edge Details: Ease edges both surface and underneath.
e. Finish: Matte

END OF SECTION

STEEL DOORS AND FRAMES
PARTMETAL SCREEN DOORS

1 GENERAL

1.01 SECTION INCLUDES

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 RELATED SECTIONS

A. Section 08710 - Door Hardware.

B. Section 09900 - Painting: Field painting.

1.03 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).

D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2005a.

E. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000 (ANSI/DHI A115 Series).

F. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1999.

1.04 SUBMITTALS

A. See Section 01330 - Submittal Procedures for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

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

B. Maintain at the project site a copy of all reference standards dealing with installation.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.
   2. Steelcraft: www.steelcraft.com.
   3. Substitutions: See Section 01600 - Product Requirements.

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: Beveled on both edges.
   4. Door Texture: Smooth faces.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
   8. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

A. Exterior Doors:
   1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
   2. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.

2.04 STEEL FRAMES

A. General:
   1. Comply with the requirements of grade specified for corresponding door.
      a. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage
   2. Finish: Same as for door.
   3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
   4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (100 mm) high to fill opening without cutting masonry units.

B. Exterior Door Frames: Face welded, seamless with joints filled.
   1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
   2. Weatherstripping: Separate, see Section 08710.

2.05 ACCESSORY MATERIALS

A. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

B. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

C. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Coordinate installation of hardware.

3.04 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Interior stile and rail wood doors with louvered panels.

B. Related Sections include the following:
   1. Division 6 Section "Finish Carpentry" for wood door frames.

1.03 SUBMITTALS

A. Product Data: For each type of door. Include details of construction and glazing.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.

C. Product Certificates: Signed by door manufacturers certifying that the products furnished comply with requirements.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain stile and rail wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with the following standard:
   1. AWI Quality Standard: AWI's "Architectural Woodwork Quality Standards" for grade of door, construction, finish, and other requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
   1. Individually package doors in plastic bags or cardboard cartons.

B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Stile and Rail Doors of Stock Design and Construction:
      a. Eggers Industries; Architectural Door Division.
      b. Morgan Manufacturing.
      c. Simpson Door Company.

2.02 STILE AND RAIL DOORS OF STOCK DESIGN AND CONSTRUCTION

A. Interior Doors: Comply with the following requirements:
   1. NWWDA Grade for Opaque Finish: Standard.
   2. Wood Species for Opaque Finish: Manufacturer's standard softwood species and cut for stiles and rails; with panels of same species or wood-base construction materials, as standard with manufacturer.
   3. Design and Layout: Panel design as described below under NWWDA design group, with minimum dimensions for stiles, rails, panels, and other elements complying with NWWDA I.S.6.
      a. NWWDA Design Group: Bifold Doors.
         1) Panel Design: As indicated.
      b. NWWDA Design Group: Louver Doors.
         1) Panel Design: As indicated.

2.03 FABRICATION

A. Fabricate stile and rail wood doors in sizes indicated for Project site fitting.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   2. Reject doors with defects.

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

3.02 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with

fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.

D. Field-Finished Doors: Refer to the following for finishing requirements:
   1. Division 9 Section "Painting."

3.03 ADJUSTING AND PROTECTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives.

1.03 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Report Forms: Test data sheets for recording test data in logical order.

D. Test: A procedure to determine quantitative performance of a system or equipment.

E. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

F. AABC: Associated Air Balance Council.

G. AMCA: Air Movement and Control Association.

H. NEBB: National Environmental Balancing Bureau.

I. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

A. Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

1.05 QUALITY ASSURANCE

A. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing", from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or from SMACNA's "HVAC Systems--Testing, Adjusting, and Balancing."

1.06 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.07 COORDINATION

A. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
   1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine equipment performance data. Relate performance data to project conditions and requirements. Compare this data with the design data and installed conditions.

D. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

E. Examine air-handling equipment to ensure clean filters have been installed and equipment with functioning controls is ready for operation.

F. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

G. Examine equipment for installation and for properly operating safety interlocks and controls.

H. Examine automatic temperature system components to verify the following:
   1. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
   2. Changeover from heating to cooling mode occurs according to design values.

3.02 PREPARATION

A. Complete system readiness checks and prepare system readiness reports. Verify the following:
   1. Permanent electrical power wiring is complete.
   2. Hydronic systems are filled, clean, and free of air.
   3. Automatic temperature-control systems are operational.
   4. Equipment access doors are securely closed.
   5. Balance dampers are open.
   6. Isolating valves are open.
   7. Windows and doors can be closed so design conditions for system operations can be met.

3.03 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems--Testing, Adjusting, and Balancing" and this Section.

3.04 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Check dampers for proper position to achieve desired airflow path.

C. Check for airflow blockages.

D. Check condensate drains for proper connections and functioning.

E. Check for proper sealing of air-handling unit components.

3.05 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.

B. Adjust fans to deliver total design airflows.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure static pressure directly at the fan outlet.

3.06 CONDENSING UNITS

A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

3.07 HEAT-TRANSFER COILS

A. Water Coils: Measure the following data for each coil:
   1. Entering- and leaving-water temperatures.
   2. Dry-bulb temperatures of entering and leaving air.

3.08 TEMPERATURE TESTING

A. Measure outside-air, wet- and dry-bulb temperatures.

3.09 TOLERANCES

A. Set HVAC system airflow rates within the following tolerances:
   1. Air Outlets and Inlets: 0 to minus 10 percent.

3.10 REPORT

A. Include a certification sheet in front of binder signed and sealed by the testing and balancing agent.

B. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
   1. Title page.
   2. Name and address of testing, adjusting, and balancing Agent.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   8. Report date.
   9. Signature of testing, adjusting, and balancing Agent.
   10. Summary of contents, including the following:
      a. Design versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence.
   11. Nomenclature sheets for each item of equipment.
   12. Notes to explain why certain final data in the body of reports vary from design values.
   13. Test conditions for fans and pump performance forms, including the following:
      a. Settings for dampers.
      b. Conditions of filters.
      c. Cooling coil, wet- and dry-bulb conditions.
      d. Fan speed settings, including settings of speed controllers.
      e. Other system operating conditions that affect performance.

C. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
   1. Unit Data: Include the following:
      a. Unit identification.
      b. Location.
      c. Make and type.
      d. Model number and unit size.
      e. Manufacturer's serial number.
   2. Motor Data: Include the following:
      a. Make and frame type and size.
      b. Horsepower and rpm.
      c. Volts, phase, and hertz.
   3. Test Data: Include design and actual values for the following:
      a. Total system static pressure in inches wg.
      b. Discharge static pressure in inches wg.
      c. Return airflow in cfm.

D. Air-Distribution-Device Reports: For air distribution units, include the following:
   1. Unit Data: Include the following:
      a. System and air-handling unit identification.
      b. Area served.
      c. Air-device type and model number.
      d. Air-device size.
   2. Test Data: Include design and actual values for the following:
      a. Airflow rate in cfm.
      b. Preliminary airflow rate as needed in cfm.
      c. Final airflow rate in cfm.

E. Compressor and Condenser Reports: For refrigerant side of air-cooled condensing units, include the following:
   1. Unit Data: Include the following:
      a. Unit identification.
      b. Location.
      c. Unit make and model number.
      d. Manufacturer's compressor serial numbers.
   2. Test Data: Include design and actual values for the following:
      a. Suction pressure in psig.
      b. Suction temperature in deg F.
      c. Condenser refrigerant pressure in psig.
      d. Condenser refrigerant temperature in deg F.
      e. Voltage at each connection.
      f. Amperage.

3.11 ADDITIONAL TESTS

A. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

THROUGH PENETRATION FIRESTOP SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
   1. Walls and partitions.
   2. Smoke barriers.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for construction of openings in concrete slabs and walls.
   2. Division 15 Sections specifying duct and piping penetrations.
   3. Division 16 Sections specifying cable and conduit penetrations.

1.03 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
   1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
   2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.

B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
   1. Penetrations located outside wall cavities.
   2. Penetrations located in construction containing fire-protection-rated openings.
   3. Penetrating items larger than 4-inch- (100-mm-) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.

D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
   1. For piping penetrations for plumbing systems, provide moisture-resistant through-penetration firestop systems.
   2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.04 SUBMITTALS

A. Product Data: For each type of through-penetration firestop system product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
   1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
   1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
   2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:.
      a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
      b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
         1) UL in "Fire Resistance Directory."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.08 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated on the drawings:

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Hilti Construction Chemicals, Inc.
   2. 3M Fire Protection Products.
   3. Tremco.
   4. United States Gypsum Company.

2.02 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-/rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.
   5. Steel sleeves.

2.03 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

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

3.02 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.03 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 FIELD QUALITY CONTROL

A. Proceed with enclosing through-penetration firestop systems with other construction only after inspection.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.05 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
   1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Through-penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Through-penetration firestop system manufacturer's name.
   6. Installer's name.

3.06 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Toilet and bath accessories.

1.03 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Samples: For each accessory item to verify design, operation, and finish requirements.
   1. Approved full-size Samples will be returned and may be used in the Work.

C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.04 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
   1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.

1.05 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.06 WARRANTY

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

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
   1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
   1. Toilet and Bath Accessories:
      a. Moen
      b. Stone Mill
      c. Project Source
      d. American Specialties

2.02 MATERIALS (NOT USED)

2.03 FABRICATION

A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
   1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.02 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.03 TOILET AND BATH ACCESSORY SCHEDULE

A. Toilet Tissue Dispenser: Where indicated, provide toilet tissue dispenser complying with the following:
   1. Products: See 2.01 Manufacturers
   2. Type: Single-roll dispenser.

3. Mounting: Surface mounted.
4. Material: Satin-finish stainless steel bracket with chrome-plated plastic spindle.
5. Operation: Noncontrol delivery.
6. Capacity: Designed for 6-inch- (152-mm) diameter-core tissue rolls

B. Towel Bars: Where indicated, provide towel holder complying with the following:
   1. Products: See 2.01 Manufacturers

C. Shower Curtain Rod: Where indicated, provide curtain rods with one-piece die-formed flanges designed for exposed fasteners, in length required for shower opening indicated, and complying with the following:
   1. Products: See 2.01 Manufacturers

D. Toothbrush Holder: Where indicated, provide toothbrush holder complying with the following:
   1. Products: See 2.01 Manufacturers

E. Soap Dish: Where indicated, provide stainless-steel soap dish complying with the following:
   1. Products: See 2.01 Manufacturers

F. Medicine Cabinet Where indicated, provide medicine cabinet complying with the following:
   1. Products: See 2.01 Manufacturers
   2. Mounting Requirements: Recessed.

END OF SECTION

VALVES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes general duty valves common to several mechanical piping systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Special purpose valves are specified in Division 15 piping system Sections.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

C. Maintenance data for valves to include in the operation and maintenance manual specified in Division 1. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility: Comply with the requirements specified in Division 1 Section "Materials and Equipment," under "Source Limitations" Paragraph.

B. ASME Compliance: Comply with ASME B31.9 for building services piping.

C. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set globe valves closed to prevent rattling.
   4. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ball Valves:
      a. Conbraco Industries, Inc.; Apollo Division.

b. Hammond Valve Corporation.
c. Grinnell Corporation.
d. Milwaukee Valve Company, Inc.
e. NIBCO Inc.
f. Stockham Valves & Fittings, Inc.

2. Globe Valves:
   a. Hammond Valve Corporation
   b. Grinnell Corporation
   c. Milwaukee Valve Company, Inc.
   d. NIBCO Inc.
   e. Stockham Valves & Fittings, Inc.
3. Check Valves:
   a. Crane Company; Valves and Fitting Division.
   b. Hammond Valve Corporation.
   c. Milwaukee Valve Company, Inc.
   d. NIBCO Inc.
   e. Powell: Wm. Powell Company (The).
   f. Stockham Valves & Fittings, Inc.

2.02 BASIC, COMMON FEATURES

A. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.

B. Sizes: Same size as upstream pipe, unless otherwise indicated.

C. Operators: Use specified operators and handwheels, except provide the following special operator features:
   1. Handwheels: For valves other than quarter turn.
   2. Lever Handles: For quarter-turn valves.

D. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

E. Threads: ASME B1.20.1.

F. Solder Joint: ASME B16.18.
   1. Caution: Where soldered end connections are used, use solder having a melting point below 421 deg F for valves.

2.03 BALL VALVES

A. Ball Valves, 2 Inches and Smaller: MSS SP-110, Class 150, 600-psi CWP, ASTM B 584 bronze body and bonnet, 2-piece union end construction; chrome-plated brass ball, standard port for 1/2-inch valves and smaller and conventional port for 3/4-inch valves and larger; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections:
   1. Operator: Vinyl-covered steel lever handle.

2.04 GLOBE VALVES

A. Globe Valves, 2 Inches and Smaller: MSS SP-80; Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and screwed bonnet, rubber, bronze, or teflon disc, silicon bronze-alloy stem, teflon-impregnated packing with bronze nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

2.05 CHECK VALVES

A. Swing Check Valves, 1 Inch and Smaller: MSS SP-80; Class 125, 200-psi CWP; horizontal

swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections:

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Do not attempt to repair defective valves; replace with new valves.

3.02 INSTALLATION

A. Install valves as indicated, according to manufacturer's written instructions.

B. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

C. Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

D. Locate valves for easy access and provide separate support where necessary.

3.03 SOLDERED CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket.

C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Open ball and globe valves to fully open position.

E. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.

F. Apply heat evenly to outside of valve around joint until solder melts on contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.04 THREADED CONNECTIONS

A. Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.

B. Align threads at point of assembly.

C. Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.

D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.05 APPLICATION SCHEDULE

A. General Application: Use ball valves for shutoff duty; globe or ball valves for throttling duty. Refer to piping system Specification Sections and drawings for specific valve applications and arrangements.

3.06 ADJUSTING

A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION

VINYL SIDING

PART 1 GENERAL

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.1 SECTION INCLUDES

A. Solid vinyl siding.

B. Vented vinyl soffit.

C. Vinyl trim.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Framing and Sheathing.

B. Section 07260 - Vapor Retarders.

C. Section 07900 - Joint Sealers.

1.3 REFERENCES

A. ASTM C 272 - Standard Test Method For Water Absorption of Core Materials for Structural Sandwich Constructions.

B. ASTM C 518 - Standard Test Method For Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM D 256 - Standard Test Method for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.

D. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.

E. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

F. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load.

G. ASTM D 696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 Degrees C. and 30 Degrees C.

H. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastic.

I. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

J. ASTM D 2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.

K. ASTM D 3679 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.

L. ASTM D 4477 - Standard Specification for Rigid Unplasticized Poly(Vinyl Chloride) (PVC) Soffit.

M. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

N. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2000.

O. UBC STD 26-9 - Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus; 1997.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. 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. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Quality Assurance Submittals: Submit evidence of Code compliance specified in QUALITY ASSURANCE Article of this section.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Code compliance in accordance with the following:
1. BOCA.
2. ICBO.
3. Metropolitan Dade County, Florida.
4. BBA.
5. National Evaluation Service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store vinyl siding products in original packaging, on flat surface under cover, stacked no more than 12 boxes high. Do not store in location where temperatures may exceed 130 degrees F (54 degrees C).

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. Provide manufacturer's standard limited lifetime warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Alcoa Home Exteriors, Inc., or equal

B. Substitutions: See Section 00440 Substitutions.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 MATERIALS

A. Siding and Soffit - General Requirements: Polyvinyl chloride products with the following characteristics:
   1. Siding: Comply with ASTM D 3679, Class 2.
   2. PVC cell classification in accordance with ASTM D 1784: 13334.
   3. Coefficient of linear expansion in accordance with ASTM D 696: 0.000029 inch per inch per degree F.
   4. Tensile strength when tested in accordance with ASTM D 638: Minimum 7,100 pounds per square inch.
   5. Modulus of elasticity when tested in accordance with ASTM D 638: Minimum 360,000 pounds per square inch, average.
   6. Izod impact, standard 1/8 inch bar when tested in accordance with ASTM D 256: 3.30 foot-pounds per inch, average.
   7. Shore D Hardness: Minimum 73.
   8. Specific Gravity: Minimum 1.39.
   9. Deflection temperature when tested in accordance with ASTM D 648: 170 degrees F, 264 pounds per square inch.
   10. Smoke density rating when tested in accordance with ASTM D 2843: 48 percent, average.
   11. Horizontal flammability, when tested in accordance with ASTM D 635:
      a. Burn distance: 20 mm.
      b. Burn time: Less than 5 seconds.
   12. Surface burning characteristics when tested in accordance with ASTM E 84: Flame spread 20, fuel contribution 0, smoke density 400.
   13. Fire Resistance - Siding: 1 hour, when tested in accordance with ASTM E 119, with siding applied over gypsum sheathing.
   14. Flammability - Siding: Comply with requirements of UBC Std 26-9.
   15. Thermal Resistance when tested in accordance to ASTM C 518: "R" Value 3.7.
   16. Water Absorption by Immersion in accordance to ASTM C 272: 0.5 percent by volume.
   17. Density in accordance to ASTM D 1622: 1.0 pounds per cubic foot.

B. Fasteners: Aluminum nails, alloy 5056 or 6110, having minimum tensile strength 63,000 pounds per square inch.

C. Vapor Retarder: Specified in Section 07260.

D. Joint Sealers: Specified in Section 07900.

2.3 VINYL SIDING AND TRIM

A. Vinyl Siding Type ___: Mill Creek Siding.
   1. Product Description: Double 4 profile, 8 inches exposure; nominal 0.040 inch material thickness; nominal 12 feet 6 inch piece length.
   2. Product Description: Double 4 Dutch Lap profile, 8 inches exposure; nominal 0.040 inch material thickness; nominal 12 feet 6 inch piece length.
   3. Product Description: Double 5 profile, 10 inches exposure; nominal 0.040 inch material thickness; nominal 12 feet piece length.

4. Product Description: Double 5 Dutch Lap profile, 10 inches exposure; nominal 0.040 inch material thickness; nominal 12 feet piece length.
5. Nailing Hem: Single-row, with elongated nailing holes 1-1/4 inches long at 1-5/8 inches on center.
6. Finish: Cedar woodgrain texture.
7. Color: As selected from manufacturer's full range of available colors.

B. Vinyl Trim:
1. Structure Corner Post: 4 inches by 4 inches post, 1-1/4 inch wide siding recess; woodgrain finish; _____ color.
2. Universal Outside Corner Post: 4 inches by 4 inches post, 3/4 inch wide siding recess; woodgrain finish; _____ color.
3. Universal Outside Corner Post: 4 inches by 4 inches post, 3/4 inch wide siding recess; smooth finish; _____ color.
4. Traditional Outside Corner Post with Foam Insert: 5-1/2 inches by 5-1/2 inches post, 3/4 inch wide siding recess; _____ color.
5. Fluted Outside Corner Post with Foam Insert: 5-1/2 inches by 5-1/2 inches post, 3/4 inch wide siding recess; _____ color.
6. Standard Inside Corner Post: 2 inches by 2 inches covered projection, 3/4 inch wide siding recess; _____ color.
7. J-Trim: Channel, 1-1/2 inches nailing leg, 3/4 inch forward leg, 5/8 inch channel width; _____ color.
8. J-Trim: Channel, 1-1/2 inches nailing leg, 3/4 inch forward leg, 7/8 inch channel width; _____ color.
9. J-Trim: Channel, 1-1/2 inches nailing leg, 3/4 inch forward leg, 1-1/4 inch channel width; _____ color.
10. Finishing Trim: 1-1/2 inches nailing leg, 3/4 inch forward leg; _____ color.
11. Double Finish Trim: 1-1/2 inches nailing leg, 3/4 inch forward leg, double channel 7/8 inch total width; _____ color.
12. Wide Window Casing: 3-1/2 inches nailing leg, 2-1/2 inch forward leg with 7/8 inch return; white color.
13. Wide Window Casing: 3-1/2 inches nailing leg, 2-1/2 inch forward leg with 1-1/4 inch return; white color.
14. Wide Window Casing: 3-1/2 inches nailing leg, 2-1/2 inch forward leg with 3/4 inch return; _____ color.
15. Structure Starter Strip: Double-row nailing hem with elongated nailing holes 1-1/4 inches long 18 inches on center; 1/4 inch base projection; white color.
16. Starter Strip: Single-row nailing hem with elongated nailing holes 1-1/4 inches long 18 inches on center; 1/4 inch base projection; white color.
17. Starter Strip: Single-row nailing hem with elongated nailing holes 1-1/4 inches long 18 inches on center, 1-1/4 inch base projection; white color.

2.4 VINYL SOFFIT AND TRIM

A. Vinyl Soffit Type ___: Ventura Hidden Vent Soffit.
1. Product Description: Vented Triple 3-1/3 V-groove profile, 10 inches exposure, 5/8 inch depth; nominal 0.044 inch material thickness; nominal 12 feet piece length.
2. Product Description: Non-vented Triple 3-1/3 V-groove profile, 10 inches exposure, 5/8 inch depth; nominal 0.044 inch material thickness; nominal 12 feet piece length.
3. Nailing Hem: Single-row, with elongated nailing holes 1-1/4 inches long at 1-5/8 inches on center.
4. Finish: Low-gloss brushed texture.
5. Color: As selected from manufacturer's full range of available colors.

6. Ventilation - Supply ventilation type soffit material having .156 by .750 openings with 9.19 square inches free air space per square foot of soffit area.

B. Vinyl Trim:
1. Soffit J-Trim: Channel, 1-1/2 inches nailing leg, 3/4 inch forward leg, 1/2 inch channel width; _____ color.
2. Soffit J-Trim: Channel, 1-1/2 inches nailing leg, 3/4 inch forward leg, 5/8 inch channel width; _____ color.
3. T-Channel: 1-3/4 inches batten, 5/8 inch recess; _____ color.
4. Frieze Runner F-Channel: _____ color.
5. Pro-Bead Soffit J-Trim: Channel, 2-3/8 inch nailing leg, 1-3/8 inch forward leg, 3/8 inch channel width; _____ color.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate conditions before beginning installation of vinyl products; verify dimensions and acceptability of substrate.

B. Do not proceed with installation of vinyl products until unacceptable conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Installation of vapor retarder is specified in Section 07260.

B. Install vinyl products in accordance with manufacturer's printed installation instructions.

C. Attach vinyl products to substrate for weathertight installation; ensure that horizontal components are installed true to level, that vertical components are installed true to plumb.

D. Installation of joint sealers is specified in Section 07900.

3.4 CLEANING

A. Clean dirt from surface of installed products, using mild soap and water.

B. After completing installation of vinyl products, remove from project site excess materials and debris resulting from installation of vinyl products.

VINYL WINDOWS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Factory fabricated tubular extruded plastic windows with double hung operating sash.

B. Related Sections include the following:
   1. Section 07900- Joint Sealers; Perimeter sealant and back-up materials.

1.03 SUBMITTALS: (Not Used)

1.04 WARRANTY

A. Windows shall carry the standard manufacturer's warranty for vinyl windows.

PART 2 PRODUCTS

2.01 MANUFACTURER:

A. Windows shall be Andersen Silver Line 1200 Series double-hung vinyl window or EQUAL. Windows shall be energy star compliant.

2.02 VINYL WINDOWS:

A. Main Frame- Head, jamb, and sill shall be made from rigid, multi-hollow, polyvinylchloride (PVC) extrusions, which are .070" thick. Main frame of welded corner construction. Overall frame depth 3-1/4".

B. Sash- Sash shall be made from rigid PVC extrusions, which are a minimum wall thickness of .062". Sash to be of welded corner construction. Bottom sash to have metal reinforcement in horizontal members. The top sash to have metal reinforcement in bottom rail.

C. Glazing- Sash to be drop-in tape glazed using 3/4" thick insulating glass with rigid, extruded, vinyl, exterior glazing bead, filled with Argon gas.

D. Weatherstripping- A finseal weatherstrip to be located on both the main frame head and sill. Two strips of finseal weatherstrip to be located at each sash stile. The top rail of the top sash and each interlock railare to receive finseal weatherstrip. The bottom rail sash is to receive two "bulb type" weatherstrip. A polypile dust plug shall be located at the top of each interior sash stile.

E. Hardware- Sash balancing mechanisms to consist of stainless steel constant force springs. Two metal, recessed, cam-type sweep locks are to be located equidistant from each end of the interlocking rail. Two metal, recessed sweep lock keepers to be fastened to the exterior interlocking rail. One injection molded thermo-plastic tilt latch shall be used at the ends of the top rail of each sash. A vinyl spring loaded sash stop shall be used at the bottom of each exterior jamb track and a rigid vinyl balance cover on the interior jamb track. All screws, clips, and other fasteners to be made of non-corrosive materials compatible with aluminum. Upper sash shall come equipped with vent latches.

F. Screen- Full screens are required. Screens to be made from extruded aluminum, 5/16"x3/4", with a .040" thickness. Screens meet ANSI/AAMA standard. (Note: Insect screens are intended only

to provide reasonable insect control. They are not intended to prevent people or objects from exiting the window or to provide security against forced entry.)

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine openings to verify that they comply with the manufacturer's installation requirements.

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

3.02 INSTALLATION

A. Frames should be installed straight, plumb, and level without twisting, bowing, or springing. Manufacturer's recommended installation instructions are to be used. Installer should make final adjustments to ensure proper sash operation and window performance.

END OF SECTION

WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes water distribution piping from locations indicated to fixtures and equipment inside building.

B. Related Sections include the following:
   1. Division 2 Section “Earthwork” for excavation.
   2. Division 15 Section “Basic Mechanical Materials and Methods” for basic piping joint construction.
   3. Division 15 Section “Hangers and Supports” for installation hangers and supports.
   4. Division 15 Section “Valves” for general-duty valves.
   5. Division 15 Section "Plumbing Specialties" for special duty valves.

1.03 DEFINITIONS

A. Service Entrance Piping: Water piping at entry into building between water service piping and water distribution piping.

B. Water Distribution Piping: Water piping inside building that conveys water to fixtures and equipment throughout the building.

C. The following are industry abbreviations for plastic piping materials:
   1. CPVC: Chlorinated polyvinyl chloride.
   2. PVC: Polyvinyl chloride.
   3. PEX: Cross-linked polyethylene.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
   1. Service Entrance Piping: 160 psig.
   2. Water Distribution Piping: 125 psig.

1.05 SUBMITTALS

A. Water Samples, Test Results, and Reports: Specified in "Field Quality Control" and "Cleaning" articles.

1.06 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water piping components. Include marking "NSF-pw" on plastic potable-water piping.

D. Comply with NSF 61, "Drinking Water System Components--Health Effects," Sections 1 through 9 for potable-water piping and components.

E. Comply with ASTM F877, "Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems"

PART 2 PRODUCTS

2.01 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

C. CPVC Plastic Pipe System: ASTM D 2846, B. F. Goodrich “FlowGuard Gold”.

D. PVC Plastic Pipe: ASTM D 1785, Schedule 40.

E. PEX Pipe System: ASTM F 877, ViegaPEX Cross-linked Polyethylene.

E. PEX Pipe: ASTM F 876/F 877, SDR-9.

2.02 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.

C. Copper Unions: ASME B16.18, cast-copper-alloy, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.

D. Schedule 40, CPVC Threaded Fittings: ASTM F 437.

E. Schedule 40, CPVC Socket Fittings: ASTM F 439.

F. Schedule 40, CPVC Socket Fittings: ASTM F 438.

G. CPVC Plastic-Tubing-System Socket Fittings: ASTM D 2846; B. F. Goodrich “FlowGuard Gold”; brass threaded transitions on hot water systems.

H. Schedule 40, PVC Socket Fittings: ASTM D 2467.

I. SDR-9 CTS, Bronze, PEX Crimp Fittings: ASTM F 877.

J. SDR-9 CTS, Bronze Zero Lead Press Fittings: ASTM F 877.

K. SDR-9 CTS, Metallic Zero Lead PEX Press Fittings: ASTM F 1807.

L. SDR-9 CTS, PolyAlloy PEX Crimp Fittings: ASTM F 2159.

M. SDR-9 CTS, PEX Press Polymer Fittings: ASTM F877.

2.03 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for commonly used

joining materials.

C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.

D. Cement: ASTM F493, NSF approved and labeled.

E. Press: ASTM F877, NSF approved and labeled.

F. Crimp: ASTM F 1807/ F 2159, NSF approved and labeled.

2.04 VALVES

A. Refer to Division 15 Section "Valves" for general-duty valves.

B. Refer to Division 15 Section "Plumbing Specialties" for special-duty valves.

C. CPVC Plastic Valves: CPVC plastic body material similar to CPVC plastic piping system with seats, seals, and other components suitable for potable-water service rated for 125 psig at 150 deg. F. Comply with the following:
1. Ball Valves, 1-Inch NPS and Smaller: Union type with socket or threaded ends.
2. Check Valves, 1-Inch NPS and Smaller: Ball type with socket ends.

D. PEX Valves: PEX body material similar to PEX piping system with other components suitable for potable water service rated for maximum 100 psig at 180 deg.
F. Comply with the following:
1. Ball Valves, NPS 1-Inch and smaller: Union type with press or crimp connection.
2. Stop Valves, NPS 1-Inch and smaller: Union type with press or crimp connection.

PART 3 EXECUTION

3.01 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Underground, Service Entrance Piping: Do not use flanges or valves underground. Use the following:
1. 2-Inch NPS and Smaller: CPVC, Schedule 40 pipe; PVC, Schedule 40 socket fittings; solvent-cemented joints.

C. Aboveground, Water Distribution Piping:
1. 1-1/2-Inch NPS and Smaller: SDR 11, CPVC tubing; CPVC, Schedule 40 socket fittings; and solvent-cemented joints.
2. Hot & Tempered Water: B. F. Goodrich “FlowGuard Gold.”
3. PEX Piping: Viega, EVERPEX, or equivalent

3.03 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use ball valves.
2. Throttling Duty: Use globe or ball valves.

B. Plastic CPVC ball, and check valves may be used with plastic piping.

C. PEX Piping: Ball, and check valves may be used with PEX piping

3.04 PIPING INSTALLATION, GENERAL

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

3.05 SERVICE ENTRANCE PIPING INSTALLATION

A. Extend service entrance piping to exterior water service piping in sizes and locations indicated for service entrances into building. Refer to Division 2 Section "Water Systems" for water service piping.

3.06 WATER DISTRIBUTION PIPING INSTALLATION

A. Install piping level without pitch.

B. Install CPVC in strict accordance with manufacturer's installation instructions.

C. Install PEX located absent to any UV source and in strict accordance with manufacturer’s installation instructions

3.07 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Solvent-Cemented, Thermoplastic Pipe and Fitting Joints: Handle cleaners, primers, and solvent cements according to ASTM F 402; use cements and primers approved by the manufacturer.

3.08 VALVE INSTALLATION

A. Shutoff Valves: Install shutoff valve on each water supply to equipment, on each supply to plumbing fixtures without supply stops, and where indicated. Use ball valves for piping 2-inch NPS and smaller.

B. Drain Valves: Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
   1. Install hose-end drain valves at low points in water mains, risers, and branches.

3.09 HANGER AND SUPPORT INSTALLATION

A. Install supports according to Division 15 Section "Hangers and Supports."

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

D. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
   1. 3/4-Inch NPS and Smaller: Maximum horizontal spacing, 60 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.

E. Install hangers for CPVC plastic piping with the maximum 36 inch spacing in accordance with manufacturer's installation instructions.

G. Support piping and tubing not listed above according to MSS SP-69 and CPVC manufacturer's written instructions.

3.10 CONNECTIONS

A. Connect service entrance piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

B. Connect water distribution piping to service entrance piping at shutoff valve, and extend to and connect to the following:
   1. Water Heaters: Connect cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
   2. Plumbing Fixtures: Connect hot- and cold-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures.
   3. Equipment: Connect hot- and cold-water supply piping as indicated. Provide shutoff valve and union for each connection.

3.11 FIELD QUALITY CONTROL

A. Inspect water distribution piping as follows:

B. Inspect service entrance piping and water distribution piping as follows:
   1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
   2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
      a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
   3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
   4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Test water piping as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
   3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
   4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
   5. Prepare reports for tests and required corrective action.

3.12 CLEANING

A. Clean and disinfect water piping as follows:
   1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of

chlorine. Isolate and allow to stand for 3 hours.

c. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows contamination.

B. Prepare and submit reports for purging and disinfecting activities.

C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.13 COMMISSIONING

A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

B. Perform the following steps before putting into operation:
1. Close drain valves and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.

C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

D. Check plumbing specialties and verify proper settings, adjustments, and operation.

END OF SECTION

WIRING DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, General and Supplementary Conditions and Specification, and the RFP/RFQ apply to this Section.

1.02 SUMMARY

A. This Section includes various types of receptacles, connectors, switches, and finish plates.

1.03 SUBMITTALS

A. Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
   1. Receptacles, switches, and safety switches.

B. Product data for each product specified.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for devices and installation.

B. Listing and Labeling: Provide products that are listed and labeled for their applications and installation conditions and for the environments in which installed.
   1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.05 COORDINATION

A. Wiring Devices for Owner Furnished Equipment: Match devices to plug connectors for Owner-furnished equipment.

B. Cord and Plug Sets: Match cord and plug sets to equipment requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2.02 WALL SWITCHES

A. Single Pole Switch:
   1. Hubbell Model 1221I
   2. Arrow-Hart Model 1991I

B. Double Pole Switch:
   1. Hubbell Model 1222I
   2. Arrow-Hart Model 1992I

C. Three-way Switch:
   1. Hubbell Model 1223I

2. Arrow-Hart Model 1993I

D. Four-way Switch:
   1. Hubbell Model 1224
   2. Arrow-Hart Model 1994I

2.03 RECEPTACLES

A. Single Convenience Receptacle:
   1. Hubbell Model 5361I
   2. Arrow-Hart Model 5361I

B. Duplex Convenience Receptacle:
   1. Hubbell Model 5362I
   2. Arrow-Hart Model 5362I

C. GFCI Receptacle:
   1. Hubbell Model GF5362I
      a. Arrow-Hart Model GF5342I

2.04 WIRING DEVICES

A. Comply with NEMA Standard WD 1, "General Purpose Wiring Devices."

B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.

C. Color: Ivory except as otherwise indicated or required by Code.

D. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicted, and with the following additional requirements:
   1. Ground-Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, "Ground Fault Circuit Interrupters," feed-through type, with integral NEMA 5-20R duplex receptacle arranged to protect connected downstream receptacles on the same circuit. Design units for installation in a 2-3/4-inch (70-mm) deep outlet box without an adapter.

E. Snap Switches: Quiet-type a.c. switches, NRTL listed and labeled as complying with UL Standard 20 "General Use Snap Switches," and with Federal Specification W-S-896.

F. Telephone Jack: 4-position, modular, latching-plug type, flush in face of wall plate.

G. Wall Plates: Single and combination types that mate and match with corresponding wiring devices. Features include the following:
   1. Color: Matches wiring device except as otherwise indicated.
   2. Plate-Securing Screws: Metal with heads colored to match plate finish.
   3. Material for Finished Spaces: Nylon, heavy duty.
   4. Material for Unfinished Spaces: Galvanized steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

C. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

D. Protect devices and assemblies during painting.

3.02 IDENTIFICATION

A. Comply with Division 16 Section "Basic Electrical Materials and Methods" for electrical identification.
   1. Switches: Where 3 or more switches are ganged, and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.
   2. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.03 FIELD QUALITY CONTROL

A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least 6 times.

B. Test ground-fault circuit interrupter operation with both local and remote fault simulations according to manufacturer recommendations.

C. Replace damaged or defective components.

3.04 CLEANING

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

END OF SECTION 16140