EMERGENCY MANAGEMENT & 911 COMMUNICATIONS DISPATCH CENTER

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SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing systems.
2. Grid suspension systems.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; and roof rafters and ceiling joists.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received prior to installation.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

C. Horizontal Deflection: For non-composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

D. Design framing systems in accordance with AISI S220, "North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members," unless otherwise indicated.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with AISI S220 for conditions indicated.

1. Steel Sheet Components: Comply with AISI S220 requirements for metal unless otherwise indicated
2. Protective Coating: Comply with AISI S220; ASTM A653/A653M, G40; or coating with equivalent corrosion resistance. Galvannealed products are unacceptable.
    a. Coating demonstrates equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.

B. Studs and Track: AISI S220.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; ProSTUD Drywall Framing or comparable product by one of the following:
    a. CEMCO; California Expanded Metal Products Co.
    b. TELLING Industries.
2. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
3. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Steel Thickness: As indicated on Drawings.

F. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical.

G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4 inch, minimum uncoated-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 GRID SUSPENSION SYSTEMS

A. Grid Suspension Systems for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong World Industries, Inc.
b. USG Corporation.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow- metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLATION OF FRAMING SYSTEMS

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
2. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated.
3. Multilayer Application: 16 inches on center unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLATION OF GRID SUSPENSION SYSTEMS

A. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.6 FIELD QUALITY CONTROL

A. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Section 072100 "Thermal Insulation" for glass fiber thermal insulation and glass fiber sound batt insulation.
2. Section 079219 "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
3. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.3 GYPSUM BOARD, GENERAL

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

2.4 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Gypsum.
   b. Georgia-Pacific Gypsum LLC.
   c. Gold Bond Building Products, LLC provided by National Gypsum Company.
   d. USG Corporation.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Gypsum.
   b. Georgia-Pacific Gypsum LLC.
   c. Gold Bond Building Products, LLC provided by National Gypsum Company.
   d. USG Corporation.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Gypsum.
   b. Georgia-Pacific Gypsum LLC.
   c. Gold Bond Building Products, LLC provided by National Gypsum Company.
   d. USG Corporation.
2. Core: As indicated on Drawings.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. James Hardie Building Products, Inc.
   b. PermaBASE Building Products, LLC provided by National Gypsum Company.
   c. USG Corporation.
2. Thickness: As indicated on Drawings.
3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Paper-faced galvanized-steel sheet.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints 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 drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

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

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation" for glass fiber thermal insulation and glass fiber sound batt insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

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

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

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

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

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

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

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

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

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings.
3. Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLATION OF TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLATION OF 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 in accordance with ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated on Drawings.

3.6 FINISHING OF GYPSUM BOARD

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

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain floor tile and base.
2. Glazed wall tile.
3. Waterproof membranes.
4. Crack isolation membranes.
5. Setting material.
6. Grout materials.
7. Metal edge strips.

B. Related Requirements:

1. Section 092900 "Gypsum Board" for tile backing panels.

1.2 DEFINITIONS

A. General: Definitions in ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Face Size: Actual tile size, excluding spacer lugs.

C. Large Format Tile: Tile with at least one edge 15 inches or longer.

D. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.
2. Review requirements for aesthetics and joint alignment.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations, plans, and elevations, of each type of tile and tile pattern. Show widths, details, and locations of movement joints in tile substrates and finished tile surfaces. Show thresholds.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection or shade variation.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory.
3. Metal thresholds in 6-inch lengths.
4. Metal cove 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product, including product use classification.

D. Product Test Reports:

1. Tile-setting and -grouting products.
2. Certified porcelain tile.
3. Slip-resistance test reports from qualified independent testing agency.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Supervisor Certification.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in "Referenced Standards" Article in the Evaluations and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Tile: Obtain tile of each type from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ARDEX Americas.
   b. Custom Building Products.
   c. Laticrete International, Inc.
   d. MAPEI Corporation.

2. Obtain setting and grouting materials, except for unmodified portland cement and aggregate, from single manufacturer.
3. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
4. Obtain joint sealants from manufacturer of setting and grouting materials.

C. Accessory Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Backer units.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard Grade requirements.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

A. Ceramic Tile Type: Unglazed porcelain floor tile

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. American Olean; a brand of Dal-Tile Corporation.
   b. Crossville, Inc.
   c. Daltile; a brand of Dal-Tile Corporation.
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 11-13/16 by 11-13/16 inches.
4. Face Size Variation: Rectified.
5. Thickness: 5/16 inch.

6. Face: Plain with square or cushion edges.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color, Glaze, and Pattern: As selected by Architect from manufacturer's full range.
9. Grout Color: As selected by Architect from manufacturer's full range.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    a. Base Cap: Surface bullnose, module size same as adjoining flat tile by 3 inches high.

B. Ceramic Tile Type: Glazed wall tile.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. American Olean; a division of Dal-Tile Corporation.
    b. Daltile.
    c. Crossville.
2. Module Size: 4-1/4 by 4-1/4 inches (108 by 108 mm).
3. Face Size Variation: Rectified.
4. Thickness: 5/16 inch (8 mm).
5. Face: Plain with modified square edges or cushion edges.
6. Finish: Mat, opaque glaze.
7. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Mounting: Factory, back mounted.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    a. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size 4-1/4 by 4-1/4 inches (108 by 108 mm).

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: See Section 092900 “Gypsum Board.”

2.5 WATERPROOF MEMBRANES

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by manufacturer for application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Polyethylene Sheet: Polyethylene sheet faced on both sides with fleece webbing

1. Basis-of-Design Product: Subject to compliance with requirements, provide Schluter Systems L.P.; Kerdi Membrane, or comparable product, approved by the Architect, by one of the following:
   a. ARDEX Americas.
   b. Laticrete International, Inc.
   c. MAPEI Corporation.
2. Nominal Thickness: 0.008 inch.

2.6 CRACK ISOLATION MEMBRANE AND UNCOUPLING MEMBRANE

A. Corrugated Polyethylene: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; 3/16-inch (4-mm) nominal thickness.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Schluter Systems L.P.
2. Basis-of-Design Product: Subject to compliance with requirements, provide Schluter Systems L.P.; Ditra, or comparable product, approved by the Architect, by one of the following:
   a. ARDEX Americas.
   b. Laticrete International, Inc.
   c. MAPEI Corporation.

2.7 SETTING MATERIALS

A. Standard Dry-Set Mortar (Unmodified Thinset): ANSI A118.1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ARDEX Americas.
   b. Custom Building Products.
   c. Laticrete International, Inc.
   d. MAPEI Corporation.
2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.1.

2.8 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3 , with a VOC content of 65 g/L or less.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ARDEX Americas.
   b. Custom Building Products.
   c. Laticrete International, Inc.
   d. MAPEI Corporation.

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 degrees F, respectively, and certified by manufacturer for intended use.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting and adhesive materials for installations indicated.

B. Metal Cove: Designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Schluter – Dilex – EHK, including all accessories for a complete job.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Bonsal American, an Oldcastle company.
   b. Bostik, Inc.
   c. LATICRETE SUPERCAP, LLC.
   d. MAPEI Corporation.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE SYSTEM

A. Install tile backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

B. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

C. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

1. Allow crack isolation membrane to cure before installing tile or setting materials over it.

D. Mix mortars and grouts to comply with "Referenced Standards" Article in the Evaluations and mortar and grout manufacturers' written instructions.

1. Add materials, water, and additives in accurate proportions.
2. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

E. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 series that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors consisting of tiles 8 by 8 inches or larger.
2. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
3. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
4. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
5. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   a. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   b. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Metal Flooring Transitions: Install at locations indicated.

G. Grout Sealer: Apply grout sealer to grout joints in accordance with manufacturer's written instructions. As soon as sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile in accordance with tile and grout manufacturer's written instructions. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR CERAMIC TILE NSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation: TCNA F122; thinset mortar over waterproof membrane.
   a. Ceramic Tile Type: Porcelain.
   b. Thinset Mortar: Unmodified dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

B. Interior Wall Installations, Metal Studs:

1. Ceramic Tile Installation: TCNA W244C; thinset mortar over waterproof membrane on cementitious backer units.
   a. Ceramic Tile Type: Porcelain.
   b. Thinset Mortar: Unmodified dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of 6-inch- square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
3. Clips: Full-size seismic clips.

C. Delegated Design Submittals: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.

2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.
    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:
    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Sprinklers.
    f. Access panels.
    g. Perimeter moldings.
7. Minimum Drawing Scale: 1/4 inch = 1 foot.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations for Ceiling System: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.

B. Seismic Performance: Suspended ceilings to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A in accordance with ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS AND SUSPENSION SYSTEMS **(**ACT-1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products, or comparable product, approved by the Architect:

1. Armstrong; Ultima #1941 with Prelude XL HD grid #7301 and #7803, 7/8” molding per ICC Evaluation Report with BERC clips
2. USG; Mars #87200 with Donn DX 26 HD Grid and 7/8” USG M7 molding per ICC Evaluation Report #ESR-1222

B. Classification: Provide panels as follows:

1. Type and Form, Type IV Form 2: Mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face.
2. Pattern: C (perforated, small holes) and E (lightly textured).

C. Color: White.

D. Light Reflectance (LR): Not less than 0.85.

E. Ceiling Attenuation Class (CAC): Not less than 35.

F. Noise Reduction Coefficient (NRC): Not less than 0.80.

G. Articulation Class (AC): Not less than 170.

H. Edge/Joint Detail: Beveled tegular.

I. Thickness: 7/8 inch.

J. Modular Size: 24 by 24 inches.

2.4 ACOUSTICAL PANELS AND SUSPENSION SYSTEMS (ACT-2)

A. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products, or comparable product, approved by the Architect:

1. Armstrong; Dune #1772 square edge with Prelude XL 15/16” grid, 7/8” molding per ICC Evaluation Report with BERC clips

2. USG; Olympia Micro #4211 square edge with USG Donn DXW 7/8” USG M7 molding per ICC Evaluation Report #ESR-1222.

B. Classification: Provide panels as follows:

1. Composition: Mineral Fiber

2. Pattern: Fine Texture

C. Color: White.

D. Light Reflectance (LR): Not less than 0.81.

E. Ceiling Attenuation Class (CAC): Not less than 35.

F. Noise Reduction Coefficient (NRC): Not less than 0.50.

G. Articulation Class (AC): Not less than 170.

H. Edge/Joint Detail: Square Lay-in

I. Thickness: 5/8 inch.

J. Modular Size: 24 by 24 inches.

2.4 ACOUSTICAL PANELS AND SUSPENSION SYSTEMS (ACT-3 in kitchen)

A. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products, or comparable product approved by the Architect:

1. Armstrong; Ceramaguard #607 with Prelude 7301G90 Grid and Gordon Grid Co. pattern CG-WA-20 2-inch wall angle molding.

2. USG; Radar Ceramic Panels; Donn DX 26 HD Grid and 7/8” USG M7 molding per ICC Evaluation Report #ESR-1222

B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Classification: Provide fire-resistance-rated panels as follows:

1. Type, Type XX: High-density, ceramic- and mineral-base panels with scrubbable finish, resistant to heat, moisture, and corrosive fumes.
2. Pattern: C (perforated, small holes) and E (lightly textured).

D. Color: White.

E. Light Reflectance (LR): Not applicable.

F. Ceiling Attenuation Class (CAC): Not less than 38.

G. Noise Reduction Coefficient (NRC): Not less than 0.55.

H. Articulation Class (AC): Not applicable.

I. Edge/Joint Detail: Square.

J. Thickness: 5/8 inch, per manufacturer.

K. Modular Size: 24 inches by 24 inches.

2.5 METAL SUSPENSION SYSTEM

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

1. Armstrong Ceiling & Wall Solutions.
2. USG Corporation.

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories in accordance with ASTM C635/C635M and designated by type, structural classification, and finish indicated.

1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" in accordance with ASTM C635/C635M.

C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted white.

2.6 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

F. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.

G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.7 METAL EDGE MOLDINGS AND TRIM

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

1. Armstrong Ceiling & Wall Solutions.
2. USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color

as that used for exposed flanges of suspension-system runners.

1. Edge moldings to fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.8 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF ACOUSTICAL PANEL CEILINGS

A. Install acoustical panel ceilings in accordance with ASTM C636/C636M , seismic design requirements, and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches on center along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches on center and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. Arrange directionally patterned acoustical panels as follows:

a. As indicated on reflected ceiling plans.
b. Install panels with pattern running in one direction parallel to long axis of space.

c. Install panels in a basket-weave pattern.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension- system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install seismic clips in areas indicated; space in accordance with panel manufacturer's written instructions unless otherwise indicated.
7. Protect lighting fixtures and air ducts in accordance with requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL

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

1. Periodic inspection during the installation of suspended ceiling grids in accordance with ASCE/SEI 7.

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

C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and post-installed anchors used to attach hangers and will test them for 200 lbf of tension; it will also select one of every two post-installed anchors used to attach bracing wires and will test them for 440 lbf of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if

they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.
2. Vinyl molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of required transition product.

C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

D. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F or more than 95 degrees F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees F or more than 95 degrees F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite, Tarkett North America (www.tarkett.com, 800-899-8916); Baseworks Wall Base or comparable product, approved by the Architect, by one of the following.

1. Flexco Corporation.
2. Roppe Corporation; Roppe Holding Company.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

C. Thickness: 0.125 inch.

D. Height: As indicated on Drawings.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As selected by Architect from manufacturer’s standards.

2.2 VINYL MOLDING ACCESSORY

A. Basis-of-Design Product: Subject to compliance with requirements, provide Tarkett North America (www.tarkett.com, 800-899-8916); products or comparable product, approved by the Architect, by one of the following.

1. Armstrong World Industries, Inc.
2. Flexco Corporation.
3. Roppe Corporation; Roppe Holding Company.
4. The R.C. Musson Rubber Co.

B. Description: Vinyl transition strips.

C. Locations: As approved by Architect.

D. Colors and Patterns: As selected by Architect from manufacturer’s standards.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

   a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

   a. Cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

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

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

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

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

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

A. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096536 - STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Static-control, rubber floor tile.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with static-control resilient flooring.
2. Section 096900 “Access Flooring” for grounding of access floor.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:

a. Examination and preparation of substrates to receive static-control resilient flooring.
b. Installation techniques required for specified products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.
2. Show locations of inscribed maintenance floor tiles in conductive, solid vinyl floor tile installation areas.
3. Show grounding locations of grounding strips and connections.

C. Samples: For each type of static-control resilient flooring and in each color, pattern, and texture required, in manufacturer's standard size, but not less than 6 by 9 inches.

D. Samples for Initial Selection: For each exposed static-control resilient flooring product, in manufacturer's standard size.

E. Samples for Verification: For each type of static-control resilient flooring and in each

color, pattern, and texture required, of size indicated below:

1. Floor Tile: Full-size units.

F. Product Schedule: For static-control resilient flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes, or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required for specified products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended in writing by manufacturer, but not less than 50 deg F or more than 90 deg F.

1. Floor Tile: Store on flat surfaces.

1.9 PROJECT CONDITIONS

A. Maintain ambient temperatures in spaces to receive static-control resilient flooring within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F during the following time periods:

1. Period recommended in writing by manufacturer before installation.
2. During installation.
3. Period recommended in writing by manufacturer after installation.

B. Until Substantial Completion, maintain ambient temperatures in installation areas within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for period recommended in writing by manufacturer after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 STATIC-CONTROL, RUBBER FLOOR TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Staticworx ESD Rubber Floor Tiles, 24” x 24” or comparable product by one of the following:

1. Roppe Corporation.
2. Nora.
3. Flexco Corporation.

B. Source Limitations: Obtain floor tile from single source from single manufacturer.

C. Seaming Method: Manufacturer's standard.

D. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with installation or static-control characteristics of floor coverings.

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

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's written instructions to ensure successful installation of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare in accordance with ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with floor-covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.

1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

F. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

A. Install static-control resilient flooring in accordance with manufacturer's written instructions.

B. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

1. For adhesively installed flooring, embed grounding strips in static-control adhesive.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

1. Extend static-control resilient flooring below built-in items and permanent, but movable, items that allow for a flexible layout where indicated on Drawings.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings.

E. Extend static-control resilient flooring to center of door openings where flooring or color transitions occur.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.

H. Free-Lay Installation: Install static-control resilient flooring in accordance with manufacturer's written instructions for a completed installation without open cracks, raising and puckering at joints, and surface imperfections.

I. Adhesive Installation: Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed

installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 INSTALLATION OF FLOOR TILE

A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.

1. Lay floor tiles square with room axis and spanning over access floor joints.

B. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

1. Lay vinyl composition floor tiles with grain direction alternating in adjacent floor tiles (basket-weave pattern).

C. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in locations approved by Architect.

3.5 INSTALLATION OF SHEET FLOOR COVERINGS

A. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.

B. Lay out sheet floor coverings as follows:

1. Maintain uniformity of sheet floor-covering direction.
2. Minimize number of seams and place them in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor-covering substrates.
3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified testing agency to test electrical resistance of static-control resilient flooring in accordance with ASTM F150, ESD STM7.1 for compliance with requirements.

1. Arrange for testing after the following:

a. Static-control adhesives have fully cured.
b. Static-control resilient flooring has stabilized to ambient conditions.
c. Ground connections are completed.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:

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

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

1. Do not wax static-control resilient flooring.
2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties. Before polishing, do the following:

    a. Ensure that static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
    b. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring and protect from rolling loads until Substantial Completion.

END OF SECTION 096536

SECTION 096813 – TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following;

1. Carpet Tile
2. ESD Anti-Static Carpet Tile

1.02 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's product data for carpet materials and accessories. Furnish copies of testing laboratory's report indicating carpeting flame spread rating per test ASTM D2859 and anti-static properties for ESD Carpet.

B. Samples: Submit four, full-size carpet tile samples of each type and color of carpet tile proposed to be used. Label each sample with manufacturer's name, material description, color, pattern, designation, and project name. Submit four – 12" long samples of each type of exposed edge stripping and accessory proposed to be used.

C. Shop Drawings: Submit shop drawings indicating the following;
1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot
3. Type of subfloor
4. Type and pattern of installation
5. Pattern type, location and direction
6. Transition details to other flooring materials

E. Mock-Up: Install a sample area of each patterned carpet, 10' x 10', for written approval by Architect or Interior Designer prior to proceeding with installation.

1.04 QUALITY ASSURANCE

A. Installer qualifications: An experienced installer who is certified by the Floor Covering Installation Board (FCIB) or who can demonstrate compliance with its certification program requirements.

B. Carpet manufacturer shall certify by register numbers or M.O. # that carpet shipped for this project complies with all requirements of this section subject to normal manufacturing tolerances.

1.05 DELIVERY, STORAGE AND HANDLING

A. Carpeting shall be delivered to the job site in original mill wrapping with each carpet tile box having it's register number properly attached, clearly marked as to size, dye lot, and materials.

B. Material shall be stored in an enclosed and dry area protected from damage and soiling.

C. Coordinate location or storage area within building with the General Contractor

1.06 PROJECT CONDITIONS

A. Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for it's intended use.

B. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer. Test concrete slabs and provide test results showing compliance.

1.07 MAINTENANCE INSTRUCTIONS

A. Meet with Owner and manufacturer's representative to instruct Owner in the proper care, equipment to be used, and maintenance of installation. Include methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule. Also include precautions for cleaning materials and methods that could be detrimental to carpet tile.

B. Prepare and present suitable maintenance manual. Include copies of CRI booklet "Steps in the Right Direction, an Owner's Manual for Your Carpet".

1.08 WARRANTY

A. Provide guarantee against faulty workmanship for a period of one (1) year, and faulty materials for a period of five (5) years.

1. Include any reanchorage of edge strips, faulty seams or other improper workmanship or material.

B. Provide minimum ten (10) year Commercial Wear Warranty.

1.09 EXTRA STOCK

A. Deliver to the Owner an extra stock of 50 S.F. of each type and color carpet used.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Provide each carpet type from a single manufacturer. Floor carpet design is based on the use of products from a specific manufacturer with partial attributes described below. Specific carpet shall have been tested against and passed the Indoor Air Quality Carpet Testing Program requirements of the Carpet and Rug Institute.

1. BASIS OF DESIGN: (CT-1)

MFR:	Interface
Carpet Tile:	24 x 24
Style:	Granite Mountain Collection
Color:	as selected from manufacturer's full range
Construction:	Tufted Textured Loop
Dye Method:	100% Solution Dyed
Yarn Weight:	17 oz/sq yd
Pile Thickness:	.071 inches
Stitches:	9 /inch
Backing System:	Glasbac
Tile Installation Method:	Nondirectional
Traffic Class:	Heavy

2. BASIS OF DESIGN: (CT-SD)
   a. MFR: StaticWorx, Inc.
   b. Style Name: ShadowFX ESD Carpet Tile "Slate Collection"
   c. Color: As selected from manufacturer's full range
   d. Static Control Fiber: Continuous Static Dissipative Staticworx 44 denier helix fiber.
   e. Yarn System: 100% Recycled content Type 6 branded nylon
   f. Yarn Construction: Tufted pattern loop
   g. Dye Method: 100% Solution Dyed
   h. Dye Lots: Non-Mergeable
   i. Tufted Stitches Per Inch: 9.0/in
   j. Tufted Pile Height: 0.15 in
   k. Tufted Yarn Weight: 18 oz/yd³
   l. Pile Thickness: 0.1 in
   m. Pile Density: 6,480 oz/yd³
   n. Traffic Rating: Heavy
   o. Electrostatic Propensity: < 2.0 kV (AATCC 134-1996)
   p. Preservative Efficacy
      i. (AATCC 174 Parts 2&3) 99% Reduction/No Mold 7 Days
      ii. (ASTM E-2471) Complete Inhibition
   q. Electrical Resistance : ANSI/ESD S7.1, RTT, RTG:
      i. 1.0 x 106 Ohms Minimum, 1.0 x 109 Ohms Maximum (ANSI/ESD S7.1-2013)
      ii. ANSI/ESD S20.20-2007:
         1. ANSI/ESD S97.2 Voltage on a person < 100 volts when tested with approved conductive footwear system.
         2. ANSI/ESD S97.1 System resistance < 3.5 x 107 Ohms
      iii. Grounding: Groundable Path
         1. Grounding Connector: 5 mm, 26 gauge Copper strip
         2. Grounding Frequency – 1 ground connector per 1000 square feet and minimum of 1 per room
      iv. Glue-free Installation – Use GroundBridge underlayment with Interface TacTiles
      v. Crockfastness: AATCC Test Method 165 Minimum stain rating on International Grey Scale of not less than 5 wet and dry.

vi. Atmospheric Fading AATCC Test Method 129 Ozone/AATCC Test Method 23, Burned Gas shall not be less than 3 on International Grey. Scale after two cycles on each test.

C. Substitutions: Products from other manufacturers will be acceptable, providing their products equal or exceed the type, quality, and color of the specified products, and meet all other specification requirements.

2.02 OTHER MATERIALS

A. Carpet and Seam Adhesive: Low VOC emitting floor covering adhesive recommended for the purpose by the carpet manufacturer. Utilize releasable type adhesive for modular carpet. Adhesives and cements not approved by the carpet manufacturer are not acceptable.

B. Carpet edging/reducer: Vinyl or rubber shaped product appropriate for the respective location. Color selected by Architect or Interior Designer.

C. Other materials: As recommended by carpet manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACES

A. Comply with Manufacturer's instructions and recommendations regarding preparation of substrates to receive carpet tile. Comply with CRI 104, "Site Conditions; Floor Preparation," for preparing substrates indicated to receive carpet tile.

B. Clean floors of dust, dirt, solvents, oil, grease, paint, plaster, and other substances detrimental to proper performance of adhesive and carpet. Allow floors to dry.

C. Ensure concrete floors are free from scaling and irregularities and exhibit neutrality relative to acidity and alkalinity. Assure one constant floor height after carpet is installed, grinding high spots and filling low spots, with maximum surface variation of 1/4 inch in 10 feet noncumulative.

3.02 INSTALLATION

A. Carpet tile shall be installed in strict accordance with manufacturer's written instructions and recommendations. Comply with CRI 104, "Carpet Modules (Tiles)."

B. Installation Method: As recommended by Architect or Interior Designer. See Architectural Finish Schedule for correct installation method.

C. Check matching of carpet tiles before installation and ensure there is no visible variation between dye lots. Refer to section 1.02D.

D. Install carpet tile in manner to allow proper seam and pattern match. Ensure tiles are straight and true and unfrayed.

F. Cut and fit carpet tile neatly around projections through floor and to walls and other vertical surfaces, and to fit neatly into breaks and recesses. Fit carpet tile snuggly to walls and other vertical surfaces where no base is scheduled, leaving no gaps.

G. Grounding: Copper grounding strips should be placed approximately 25’ – 40’ apart throughout installation in accordance with manufacturer’s instructions. The copper strips should be installed at least every 1,000 square feet or 1 minimum per room.

3.03 CLEANING

A. Upon completion of installation, remove all waste materials, tools and equipment.

B. Remove excess adhesive, seam sealer, and other substrate blemishes using cleaner recommended by carpet tile manufacturer.

C. Remove yarns that protrude from carpet tile surface.

D. Thoroughly vacuum entire floor surface using commercial vacuums.

E. Protect installed carpet tile to comply with CRI 104, “Protection of Indoor Installations.” Provide protection methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

END OF SECTION 096813

SECTION 096900 – ACCESS FLOORING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this section.

1.2 SUMMARY

A. This section includes:

1. Access flooring panels and understructure
2. All accessories, including, but not limited to grommets, ramps, and steps required for complete installation.

B. Related Sections include the following:

1. SECTION 033000 “Cast-In-Place Concrete” for concrete floor sealer.
2. Division 26 Section “Grounding and Bonding for Electrical Systems” for connection to ground of access flooring understructure.

Note: The electrical contractor shall provide the necessary labor and materials to electrically connect the access flooring to the building ground to comply with this section.

1.3 DEFINITION

A. Access flooring: A complete portable assembly of modular floor panels on an elevated support system (understructure), forming an accessible under-floor cavity to accommodate electrical and mechanical service.

B. ESD: Electrostatic Discharge. The transfer of electric charge between bodies at different potentials.

1.4 SYSTEM DESCRIPTION

A. Access Flooring System: Assemblies composed of modular floor panels that are fastened to adjustable height pedestals.

B. Access floor panels laminated with static dissipative high pressure laminate supported by a bolted stringer system with factory applied conductive gaskets.

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide access flooring system capable of supporting the following loads and stresses within limits and under conditions indicated, as demonstrated by testing manufacturer's current standard products according to referenced procedures in latest revised edition of Ceilings and Interior Systems Construction Associates (CISCA) "Recommended Test Procedures for Access Floors" referenced elsewhere in this section as CISCA/AF or, if not specified, manufacturers standard method

1. Concentrated Loads: Provide floor panels, including those with cutouts, capable of withstanding a concentrated design load of 1,250 lbf. (5560 N) with a top-surface deflection under load not to exceed 0.100 inch (2.54) and a permanent set not to exceed 0.010 inch (0.25) according to CISCA/AF Section 1, "Concentrated Loads".
2. Ultimate Load: Provide access flooring system capable of withstanding a minimum ultimate load of three times the concentrated load without failing, according to CISCA/AF, Section 2, "Ultimate Loading".
3. Rolling Loads: Provide access flooring system capable of withstanding rolling loads of the following magnitude, with a combination of local and overall deformation not to exceed 0.040 inch (1.02) mm after exposure to rolling over CISCA/FA Path A or B, whichever path produced the greatest top surface deformation, , according to CISCA/AF, Section 3, "Rolling Loads".
    a. CISCA/AF Wheel 1 Rolling Load: 1,000 lbf. (4448 N)
    b. CISCA/AF Wheel 2 Rolling Load: 800 lbf. (3559 N)
4. Pedestal Axial Load Test: Provide pedestal assemblies, without panels in place, capable of withstanding a 9,000 lbf (40,034 N) axial load per pedestal, according to CISCA/AF Section 5, "Pedestal Axial Load Test", without any permanent deformation.
5. Pedestal Overturning Moment Test: Provide pedestal assemblies, without panels in place, capable of withstanding an overturning moment of 1,000 inch-pounds (113 NM) per pedestal, according to CISCA/AF Section 6, "Pedestal Overturning Moment Test", when glued to a clean, sound, uncoated concrete surface.
6. Uniform Load Test: Provide access flooring system capable of withstanding a uniform load of 450 lbf/ft^2 (21,546 N/M^2) placed the over area one panel with a permanent set not to exceed 0.010 inch (0.25 mm) after the load is removed, according to CISCA/AF Section 7, "Uniform Load Test"
    Note: The uniform load rating of an access floor panel shall not be confused with the "uniform live load" as specified for use in seismic calculations for seismic zone applications.
7. Drop Impact Load Test: Provide access flooring system capable of withstanding a drop impact load of 175 lb. (79 kg) dropped from a height of 36 inches (914 mm) without a failure of the system, according to CISCA/AF Section 8, "Drop Impact Load Test".
8. Panel Drop Test: Provide access flooring system with panels capable of meeting all structural performance requirements specified, after the panel is dropped from a height of 36 inches onto a concrete surface.

B. Seismic Performance: Provide access flooring system capable of withstanding the effects of seismic motions in compliance with IBC and structural information on Sheet S-100.

C. ESD-Control Properties:

1. Provide access flooring system with Panel-to-Understructure resistance of not more than 10 ohms as measured without floor coverings, according to test method as specified in ASTM F 150 with 500-V applied voltage with one electrode on the top face of the panel and one electrode attached to the tube of the pedestal.

a. Panel must have a permanently attached positive grounding device (PGD) to assure electrical continuity between panel and understructure to maintain compliance to required maximum resistance of 10 ohms.

1.6 SUBMITTALS

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

1. Shop Drawings: Include complete layout of access flooring system based of field verified dimensions.
   a. Details and sections with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories and understructure.
   b. Detail Cut Sheets for each type of product indicated, including accessories, to show the information necessary to make a full evaluation of the entire flooring system.
   c. For installed products indicated to comply with seismic design loads compliant with IBC 2021 and structural loads indicated on Sheet S-100. Include calculated structural analysis data signed by a qualified Structural Engineer licensed in SC responsible for their preparation.
2. Samples for Initial Selection: For each type of flooring material indicated and exposed finish indicated, submit samples in the form of manufacturers color charts consisting of actual units or sections of units showing full range of colors, textures and patterns

B. Product Certificates: For each type of access flooring system indicated, to certify that the flooring system meets the requirements of these written specifications and signed by a qualified employee of the manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, or performed by access flooring manufacturer and witnessed by a qualified testing agency, for each type of flooring material and exposed finish.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is approved by the access flooring manufacturer for installations of the type of access flooring indicated

for this project.

B. Source Limitations: Obtain access flooring system through one source from a single manufacturer.
C. Regulatory Requirements: Fabricate and install access flooring system to comply with NFPA 75 requirements for raised flooring.
D. Provide floor panels that are clearly marked with manufacturer's name and panel type.
E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.

1. Review connection with mechanical and electrical systems.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver access flooring components in original, unopened packages, clearly labeled with manufacturer's name and item description.
B. Handle and store packages containing access flooring in a manner which avoids overloading building structure.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install access flooring until installation area is enclosed and has an ambient temperature of between 50 degrees Fahrenheit and 85 degrees Fahrenheit (10^0 C to 29^0 C) and a relative humidity of not less than 20 percent and not more than 80 percent.

1.10 COORDINATION

A. Coordinate locations of mechanical and electrical work in under-floor cavity to prevent interferences with access flooring pedestals
B. Pre-mark pedestal locations on a grid of 10' x 10' on sub-floor so that mechanical and electrical work can take place without interfering with pedestals.
C. Do not proceed with installation of access flooring until after substantial completion of other performable construction within affected spaces.

1.11 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage and identified with labels clearly describing contents.
    1. Standard field panels – 2%
    2. Pedestals – 2%

PART 2 - PRODUCTS

2.1 FLOOR PANELS AND UNDERSTRUCTURE

A. Manufacturers: Subject to compliance with requirements, provide access flooring by ASM Modular Systems, Inc., consisting of FS200 access floor panels supported on a corner-bolted understructure, or approved equal.

B. Floor Panels General: Provide modular panels complying with the following requirements, that are interchangeable with other standard field panels, and can be easily relocated by one person, using a lifting device, without disturbing adjacent panels or understructure. Installed panels with floor covering in place are to be free of exposed metal edges.

1. Nominal Panel Size: 24” x 24” (610 mm x 610 mm)
2. Fabrication Tolerances: Fabricate panels to the following tolerances with squareness tolerances expressed as the difference between diagonal measurements from corner to corner.
    a. Size and Squareness: Plus or minus 0.010” (0.12 mm) of required size, with squareness tolerance of plus or minus 0.015” (0.38 mm).
    b. Flatness: Plus or minus 0.020” (0.50 mm), measured on a diagonal on top of the panel.
3. Panel Attachment to Understructure: By Bolting to pedestal head. Provide panels with holes in corners to align precisely with threaded holes in pedestal heads and to accept countersunk screws with heads flush with top of panel.

C. Cementitious–Filled, Formed-Steel Panels: Fabricate panels with a die formed all-steel bottom pan consisting of a minimum 64 embossments, fully welded to a die-cut full-hard steel top sheet to form a structural unitized construction. Completed panels to be filled with light-weight cementitious fill. Panels to be cleaned with 3-part wash and rinse system, prior to applying a protective powder-coat epoxy finish.

1. Solid Panels: Flat, solid top surface

D. Pedestals: Provide manufactures standard pedestal assembly including base, column with provisions for height adjustments, and head (Cap), made of steel.

1. Base: Square base plate with not less than 16 square inches (103 sq. mm) of bearing area.
2. Column: Welded to base plate and of height required to bring finished floor to elevations indicated.
3. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than 2 inches (50 mm) and for locking at a selected height, so deliberate action is required to change height setting and prevents vibratory displacement.
4. Construct pedestal adjusting rod of minimum 3/4” (19 mm) diameter solid steel, and vertical column of minimum 7/8” (22 mm) square steel tubing. All steel components to have manufacturer’s standard galvanized finish.
5. Head: Pedestal head with four holes aligned with holes in floor panels for bolting of panels to pedestals.
6. Dual Panel Support: Pedestal head shall be designed to provide a combined support of the panel edge lip and the bottom corner of the panel.

2.2 FLOOR PANEL COVERINGS

A. General: Provide bare panels without wear-surface covering except Server 112, which are to be factory applied High Pressure Laminate.

2.3 ACCESSORIES

A. Service Cutouts: Fabricate cutouts in floor panels to accommodate cable penetrations and service outlets. Include field labor for all cutouts and accessories as part of standard installation. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with standard performance requirements.

1. Fit cutouts with manufacturer's standard grommets in size indicated or, where size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacture's standard plastic molding having tapered top flange. Furnish removable covers for grommets.
2. Provide foam-rubber pads for sealing annular space formed in cutouts by cables. Trim edge of cutout with molding having a double-flanged internal edge for containing and supporting foam pads.
3. For bidding purposes provide FOUR (4) 2" diameter cutouts each with grommet per console required in PSAP 119 and coordinate cutouts in EOC 126 with MEP and Technology drawings for in-floor electrical/data boxes. Final location beneath each console or table to be determined after Owner's selections are complete. Contractor fully responsible to verify and coordinate required hole locations with Owner's console vendor.

B. Vertical Closures (Fascia): Where under floor cavity is not enclosed by abutting walls or other construction, provide manufacturer's standard metal closure plates with manufacturer's standard finish.

C. Ramps: Manufacturer's standard ramp construction of width and slope indicated, but not steeper than 1 : 12, with non-slip raised-disc runner or vinyl floor covering, and of same materials, performance, and construction requirements as the access flooring.

D. Steps: Provide steps of size and arrangement indicated with floor covering to match access flooring. Apply non-slip aluminum nosing to treads, unless otherwise indicated.

E. Panel Lifting Device: Manufacture's standard portable lifting device of type and number required for lifting panels.

1. Provide the following quantity: one lifting device for PSAP and one for EOC.

PART 3 – EXECUTION

3.1 PREPARATION

A. Examine sub-floor for any problems that would prevent a satisfactory installation of access floor, such as moisture an unevenness of top surface. Do not proceed with

installation until sub-floor is clean, dry and level as completed by other trades.

B. Verify field dimensions to contract drawings for size of area of installation, height and level of recessed slabs, door openings, ledges, etc.

C. Floor Sealers: Verify that any concrete sealer that has been used is compatible with pedestal adhesive.

D. Access To Installation Area: General Contractor shall provide clear access to installation area throughout entire duration of installation of access floor that is free of construction debris and other trades.

E. Storage Of Materials: Area to receive and store access floor materials shall be enclosed and dry. Storage area shall be maintained at a temperature of not less than 40^0 F and not more than 95^0 F (4^0 C to 35^0 C), with a relative humidity level between 20% min. to 80% max.

E. Area Of Installation: Shall be maintained throughout entire duration of installation of access floor at a temperature of 50^0 F min. to 85^0 F max. (10^0 C to 29^0 C) and at 20% min. to 80 % max. relative humidity.

F. Prior to installation, all floor panels shall be stored for at least 24 hours in a dry enclosed area at no less than 40^0 F and no more than 95^0 F (4^0 C to 35^0 C).

3.2 INSTALLATION

A. Install access floor system and accessories under supervision of the access flooring manufactures authorized representative to ensure rigid, firm installation that complies with performance requirements and is free of vibration, rocking, rattles and squeaks.

B. Layout floor panel installation to keep the number of cut panels at the floor perimeter to a minimum.

C. Set pedestal in adhesive as recommended by the access flooring manufacturer to provide full bearing of the pedestal base on the sub floor.

1. Pedestal locations shall be established from approved shop drawings to allow mechanical and electrical work to be installed without interfering with pedestal installation.
2. Pedestals shall be attached to sub-floor using manufacturer’s approved method.

D. Secure grid member to pedestal heads in accordance with access floor manufacturer’s instructions.

E. Install floor panels securely in place and properly seated with panel edges flush. Do not force panels into place.

F. Scribe panels at perimeter to provide a close fit with adjoining construction with no voids greater than 1/18” (3 mm) where panels abut vertical surfaces.

G. Install accessories according Manufacturer's instructions.

H. Clean up dust, dirt and construction debris caused by floor installation, and vacuum the sub-floor area, as installation of floor panel proceeds. Extend cleaning under installed panels as far as possible.

I. Level installed access floor to within 0.10" (2.5 mm) over the entire access flooring area and within 0.060" (1.5 mm) of true level in any 10 ft. (3 M) distance.

3.3 ADJUSTING, CLEANING AND PROTECTION

A. During installation, all traffic on access floor shall be directed by access floor installer.
   1. No traffic, other than access floor installer, shall be allowed on the floor area for 24 hours after installation to allow the pedestal adhesive to set.
   2. No access floor panels shall be removed by other trades for 72 hours after installation.

B. After completing installation, vacuum clean access flooring.

C. Replace any flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

D. General contractor and/or owner shall provide and maintain suitable protection to prevent damage to completed access floor throughout entire duration of installation.

END OF SECTION 096900

SECTION 099113 – EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and field application of paint systems on exterior substrates.

B. Related Requirements:

1. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.2 REFERENCES

A. ASTM International:

1. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.

1.3 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Label each coat of each Sample.
3. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.5 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

B. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

C. Applicator: Company specializing in performing Work of this Section with minimum three years documented experience.

D. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
    b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
    a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacture’s label with the following information:

1. Product name and type (description).
2. Batch date.
3. Color number.
4. Environmental handling requirements.

5. Surface preparation requirements.
6. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

B. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

C. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Do not apply coatings when moisture content of surfaces exceeds those required by paint product manufacturer.

E. Minimum Application Temperature for Varnish and Finishes: 65 degrees F, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 foot-candles measured mid-height at substrate surface.

1.9 SEQUENCING

A. Do not apply finish coats until paintable sealant is applied.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 1 gallon of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.2 PAINTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The) (www.sherwin-williams.com); products or comparable products, approved by the Architect, by one of the following.

1. PPG Industries, Inc.
2. Benjamin Moore & Co.

B. Description: Ready mixed, except field-catalyzed coatings. Prepare coatings:

1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
2. For good flow and brushing properties.
3. Capable of drying or curing free of streaks or sags.

2.3 ACCESSORIES

A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve finishes specified; commercial quality.

B. Patching Materials (Opaque Finish): Latex filler.

C. Fastener Head Cover Materials (Opaque Finish): Latex filler.

2.4 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

a. Concrete: 12 percent.
b. Fiber-Cement Board: 12 percent.
c. Masonry (Clay and CMU): 12 percent.
d. Wood: 15 percent.
e. Portland Cement Plaster: 12 percent.
f. Gypsum Board: 12 percent.

2. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
3. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions.

B. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil,

grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Surfaces: Correct defects and clean surfaces capable of affecting Work of this Section.

E. Marks: Seal with shellac those that may bleed through surface finishes.

F. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

H. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

I. Galvanized Surfaces: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

J. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

K. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Fill nail holes with tinted exterior paintable caulking compound after prime coat has been applied.

L. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

M. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 SCHEDULE - EXTERIOR SURFACES

A. Wood:

1. Application includes treated and untreated wood.
2. System:

a. Primer: Exterior Latex Wood Primer, B42W8141
b. Finish (2 coats): Duration Exterior Acrylic Satin, K33 Series.

3. Color: As selected by Architect from manufacturer’s standards.

B. Fiber-Cement:

1. Application includes fiber-cement siding and trim.
2. System:

a. Primer: Loxon Concrete & Masonry Primer, LX02W0050
b. Finish (2 coats): Duration Exterior Acrylic Satin, K33 Series.

3. Color: As selected by Architect from manufacturer’s standards.

C. Steel:

1. Application includes hollow metal doors and frames.
2. System:
   a. Primer: Pro Industrial Pro-Cryl Universal Acrylic Primer
   b. Finish (2 coats): Sher-Cryl HPA High Performance Acrylic, Semi-Gloss, B66-350
3. Color: As selected by Architect from manufacturer’s standards.

END OF SECTION 099113

SECTION 099123 – INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.

B. Related Requirements:

1. Section 033543 “Polished Concrete Finishing” for polished concrete floors.
2. Section 099113 "Exterior Painting.”
3. Section 099600 "High-Performance Coatings" for coatings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Label each coat of each Sample.
3. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Indicate VOC content.

1.3 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 1 gallon of each material and color applied.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

B. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer’s label with the following information:

1. Product name and type (description).
2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.
7. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 degrees and 95 degrees F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than
5 degrees F above the dew point; or to damp or wet surfaces.

C. Lead Paint: It is not expected that lead paint will be encountered in the Work.

1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

D. Lead Paint: Lead paint may be present in buildings and structures to be painted. A report on the presence of lead paint is on file for review and use. Examine report to become aware of locations where lead paint is present.

1. Do not disturb lead paint or items suspected of containing hazardous materials except under procedures specified.
2. Perform preparation for painting of substrates known to include lead paint in accordance with EPA Renovation, Repair and Painting Rule and additional requirements of authorities having jurisdiction.

1.8 MANUFACTURERS

A. Basis-of-Design Product: Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin Williams Company (The) (www.sherwin-willimas.com); products or comparable products, approved by the Architect, by one of the following:

1. PPG Industries, Inc.
2. Benjamin Moore & Co.

B. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 01 6000 "Product Requirements," and the following:

1. Products are approved by manufacturer in writing for application specified.
2. Products meet performance and physical characteristics of basis of design product including published ratio of solids by volume, plus or minus two percent.

1.9 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

1.10 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

a. Concrete: 12 percent.
b. Masonry (Clay and CMU): 12 percent.
c. Wood: 15 percent.

d. Gypsum Board: 12 percent.
e. Plaster: 12 percent.

2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
3. Plaster Substrates: Verify that plaster is fully cured.
4. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

2.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Coordination of shop-applied prime coats with topcoats is critical.
2. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

1. Concrete Floors: Remove oil, dust, grease, dirt, and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-metal substrates should not be chromate passivated (commercially known as "bonderized") if primers are field applied. If galvanized metal is chromate passivated, consult manufacturers for appropriate surface preparation and primers.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

2.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

2.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

2.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints

by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

2.6 INTERIOR PAINTING SCHEDULE

A. Gypsum Board:

1. Application includes gypsum board walls
2. System:
    a. Primer: ProMar 200 Zero-VOC Latex Primer, B28W12600
    b. Finish (2 coats): ProMar 200 Zero VOC Latex Eg-Shel
3. Color: As selected by Architect from manufacturer’s standards.

B. Gypsum Board:

1. Application includes gypsum board at wet areas.
2. System:
    a. Primers: ProMar 200 Zero-VOC Latex Primer, B28W12600
    b. Finish (2 coats): Pro Industrial Waterbased Catalyzed Epoxy Egshel, B73-360 Series
3. Color: As selected by Architect from manufacturer’s standards.

C. CMU:

1. Application includes CMU walls, typical.
2. System:
    a. Primer: Pro Industrial Heavy Duty Block Filler, B42W150
    b. Finish (2 coats): ScuffTuff Waterbased Semi-Gloss Enamel, S26-150
    c. Finish (2 coats): ScuffTuff Waterbased Egshel S24-150 Series.
    d. Finish to be determined.
3. Color: As selected by Architect from manufacturer’s standards.

D. CMU:

1. Application includes CMU walls, Apparatus Bay to 8’-0”
2. System:
    a. Primers: Pro Industrial Heavy Duty Block Filler, B42W150 Series
    b. Finish (2 coats): Macropoxy 646 Fast Cure Epoxy Semi-Gloss, B58-610 Series
3. Color: As selected by Architect from manufacturer’s standards.

E. Gypsum Board:

1. Application includes gypsum board ceilings in bathrooms and wet areas

2. System:
    a. Primer: ProMar 200 Zero-VOC Latex Primer
    b. Finish (2 coat)s: Pro Industrial Waterbased Catalyzed Epoxy Egshel, B73-360 Series
3. Color: As selected by Architect from manufacturer's standards.

F. Steel:
1. Application includes shop-primed steel doors and frames, interior and exterior.
2. System:
    a. Primer: Pro Industrial Pro-Cryl Metal Primer.
    b. Finish (2 coats): Pro Industrial Waterbased Alkyd Urethane, Semi-Gloss, B53-1151
3. Color: As selected by Architect from manufacturer's standards.

G. Exposed Ceilings:
1. Application incudes exposed above-ceiling items, such as, but not limited to, steel trusses, steel deck and ductwork.
2. System:
    a. Shop Primed:
        1) Spot Prime: S-W Pro Industrial Pro-Cryl Universal Primer, B66W310.
        2) Dryfall: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42 Series.
    b. Galvanized (Not primed):
        1) Prep: SSPC-SP1
        2) Primer: S-W Pro Industrial Pro-Cryl Universal Primer, B66W310.
        3) Dryfall: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42 Series.
3. Color: As selected by Architect from manufacturer's standards.

H. Concrete:
1. Application includes concrete floors.
2. System:
    a. Finish (2 coats): Key Resin Company, Key #807 Acrylic-Urethane Sealer
3. Color: Clear only.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and application of high-performance coating systems.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
2. Section 099113 "Exterior Painting" for special-use coatings and general field painting.
3. Section 099123 "Interior Painting" for special-use coatings and general field painting.

1.2 DEFINITIONS

A. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, an eggshell finish.

B. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.

C. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.

D. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523, a high-gloss finish.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 5 percent, but not less than 1 gallon of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacture’s label with the following information:

1. Product name and type (description).
2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.
7. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 degrees and 95 degrees F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide The Sherwin-Williams Company; products indicated or comparable product from one of the following:

1. Benjamin Moore & Co.
2. Tnemec

B. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Provide products of same manufacturer for each coat in a coating system.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
   1. Report in writing conditions that may affect application, appearance, or performance of paint.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

Use applicators and techniques suited for coating and substrate indicated.

1. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
2. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
3. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 COATING SCHEDULE

A. Structural Steel:

1. Application includes:

a. Exterior canopy exposed steel structural members.

2. System:

a. Primer: Pro Industrial ProCryl Universal Primer, B66-1300 Series
b. Finish (2 coats): Pro Industrial Acrolon 100 Waterbased Urethane Egshel, B65-420 Series

3. Color: As selected by Architect from manufacturer’s standards.

END OF SECTION 099600

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Markerboards.
2. Tackboards.

1.2 ACTION SUBMITTALS

A. Product Data: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints.
3. Include sections of typical trim members.

C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:

1. Color charts: Provide Manufacturer’s color charts illustrate color.

D. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each visual display unit, for tests performed by a qualified testing agency.

B. Sample Warranties: For manufacturer's special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved shop drawings.

B. Store visual display surfaces vertically with packing materials between each unit.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1.8 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Surfaces lose original writing and erasing qualities.
    b. Surfaces exhibit crazing, cracking, or flaking.
2. Warranty Period:
    a. Life of the building.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

2.2 VISUAL DISPLAY BOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, LLC. (www.claridgeproducts.com, 800-364-2422); products or comparable products, approved by the Architect, by one of the following:

1. A-1 Visual Systems.
2. Aarco Products, Inc.
3. ADP Lemco.
4. ASI Visual Display Products.
5. Peter Pepper Products, Inc.

B. Description: Factory fabricated visual display boards.

1. Types: Markerboard and tackboard.
2. Corners: Square.
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.
5. Mounting Method: Direct to wall.

2.3 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

1. Face Sheet Thickness: 0.021 inch uncoated base metal thickness. LCS-II porcelain enamel steel Markerboard
2. MDF Core: 7/16 inch thick; with manufacturer's standard moisture-barrier backing.
3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
4. Color: White.

2.4 TACKBOARD PANELS

A. Tackboard Panels:

1. Facing: Natural cork.
2. Core: Manufacturer's standard.
3. Color: As selected by Architect from manufacturer’s standards.

2.5 ACCESSORIES

A. Aluminum Frames and Trim: Fabricated extruded aluminum; standard size and shape.

1. Aluminum Finish: Clear anodic finish.

2.6 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer' three-coat process.

B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish; with surface-burning characteristics indicated.

C. MDF: ANSI A208.2, Grade 130.

D. Extruded Aluminum: ASTM B221, Alloy 6063; not less than 0.062-inch thick.

E. Adhesive: Type recommend by visual display board manufacturer.

2.7 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions

affecting performance of the Work.

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

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

3.3 INSTALLATION - GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.

1. Keep perimeter lines straight, level, and plumb.
2. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches on center. Secure both top and bottom of boards to walls.

C. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 101416 - PLAQUES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plaques.

B. Related Requirements:

1. Section 012100 ‘Allowances” for plaque allowance.

1.2 ALLOWANCES

A. Allowances for plaques are specified in Section 012100 "Allowances."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For plaques.

1. Include fabrication and installation details. and attachments to other work.
2. Show plaque mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each plaque in full f size.

C. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of plaque showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Plaques: Full-size Sample.
2. Exposed Accessories: Full-size Sample of each accessory type.
3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

E. Product Schedule: For plaques. Use same designations indicated on Drawings or specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For plaques to include in maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of plaques that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 PLAQUES

A. As selected by Architect from allowance. Approximate size 18 inches by 24 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.

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

3.2 INSTALLATION OF METAL PLAQUES

A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.

1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Fasteners: Drill holes in substrate using predrilled holes in plaque as template. Countersink holes in plaque if required. Place plaque in position and flush to surface. Install through fasteners and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as plaques are installed.

C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101416

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dimensional characters.
    a. Cutout dimensional characters, illuminated

1.2 DEFINITIONS

A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Dimensional Characters: Half-size Sample of dimensional character.
2. Exposed Accessories: Full-size Sample of each accessory type.

E. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

F. Delegated Design Submittal: For signs indicated in "Performance Requirements" Article.

1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.1 QUALITY ASSURANCE

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of dimensional character sign type(s) according to structural performance requirements.

B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.

1. Uniform Wind Load: As indicated on Drawings.

C. Thermal Movements: For exterior f dimensional characters, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DIMENSIONAL CHARACTERS

A. Cutout Characters: Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. ACE Sign Systems, Inc.
    b. ASI Sign Systems, Inc.
    c. Diskey Sign Company.
    d. Gemini Signage; Gemini, Inc.
    e. inpro Corporation.
2. Character Material: Sheet or plate aluminum.
3. Character Height: As indicated on Drawings.
4. Thickness: Manufacturer's standard for size of character.
5. Finishes: To be determined.
6. Illuminated.
7. Mounting: Concealed studs.
8. Typeface: As indicated on Drawings.

2.3 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless steel devices unless otherwise indicated.
3. Sign Mounting Fasteners:

    a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

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

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

B. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

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

E.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 101423 - ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Room-identification signs that are directly attached to the building.

B. Related Requirements:

1. Section 012100 “Allowance” for panel signage allowance.

1.2 ALLOWANCES

A. Allowances for room-identification signs are specified in Section 012100 "Allowances."

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For room-identification signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements , including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Room-Identification Signs: Full-size Sample.
2. Full-size Samples, if approved, will be returned to Contractor for use in Project.

E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Deterioration of finishes beyond normal weathering.
    b. Deterioration of embedded graphic image.
    c. Separation or delamination of sheet materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 ROOM-IDENTIFICATION PANEL SIGNAGE, GENERAL

A. Signs: As selected by Architect by allowance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:

1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
2. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

D. ADJUSTING AND CLEANING

E. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

F. Remove temporary protective coverings and strippable films as signs are installed.

G. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

SECTION 102113 - PHENOLIC-CORE TOILET COMPARTMENTS PART 1

- GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartments.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for blocking.
2. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data.

1. Phenolic-core toilet compartments.
   a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show overhead support or bracing locations.

C. Samples for Verification: Actual sample of finished products for each type of toilet compartment, hardware, and accessory.

1. Size: Manufacturers' standard size.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: 10 fasteners of each size and type.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain phenolic-core toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 for toilet compartments designated as accessible.

2.3 PHENOLIC-CORE TOILET COMPARTMENTS

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

1. ASI Accurate Partitions.
2. ASI Global Partitions.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. Partition Systems International of South Carolina (PSISC); Columbia Systems International of South Carolina LLC.

B. Toilet-Enclosure Style: Overhead braced and floor anchored.

C. Door, Panel, and Pilaster Construction: Solid phenolic-core material with melamine facing on both sides fused to substrate during manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch- thick doors and pilasters and minimum 1/2-inch- thick panels.

D. Pilaster Shoes: Formed from stainless steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

E. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

F. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design, stainless steel.

G. Phenolic Compartment Finish: One color in each room.

1. Dark-Core Phenolic: Manufacturer's standard dark color core and edge.
   a. Facing Sheet Color: As selected by Architect from manufacturer's full range.
2. Through-Color Phenolic: Manufacturer's standard solid through-color.
   a. Color: As selected by Architect from manufacturer's full range.

2.4 HARDWARE AND ACCESSORIES

A. Door Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty institutional operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch- thick, stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through bolts.
2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through bolts.

3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
4. Door Pull: Manufacturer's heavy-duty, cast stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible. Mount with through bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221.

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

D. Stainless Steel Castings: ASTM A743/A743M.

2.6 FABRICATION

A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, inswinging doors for standard toilet enclosures and 36-inch- wide, outswinging doors with a minimum 32-inch- wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

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

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:
   a. Pilasters and Panels or Screens: 1/2 inch.
   b. Panels or Screens and Walls: 1 inch.
2. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.
   a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Corner guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For each type of wall protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Corner Guards: 6 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of covers. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 degrees F during the period materials are stored.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
    b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.3 CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. American Floor Products Company, Inc.
    b. Construction Specialties, Inc.

c. inpro Corporation.
d. Nystrom, Inc.
e. Pawling Corporation.
f. WallGuard.com.

2. Material: Stainless-steel sheet, Type 304.
   a. Thickness: Minimum 0.0625 inch.
   b. Finish: Directional satin, No. 4.
3. Wing Size: Nominal 1-1/2 by 1-1/2 inches.
4. Corner Radius: 1/8 inch.
5. Mounting: Adhesive.

2.4 MATERIALS

A. Adhesive: As recommended by protection product manufacturer.

2.5 FABRICATION

A. Fabricate wall protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

2.6 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls to which wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

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

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Mounting Heights: Install wall protection in locations and at mounting heights indicated on Drawings.

3.4 CLEANING

A. Immediately after completion of installation, clean covers using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Toilet accessories.
2. Shower accessories.
3. Soap dispensers.
4. Custodial accessories.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

B. Samples: For each exposed product and for each finish specified, full size.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

D. Delegated Design Submittals: For grab bars and shower seats.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Contractor-Installed (OFCI) Materials: See Products in this Section and Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
2. Shower Seats: Installed units are able to resist 360 lbf concentrated load applied in any direction and at any point.

2.3 TOILET ACCESSORIES

A. Source Limitations: Obtain each type of toilet accessory from single source from single manufacturer.

B. Soap Dispensers: OFCI

C. Hand Sanitizers: OFCI

D. Paper Towel (Folded) Dispensers: OFCI

E. Toilet Tissue (Roll) Dispensers: OFCI

F. Trash Receptacles: OFCI

G. Grab Bars:

1. Basis-of-Design Product: Subject to compliance with requirements, provide

Bradley Corporation (www.bradleycorp.com, 800-272-3539); Grab Bar Series, Model 812, or comparable product, approved by the Architect, by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 18-gage thick.

a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/2 inches.

2.4 SHOWER ACCESSORIES

A. Source Limitations: Obtain each type of public-use shower room accessory from single source from single manufacturer.

B. Shower Curtain Rod:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation (www.bradleycorp.com); Shower Curtain Rod, Model 953, or comparable product, approved by the Architect, by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.

2. Description: 1-inch- outside diameter, straight rod.
3. Configuration: As indicated on Drawings.
4. Mounting Flanges: Exposed Concealed fasteners; in material and finish matching rod.
5. Rod Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Shower Curtain:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation (www.bradleycorp.com); Vinyl Shower Curtain, Model 9537, or comparable product, approved by the Architect, by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.

2. Size: Minimum 12 inches wider than opening by 72 inches high.
3. Material: Vinyl, minimum 0.014-inch thick, opaque, matte.
4. Color: White.
5. Grommets: Corrosion resistant at minimum 6 inches on center through top hem.
6. Shower Curtain Hooks: Chrome-plated or stainless steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

D. Folding Shower Seat:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation (www.bradleycorp.com, 800-272-3539); Reversible Phenolic Shower Seat, Model 9569, or comparable product, approved by the Architect, by

one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.

2. Configuration: L-shaped seat, designed for wheelchair access.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
4. Mounting Mechanism: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Dimensions (Inches):

a. Width: 34-1/2
b. Depth: 37-3/8 maximum; 30-3/8 minimum.

E. Robe Hook:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation (www.bradleycorp.com, 800-272-3539); Double Robe Hook, Model 9124-US, or comparable product, approved by the Architect, by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.

2. Description: Double -prong unit.
3. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.5 CUSTODIAL ACCESSORIES

A. Mop/Broom Holder with Utility Shelf: OFCI

2.6 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch- minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

2.7 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with 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.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 102800

SECTION 104300 - EMERGENCY AID SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Automated external defibrillator (AED).
2. Automated external defibrillator (AED) cabinet.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For automated external defibrillator cabinets. Coordinate final automated external defibrillator cabinet schedule with number and type of automated external defibrillators to ensure proper fit and function. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For automated external defibrillators and automated external defibrillator cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of automated external defibrillator cabinets to ensure that type and capacity of automated external defibrillators indicated are accommodated.

B. Coordinate sizes and locations of automated external defibrillator cabinets with wall depths.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace automated external defibrillators that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 8 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Basis-of-Design products by Activar Construction Products Group, Inc. - JL Industries (www.activarcpg.com, 800-554-6077); products or comparable product, approved by the Architect, by one of the following:

1. Automated External Defibrillator (AED):
    a. HeartSine.
    b. Philips.
    c. Physio-Control.
2. Automated External Defibrillator (AED) Cabinets:
    a. Modern Metal Products.
    b. Safety Technology, Inc.

2.2 AUTOMATED EXTERNAL DEFIBRILLATOR (AED)

A. Automated External Defibrillator: Portable automated external defibrillator capable of automatically diagnosing life-threatening cardiac arrhythmias, suitable for use on adult or pediatric patients. Lid release, on/off button operation. Type, size, and capacity for each cabinet indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Activar Construction Products Group, Inc. - JL Industries; LIFEPAK CR2 Defibrillator or comparable product.
2. Model: LP-CR2-WIFI AUTO.
3. Storage Case: Manufacturer's standard.
4. Battery Capacity: 13 hours.
5. Standby Life: 6 years.

2.3 MOUNTABLE - AUTOMATED EXTERNAL DEFIBRILLATOR CABINET, Fire Rated.

A. Automated External Defibrillator (AED) Cabinet Type: Mountable AED cabinet of suitable type, size and capacity for automated external defibrillator.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Activar Construction Products Group, Inc. - JL Industries; LifeStart 1400 Fire FX2 cabinet indicated or comparable product.

B. AED Cabinet Construction: Flush doors with 5/8-inch doorstop attached by continuous hinge and equipped with zinc-plated pull and roller catch.

1. Cold-Rolled Steel Sheet Model: 1416.

C. Cabinet Construction: Fire Rated.

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/2-inch backbend depth.

E. Door Glazing: Acrylic sheet.

F. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

G. Identification: Manufacturer's standard graphics and lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.

H. Door Finish:

1. Steel: Manufacturer's standard baked-enamel or powder coat finish.
   a. Standard Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

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

3.2 PREPARATION

A. Prepare recesses for semirecessed automated external defibrillator cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install automated external defibrillator cabinets in locations and at mounting heights indicated or, if not indicated, at height indicated below:

B. Automated External Defibrillator Cabinets: 48 inches above finished floor to top of fire extinguisher.

C. Automated External Defibrillator Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide semirecessed automated external defibrillator cabinets.
2. Provide inside latch and lock for break-glass panels.

3. Fasten mounting brackets to inside surface of automated external defibrillator cabinets, square and plumb.

D. Identification:

1. Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as automated external defibrillator cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust automated external defibrillator cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of automated external defibrillator cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes or replace automated external defibrillator cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by automated external defibrillator cabinet manufacturer.

END OF SECTION 104300

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:
    a. Portable fire extinguisher.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.2 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire-protection cabinets, including, but not limited to, the following:
    a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required, prepared on samples 6 by 6 inches square.

D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 FIRE-PROTECTION CABINET - FEC

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Babcock-Davis.
b. Guardian Fire Equipment, Inc.
c. JL Industries; Activar Construction Products Group, Inc.
d. Larsen's Manufacturing Company.
e. Nystrom, Inc.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Cold-rolled steel sheet.

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Acrylic sheet.

1. Acrylic Sheet Color:

a. Clear transparent acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:

1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words " FIRE EXTINGUISHER."
1) Location: Applied to cabinet door.
1) Application Process: Pressure-sensitive vinyl letters.
2) Lettering Color: Red.
3) Orientation: Vertical.

K. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
c. Color: As selected by Architect from manufacturer's full range.

2. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.
5. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

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

3.2 PREPARATION

A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at height indicated below:

1. Fire-Protection Cabinet Mounting Height: 42 inches above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification:

1. Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets."

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
    b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Babcock-Davis.
    b. Guardian Fire Equipment, Inc.
    c. JL Industries; Activar Construction Products Group, Inc.
    d. Larsen's Manufacturing Company.
    e. Nystrom, Inc.
2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container:

1. Typical: UL-rated 3-A:40-B:C, 6-lb and nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
2. Apparatus Bay: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

C. Purple-K Dry-Chemical Type in Aluminum Container: UL-rated 10-B:C, 2.5-lb nominal capacity, with potassium bicarbonate-based dry chemical in enameled-aluminum container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.

1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

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

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

1. Mounting Height: Top of fire extinguisher to be at 42 inches above finished floor.

END OF SECTION 104416

SECTION 107300 – ALUMINUM CANOPY – HANGER ROD SUPPORTED

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work in this section includes furnishing and installation of extruded aluminum overhead hanger rod style canopies.

B. Related Items:

1. Flashing.
2. Metal siding
3. Ensure adequate wall condition to carry canopy loads.
4. Refer to Section 018113.53 “Sustainable Design Requirement – Green Globes” for additional project requirements, including but not limited to performance and submittal requirements that may apply to any product herein specified.

1.2 QUALITY ASSURANCE

A. Products meeting these specifications established standard of quality required as manufactured by Mapes Industries, Inc. Lincoln, Nebraska 1-888-273-1132.

1.3 SUBMITTALS

A. Confirm dimensions prior to preparation of shop drawings.

B. Provide manufacturer’s standard literature and specifications for canopies.

C. Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly.

D. Provide samples for color selection.

E. Provide copy of manufacturer’s standard warranty.

1.4 PERFORMANCE REQUIREMENTS

A. Canopy must conform to local codes, including wind and seismic loads.

B. PE Stamped calculations are required and must be signed and sealed by an engineer licensed within the state canopy is installed.

1.5 DELIVER, STORAGE, HANDLING

A. Deliver and store all canopy components in protected areas.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by Mapes Canopies, Lincoln, Nebraska, Phone: 1-888-273-1132, Fax: 1-877-455-6572 or approved equal by Peachtree Protective Covers, Inc., 1477 Rosedale Drive, Hiram, GA 30141, Phone: 1-770-439-2120 or Dittmer Architectural Aluminum, 1006 Shepard Rd, Winter Springs, FL 32708, Phone: 1-407-699-1755.

2.2 MATERIALS

A. Decking shall consist of 2 ¾” Extruded .078” Decking.

B. Intermediate framing members shall be extruded aluminum, alloy 6063-T6, in profile and thickness shown in current Mapes brochures.

C. Hanger rods and attachment hardware shall be powder coated.

D. Fascia shall be standard 8" extruded C-Channel style. (minimum .125 Aluminum)

2.3 FINISHES

A. Finish type shall be selected from manufacturer’s full line of available products including clear anodized, bronze baked enamel or white baked enamel.

2.4 FABRICATION

A. All Mapes canopies are shipped in preassembled section for ease of installation.

B. All connections shall be mechanically assembled utilizing 3/16 fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.

C. Decking shall be designed with interlocking roll-formed aluminum members.

D. Concealed drainage. Water shall drain from covered surfaces into intermediate trough and be directed to Downspout From Fascia.

PART 3 - EXECUTION

3.1 INSPECTION

A. Confirm that surrounding area is ready for the canopy installation.

B. Installer shall confirm dimensions and elevations to be as shown on drawings provided by Mapes Industries.

C. Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed

3.2 INSTALLATION

A. Installation shall be in strict accordance with manufacturer s shop drawings. Particular attention should be given to protecting the finish during handling and erection. Where in contact with copper siding – provide a bituminous sheet – 30lb minimum- between copper and aluminum.

3.3 AFTER INSTALLATION

A. Entire system shall be left in a clean condition.

END OF SECTION 107300

SECTION 107516 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ground-set flagpoles.

B. Owner-Furnished Material: Flags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For each flagpole.

1. Include the following

a. Plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
b. Section, and details of foundation system.

C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

D. Delegated Design Submittals: For flagpoles.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.

B. Seismic Performance: Flagpole assemblies to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Structural Performance: Flagpole assemblies, including anchorages and supports, to withstand design loads indicated within limits and under conditions indicated.

1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is indicated on Drawings.
2. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

A. Aluminum Flagpoles: Cone -tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acme Lingo Flagpoles.
b. American Flagpole.
c. Baartol Company.
d. Concord American Flagpole.
e. Eder Flag Manufacturing Company, Inc.
f. Ewing Flagpole Co., Inc.; Ewing Group Company.
g. Morgan-Francis Flagpoles and Accessories.
h. Pole-Tech Co., Inc.
i. US Flag & Flagpole Supply, LLC.

B. Exposed Height: 25 feet.

C. Construct flagpoles in one piece.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch wall thickness with 3/16-inch steel bottom plate and support plate; 3/4-inch-diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.

1. Flashing Collar: Same material and finish as flagpole.

E. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

1. Flashing Collar: Same material and finish as flagpole.

F. Cast-Metal Shoe Base: Made from aluminum with same finish and color as flagpoles for anchor-bolt mounting; furnish with anchor bolts.

1. Furnish ground spike.

2.4 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch spun aluminum , finished to match flagpole.

B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

1. Halyards and Cleats: One at each flagpole.
2. Cleat Covers: Cast metal, finished to match flagpole, secured with cylinder locks.
3. Halyard Covers: 2-inch channel, 60 inches long, finished to match flagpole.
4. Halyard Flag Snaps: Chromium-plated bronze. Furnish two per halyard.

2.5 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

C. Sand: ASTM C33/C33M, fine aggregate.

D. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with requirements in Section 079200 "Joint Sealants."

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

2.6 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

E. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.

F. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

G. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to approved Shop Drawings and manufacturer's written instructions.

B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 107516

SECTION 113013 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Appliances specified in this Section shall be Owner Furnished / Contractor Installed (OFCI):

1. Cooking appliances.
2. Refrigeration appliances.
3. Cleaning appliances.

1.2 ACTION SUBMITTALS

A. Product Data: For each product.

1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.

C. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of appliance.

C. Field quality-control reports.

D. Sample Warranties: For manufacturers' special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintains, within 10 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.

C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in ICC A117.1.

2.2 COOKING APPLIANCES

A. Gas Range: Slide-in range with one oven.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Electrolux Major Appliances, NA (www.electrolux.com, 877-435-3287); product or comparable product, approved by the Architect.
2. Product: 36-inch Front Control Freestanding Gas Range, Model ECFG3668AS.
3. Width: 36 inches.
4. Gas Burners: Six.
5. Oven Features:
    a. Capacity: 4.4 cu. ft.
    b. Operation: Baking convection.
6. Electric Power Supply: As indicated on Drawings.
7. Material/Finish: Stainless steel.
8. Warranty: One year parts and labor.

B. Hood: See Mechanical Drawings & Specifications for Residential Suppression Hood

C. Microwave Oven:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Electrolux Major Appliances, NA (www.electrolux.com, 877-435-3287); product or comparable product, approved by the Architect.
2. Product: 30” Built-In Microwave Oven with Drop Down Drawer, Model EMBD3010AS.
3. Mounting: Built-in.
4. Type: Convection.

5. Dimensions:
    a. Width: 29-13/16 inches.
    b. Depth: 23-5/32 inches.
    c. Height: 19-19/32 inches.
6. Capacity: 1.6 cu. ft.
7. Material/Finish: Stainless steel.
8. Warranty: One year parts and labor.

2.3 REFRIGERATION APPLIANCES

A. Refrigerator/Freezer: Three-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Everest Appliances (www.eveesrtappliances.com, 310-323-6586); product or comparable product, approved by the Architect.
2. Product: Bottom Mount Upright Reach-In Dual Temp, Model EBRF3.
3. Type: Freestanding.
4. Dimensions:
    a. Width: 74-3/4 inches.
    b. Depth: 33-1/8 inches.
    c. Height: 82 inches.
5. Storage Capacity:
    a. Refrigeration Compartment Volume: 46 cu. ft.
    b. Freezer Volume: 22 cu. ft.
6. Energy Star: Provide appliances that qualify for the EPA/DOE Energy Star product-labeling program.
7. Material/Finish: Stainless steel.

B. Icemaker and Ice Storage Bin:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hoshizaki America Inc. (www.hoshizakiamerica.com, 866-438-6087); products or comparable products, approved by the Architect.
2. Icemaker:
    a. Product: Crescent Cuber Icemaker, Air-cooled, Model KM-350MAJ
    b. Type: Free-standing.
    c. Dimensions:
        1) Width: 22 inches.
        2) Depth: 27-3/8 inches
        3) Height: 28 inches.
    d. Ice Capacity:
        1) Production: 489 lbs per day.
    e. Material/Finish: Stainless steel.

f. Warranty:

1) Three Years: Parts and labor warranty on entire machine.
2) Five Years: Parts and labor warranty on evaporator

3. Ice Storage Bin:

a. Product: SF Bins, Ice Storage Bin Series, Model B-300SF.
b. Type: Free-standing.
c. Dimensions:

1) Width: 22 inches.
2) Depth: 32-1/2 inches
3) Height: 46 inches.

d. Ice Capacity:

1) Production: 300 lbs per day.

e. Features:

1) Top-hinged front-opening bin door
2) Polyethylene bin liner for sanitary ice storage.
3) Foamed-in-place polyurethane insulation.
4) Standard with 6-inch painted flange legs.

f. Material/Finish: Stainless Steel.
g. Warranty: Two years parts and labor.

2.4 CLEANING APPLIANCES

A. Clothes Washer: Complying with AHAM HLW-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Electrolux Major Appliances, NA (www.electrolux.com, 877-435-3287); product or comparable product, approved by the Architect.
2. Product: Front Load Perfect Steam Washer with LuxCare Plus Wash and SmartBoost, Model ELFW7637AT
3. Type: Freestanding, front-loading unit.
4. Dimensions:

a. Width: 27 inches.
b. Depth: 32 inches.
c. Height: 38 inches.

5. Drum: Perforated stainless steel.

a. Capacity: 4.5 cu. ft.

6. Electrical Power: 120 V, 60 Hz, 1 phase, 15 A.
7. Motor: Manufacturer's standard with built-in overload protector.
8. Energy Star: Provide appliances that qualify for the EPA/DOE Energy Star product-labeling program.
9. Water-Efficient Clothes Washer: Provide clothes washer with modified energy factor greater than or equal to 2.0 and water factor less than 5.5.
10. Color: Titanium.
11. Warranty: One year parts and labor.

B. Clothes Dryer: Complying with AHAM HLD-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Electrolux Major Appliances, NA (www.electrolux.com, 877-435-3287); product or comparable product, approved by the Architect.
2. Product: Front Load Perfect Steam Electric Dryer with Balanced Dry and Instant Refresh, Model ELFE7637AT
3. Type: Freestanding, frontloading, electric unit.
4. Dimensions:
    a. Width: 27 inches.
    b. Depth: 32 inches.
    c. Height: 38 inches.
5. Drum: Perforated stainless steel.
    a. Capacity: 8.0 cu. ft.
6. Color: Titanium.
7. Warranty: One year parts and labor.

C. Extractor:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Speed Queen (www.speedqueencommercial.com); product or comparable product, approved by the Architect.
2. Product: Hardmount Washer-Extractor for 40 LB, Model SCT040.
3. Type: Freestanding, frontloading, electric unit.
4. Dimensions:
    a. Width: 30.6 inches.
    b. Depth: 42.3 inches.
    c. Height: 47.2 inches.
5. Color: Manufacturer’s standard.
6. Warranty: 10 years seals and bearings; 5 years limited.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION

A. Install appliances according to manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 DEMONSTRATION

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

END OF SECTION 113013

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated, single-roller shades.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.
2. Installation Accessories: Full-size unit, not less than 10 inches long.

E. Product Schedule: For roller shades. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED, SINGLE-ROLLER SHADES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Douglas (www.hunterdouglas.com, 800-789-0331); RB 500 Manual Roller Shades, or comparable products, approved by the Architect, by one of the following.

1. BTX Intelligent Fashion, LLC.
2. Draper, Inc.
3. Lutron Electronics Co., Inc.
4. MechoShade Systems, LLC.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Manufacturer's standard.
    a. Loop Length: Full length of roller shade.
    b. Limit Stops: Provide upper and lower ball stops.
    c. Chain-Retainer Type: Chain tensioner, jamb mounted.
2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
    a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: As determined by Architect.
2. Direction of Shadeband Roll: Regular, from back (exterior face)of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Shadebands:

1. Shadeband Material: Light-filtering fabric and light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    a. Type: Enclosed in sealed pocket of shadeband material.
    b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Side Channels (at all bunk rooms): With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at top.

G. Installation Accessories:

1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
    a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 3 inches.
2. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: Woven 36 percent PVC-coated fiberglass and 64 percent PVC-coated polyester.
3. Weave: Mesh.
4. Roll Width: Varies.
5. Orientation on Shadeband: Up the bolt.
6. Openness Factor:
    a. All Windows (except as noted): 3 percent
    b. Bunk Room: 0 percent, opaque.
7. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 degrees F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

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

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

SECTION 123661 – SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material window sills.
5. Countertop brackets.

B. Related Requirements:

1. Section 064116 “Plastic-Laminate-Clad Architectural Cabinets” for cabinets.
2. Division 22 "Plumbing" for sinks and plumbing fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials and window sills.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. Window sill material, 6 inches square.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont; DuPont de Nemours, Inc. (www.dupont.com); Corian or comparable product, approved by the Architect, by one of the following.
    a. Avonite Surfaces; a Brand of Aristech Surfaces LLC.
    b. Durasein Solid Surface; a brand of Relang International, LLC.
    c. Formica Corporation.
    d. LG Hausys, Ltd.
    e. Wilsonart LLC.
2. Type: Provide Standard type unless Special Purpose type is indicated.
3. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 SOLID SURFACE WINDOW SILLS

A. Fabricate to dimensions and sizes indicated on Drawings.

B. Color: As selected by Architect from manufacturer’s full range.

2.3 ACCESSORIES

A. Brackets:

1. Basis-of-Design Product: Subject to compliance with requirements, provide The Original Granite Bracket (www.originalgranitebracket.com, 888-584-1112); Industrial Side Wall, or comparable product, approved by the Architect.
2. Description: Reinforced ribbed aluminum.
    a. Size: To suit application.
    b. Color: Black.

2.4 FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom.

B. Configuration:

1. Front: Straight, slightly eased at top.
2. Backsplash: Straight, slightly eased at corner.
3. End Splash: Matching backsplash.

C. Countertops:

1. 3/4-inch- thick, solid surface material with front edge built up with same material.

D. Backsplashes: 1/2-inch- thick, solid surface material.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

F. Joints:

1. Fabricate countertops in sections for joining in field , with joints at locations indicated on approved shop drawings.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures **in shop** using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
    a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.5 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

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

3.2 INSTALLATION

A. Install brackets in accordance with manufacturer’s written installation instructions and approved shop drawings.

B. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Attach countertop to brackets with 100 percent silicone, or similar, as recommended by manufacturer.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

I. Fasten window sills with adhesive.

END OF SECTION 123661

SECTION 210500 - GENERAL FIRE SUPPRESSION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. Section 078413 Penetration Firestopping.

C. All sections of Division 21 specifications apply to this section.

1.2 SUMMARY

A. The Fire Protection Work shall include, but not be limited to, the following:

1. The aboveground fire protection main starts 1’-0” AFF in FP/PLB/MECH (112).
2. Alarm valves and risers.
3. Fire department connections.
4. Backflow preventer test connections.
5. Drain connections.
6. Pipe hangers and supports.
7. Seismic supports.
8. Water piping, sprinkler heads, and valves.
9. Submittals.
10. All other work and materials specified herein or shown on drawings.
11. Design, installation, and testing of the automatic sprinkler system to provide coverage as indicated on the contract documents. The installation of the sprinkler system shall conform to NFPA 13 (2019 edition). The system shall be hydraulically calculated by the Contractor.
12. Design, installation, and testing of the clean agent system to provide coverage as indicated on the contract documents. The design, installation, and testing of the clean agent system shall conform to NFPA 2001 (2018 Edition), “Standard on Clean Agent Fire Extinguishing Systems”.
13. Securing permits and inspections.
14. Underground fire line to the sprinkler system (including the fire department connection line) shall be flushed and tested per NFPA 24 (2019 edition) by a licensed contractor per the South Carolina Fire Protection Sprinkler Systems Act.

1.3 DELINEATION OF WORK

A. Provide all necessary supervision and coordination of information to installers who are performing work to accommodate Division 21 installations.

B. Where the Division 21 installer is required to install items that they do not purchase, they shall include such items:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any designated point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement, or corrosion to which they may have been subjected.
5. Their field assembly and internal connection as necessary for their proper operation.
6. Their mounting in place includes the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building systems includes the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

C. Items that are to be installed by the Division 21 installer but not purchased as part of the work of Division 21 shall be carefully examined upon delivery to the project. The Division 21 installer shall provide all work necessary to properly install these items.

D. If any items have been received in such condition that their installation will require additional work beyond the project scope of the work, the Architect/Engineer shall be notified in writing within 10 working days of the date of delivery of the items. Any claims beyond 10 days will not be considered by the Architect/Engineer.

1.4 QUALITY CONTROL

A. Qualifications of Installer:

1. The systems shall be installed by a licensed fire protection contractor or contracting firm regularly engaged in the installation of fire protection systems. The Architect/Engineer may require evidence to support the above requirements and may reject any proposed contractor who cannot show suitable experience.
2. The Contractor must be certified as a NICET Level III for fire sprinkler systems and shall submit data showing the same.
3. The Contractor shall furnish evidence that there is an experienced and effective service organization that carries a stock of repair parts for the system to be furnished. Should the Contractor fail to comply with the service requirements of this Section, the Owner or his Representative will then have the option to make the necessary repairs and back-charge the Contractor without any loss of warranty as provided by the Contract Documents.

B. Equipment and Materials:

1. All equipment and materials required for installation under these specifications shall be new and unused, of the best grade and quality, shall be of the latest design of the manufacturer, and shall be listed as approved by U.L. All components shall be suitable for the pressures to be encountered.
2. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment for a minimum of three (3) years and, if so, directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.

3. All equipment, materials, and work is intended to be installed in a manner conforming to the best engineering practice and all equipment is intended to be complete in every respect to satisfy the job requirements and/or this specification.
4. Where the specifications do not list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.
5. All materials with a manufacturer's listed shelf life shall be used at least six months before the expiration of the materials' shelf life.

C. Criteria:

1. Installation of the systems and all the work covered by these specifications shall conform in strict accordance to all codes, ordinances, and regulations of the City, County, State, National Fire Protection Association (NFPA), and/or all other authorities having jurisdiction. Also, the work covered by these specifications shall be provided in strict accordance with all requirements and recommendations of the National Fire Protection Association, and the insurance underwriter. All material and work necessary to meet these requirements shall be so indicated on the shop drawings and shall be installed at no extra cost to the Owner.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

A. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.

B. All work shall conform to the following Building Codes (latest edition unless noted otherwise):

1. International Building Codes
2. National Fire Protection Association

C. All work shall conform to all federal, state, and local ordinances.

D. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:

1. Factory Mutual Laboratories (FM)
2. Underwriters Laboratories, Inc. (UL)

1.6 APPROVAL OF SUBSTITUTIONS

A. Specific reference in the specifications to any article, device, product, materials, fixture, form or type of construction, etc., by name, make, or catalog number, with or without the words "or equal", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases may, at his option, use any article, device, product, material, fixture, form, or type of construction which, in the judgment of the Architect/Engineer expressed in writing, is equal to that named. Where quality and other characteristics are nearly the same, the question of determining equal materials and readily available service sometimes resolves itself to a matter of personal opinion and judgment and in these and all other cases involving the approval of materials, the opinion, judgment, and decision of the Architect/Engineer shall be final and bind all parties concerned.

B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for approval in writing ten (10) calendar days before the bid opening date to the Architect/Engineer. Requests shall be accompanied by samples, literature, and information as necessary to fully identify and allow appraisal of the material or equipment. Submittals shall be as concise, clear, and brief as possible. Incomplete submittals or submittals requiring lengthy research to ascertain quality will not be considered.

C. Approval of the Architect/Engineer to use materials or equipment, if granted, will be in the form of a written addendum. Approved substitutions may be used at the Contractor's option. No substitutions will be allowed if substitutions are requested later than ten (10) days before the bid opening date.

D. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are indicated in the form of a letter that is enclosed with the submittals. The Contractor shall be responsible for verifying all dimensions with available space. If, in the opinion of the Architect/Engineer, the physical dimensions do not permit the substituted material or equipment to be properly operated, maintained, serviced, or otherwise accessed, or the physical dimension adversely impacts other components, a system's ability to be operated, maintained, serviced or otherwise accessed, the material or equipment shall be replaced at the Contractor's expense.

1.7 VERIFICATION OF DIMENSIONS AND LOCATIONS

A. The Contractor shall visit the facility and become thoroughly familiar with all details of the work, working conditions, dimensions, and clearances.

B. Notify the Architect/Engineer of any discrepancy between actual conditions and conditions indicated on the contract documents that could cause changes, other than minor ones, to the installation of any systems or equipment.

1.8 ELECTRICAL CHARACTERISTICS FOR FIRE SUPPRESSIONS EQUIPMENT

A. Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements. The Contractor is responsible for the modifications to and the extension of connecting components as required for the equipment provided.

B. The Contractor shall bear all costs for required changes in connection to equipment.

1.9 WORKMANSHIP

A. Workmen shall be thoroughly experienced and fully capable of installing the work. Work shall be per the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to the Owner.

B. All materials and equipment are to be installed per the manufacturer's printed recommendations using recommended accessories. Retain a copy on the job site and submit others for approval when required.

1.10 WARRANTIES

A. General:

1. Furnish to the Architect/Engineer a warranty form signed by the Contractor and Owner agreeing to the start and end dates of all systems and equipment under warranty.
2. All defective materials or inferior workmanship shall be replaced or repaired as directed by the Owner's representative during the warranty period.

B. Equipment Warranties:

1. Equipment shall be warranted by the equipment manufacturer. Where labor is included in the warranty, the manufacturer, at his option, may permit the contractor to provide the required repairs on the equipment.
2. The equipment manufacturer shall include a written warranty with the closeout documentation.

C. Duration Period:

1. For work not otherwise specified, the duration shall be one year from substantial completion including all parts, labor, and other charges.
2. The Contractor is responsible for purchasing from the equipment manufacturers any additional warranties to ensure that the equipment is warranted by the manufacturer through the duration period specified.

D. Non-Warranted Items:

1. Nondurable replaceable items do not require replacement after the date of acceptance.

E. Warranty Repair:

1. Repair shall take place as soon as possible but not later than the following:

a. Items not essential for facility operation - 7 days.
b. Items that have a small impact on facility operation - 2 days.
c. Items that have a significant impact on the facility operation - immediately begin repairs or work necessary to minimize operational impact to the Owner.

2. The determination of the impact on the facility is solely that of the Owner and Architect/Engineer.
3. Where life safety issues are impacted, the contractor shall take all steps necessary to ensure the facility can continue to function safely.
4. If repairs cannot be made in the required period, temporary systems shall be installed until repairs can be completed.
5. All costs associated with warranty work shall be borne by the contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRIOR CONDITIONS

A. Before the installation of any equipment or system component, the Contractor shall review any prior work that has been completed to accommodate the equipment or system component to be installed.

B. If the prior work does not make the proper installation of any equipment or system component possible, notify the Architect/Engineer before installation of any equipment or system component.

3.2 JOB CONDITIONS

A. Where work requires interruption of existing public utility service, obtain written permission from the affected utility company for the interruption.

B. Where work requires interruption of the Owner's existing utility service, schedule interruption with the Owner. Notify the Owner and Architect/Engineer at least 48 hours before the scheduled interruption.

3.3 INSTALLATION:

A. Install all equipment and appurtenances in strict accordance with the manufacturer's recommendations and the manufacturer's shop drawings.

B. If any equipment cannot be installed per Codes, contract documents, manufacturer's recommendations, and accepted practices notify the Architect/Engineer in writing before installation of equipment.

C. If any system component cannot be installed per Codes, contract documents, and accepted practices, notify the Architect/Engineer in writing before installation of the system component.

3.4 LEAK DAMAGE

A. This Contractor shall be responsible during the installation and testing periods of the sprinkler system for any damage to the work of others, to the building or its contents, or the site, etc., caused by leaks in any equipment, by unplugged or disconnected pipes, fittings, etc., or by overflow and shall pay for necessary replacement or repairs to work of others, buildings, sites, or furniture and equipment by such leakage.

3.5 HOSE THREADS

A. Hose threads shall conform to the standards of the local fire department. The Contractor shall verify the exact threads used before ordering materials.

3.6 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage before final inspections, repair or replace damaged items as determined by the Architect/Engineer, at no cost to the Owner.

B. Store equipment on elevated supports and cover them on all sides with securely fastened waterproof coverings. All equipment openings shall be securely sealed.

C. Piping shall be protected by storing it on elevated supports and capping the ends.

D. During construction, all open ends of all pipes, equipment, etc. which could collect construction debris shall be properly capped.

3.7 CLEANING OF SYSTEMS AND EQUIPMENT

A. All equipment and systems shall be cleaned of all extraneous materials to leave equipment and system finish in a new condition.

B. Where equipment and systems cannot be properly cleaned, take all measures necessary to replace or repair equipment and systems to bring them back to a "like new" condition. All costs shall be borne by the Contractor.

C. All extraneous materials shall be removed on the site regularly to provide access to all work as well as a safe working environment.

END OF SECTION

SECTION 210501 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Sleeves
2. Escutcheons
3. Fire-suppression equipment and piping demolition.
4. Equipment installation requirements common to equipment sections
5. Painting and finishing
6. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawlspaces, 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 chases.

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.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Escutcheons

1.5 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in the building structure during the progress of construction, to allow for fire-suppression installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 SLEEVES

A. General:

1. Provide sleeves for each pipe passing through walls, partitions, floors, and roofs unless specific details indicate otherwise.
2. Provide sleeves where required by UL firestop assembly selected. Sleeve size, length, and type shall be equal to that required for the UL firestop assembly utilized.
3. Do not provide a sleeve when not permitted by the UL firestop assembly selected.
4. Core drilled holes in concrete walls do not require sleeves unless required by UL firestop assembly where applicable.

B. Type:

1. Sleeves in non-masonry or concrete construction shall be a minimum of 24-gauge sheet metal.
2. Sleeves in masonry or concrete construction shall be Schedule 40 black or galvanized steel.
3. Sleeves in the membrane or waterproof construction shall have a flashing ring or other method acceptable to the membrane or waterproofing manufacturer.
4. Sleeves provided at floor slabs and support piping weight shall be cast in place and have a minimum of four anchoring tabs.
5. Split sleeves shall be permitted only when approved by the Engineer.

C. Sleeve Sizes:

1. Sleeves for piping (insulated and uninsulated) shall have annular space as required by NFPA 13.

D. Sleeve Length:

1. Sleeves shall be equal to the thickness of constructions and terminated flush with surfaces.

E. Sleeve Packing:

1. Sleeves shall be packed as follows:

a. As indicated in detail or fire-stopping specification.
b. If not indicated otherwise, seal the entire sleeve at the exterior wall/floor with a flexible elastomeric or silicone caulk.

F. Fire-Rated Assemblies:

1. Provide a sleeve where required by UL firestop assembly utilized.
2. Do not provide a sleeve if not permitted by UL firestop assembly utilized.

2.3 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an internal diameter to closely fit around the pipe, tube, and insulation of insulated piping and an outside diameter that completely covers the opening.

B. General:

1. Escutcheons shall be chrome-plated brass.
2. Escutcheons shall be held in place by the internal spring tension of set screws.

2.4 SPRINKLER GUARDS AND WATER SHIELDS

A. Sprinkler Guards:

1. Provide guards for sprinklers located within 7 feet of the finished floor, wherever sprinklers may be subject to mechanical damage, or where noted on drawings.
2. Sprinkler guards shall be “Thread Guard” with a white powder coat finish manufactured by SprinkGUARD. The sprinkler shall be UL listed for use with fire sprinkler guards as manufactured by SprinkGUARD.
3. Sprinkler guards shall be listed for use with the proposed sprinkler.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate the general location and arrangement of piping systems.

C. Install piping in concealed locations, unless otherwise indicated except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes or as required by NFPA 13.

H. Install piping free of sags and bends.

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

J. Install piping to allow the application of insulation.

K. Select system components with a pressure rating equal to or greater than the system operating pressure.

L. Install escutcheons for all exposed piping penetrations of walls, ceilings, and floors except in unoccupied equipment rooms (i.e., fire pump/riser rooms, mechanical rooms, etc.)

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves that are large enough to provide annular clear space between the sleeve and pipe or pipe insulation as required for seismic conditions per IBC and NFPA 13 and per Fire Barrier penetration requirements.

N. Aboveground interior and exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for the size, depth, and location of the joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for additional information.

P. Verify final equipment locations for roughing-in.

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

3.2 PAINTING

A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

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

END OF SECTION

SECTION 210510 - DOCUMENTATION AND CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the project documentation and closeout.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 21 specifications apply to this section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. All reports, forms, and manuals shall be submitted to the Architect/Engineer in triplicate unless additional copies are noted.

B. Reports, forms, and manuals are to be submitted as soon as possible, but no later than thirty (30) days after the earliest date they can be prepared.

3.2 OWNER TRAINING

A. The contractor shall schedule the training on equipment and systems at least 21 days before training is to take place. The contractor shall provide multiple dates and times for the training to allow the Owner to coordinate the schedules of their staff to be trained.

B. The contractor shall provide all training aids, manuals, etc. for the Owner’s staff at the training classes. These are in addition to whatever is required for the Operations and Maintenance manuals. The contractor shall coordinate the number required with the Owner but shall include a maximum of 8 sets for the training class.

C. The person providing the training shall be thoroughly knowledgeable in the subject matter and shall be certified by the equipment or system manufacturer.

3.3 PROJECT JOB DRAWINGS AND AS-BUILT DRAWINGS

A. Keep a record set of drawings on the job and, as construction progresses, shall show the actual installed location of all items, materials, and equipment on the project job drawings.

B. As built drawings shall have the information transferred from the project job drawings including all addenda, supplemental instructions, change orders, and similar information.

C. Qualified draftsmen shall perform this task.

D. SPRINKLER SUPPRESSION SYSTEM DOCUMENTS CABINET:

1. Provide a heavy-duty, red-hinged cabinet with a locking door installed in FP/PLB/MECH room.
2. The cabinet shall be a surface-type enclosure constructed of 16 gauge cold rolled steel and shall be finished with a durable red textured, heat-resistant baked-on enamel finish.
3. The cabinet door shall have a stainless-steel piano hinge and a high-security CAT 30 keyed door lock.
4. The front cover shall include a durable label displaying “SPRINKLER SUPPRESSION SYSTEM DOCUMENTS” in 1” white indelible lettering, applied to the cover relative to the orientation of the installed back box.
5. The documentation cabinet shall be sized to include all necessary documentation which shall include, as a minimum:

    a. Approved submittal drawings/as-built drawings
    b. Copy of the currently adopted edition of NFPA 25
    c. Fully executed Contractor’s Material and Test Certificate for Aboveground Piping and Underground Piping as applicable
    d. Backflow preventer test certificate as applicable

6. Cabinet shall be equal to DBX As Built Drawing Cabinet as manufactured by Space Age Electronics model #SSU00677 (26-1/4” W x 14-1/4” H x 4” D), minimum size with lettering as specified above.

E. Provide a compact disc with computer-generated plans of the Contractor’s submittal/as-built drawings in Portable Document Format (PDF).

3.4 OPERATING AND MAINTENANCE MANUALS

A. Compile and bind three (3) sets of all manufacturers’ instructions and descriptive literature on all items of equipment furnished under this work. Additionally, provide this information on a CD in PDF format.

B. The binder shall be a hardcover, three-ring notebook, embossed with the name of the project, 11" x 8-1/2" with heavy-duty rings. Maximum binder size shall be 2-1/2".

C. The front of the binder shall be titled "Fire Suppression Operating and Maintenance Instructions," with the name of the job and documents date under the title.

D. Where laminated documents are required, only one set shall be provided.

E. Operating and Maintenance Instructions shall include the following:

1. Cover sheet in each binder listing the architect, engineer, and all contractors. List addresses and phone numbers.
2. List the name, address, and phone number of the organization responsible for warranty work, if other than the Contractor, and the specific work for which he is responsible.
3. List the name, address, and phone number of the nearest sales and the nearest service organization for each product.
4. Schedules of all equipment including identification tag numbers shown on plans cross-referenced to field applied identification tag numbers.
5. Performance Curves: For pumps, valves, and similar equipment at the operating conditions.
6. Lubrication Schedule: Indicating type and frequency of lubrication required.
7. List of Spare Parts: Recommended for normal service requirements. Each piece of equipment shall have this list marked or attached to this submittal.
8. NFPA-25 (2020 latest edition) "Inspection, Testing, and Maintenance of Water Based Fire Protection Systems."
9. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
10. Instruction Books: These may be standard booklets but shall be marked to indicate applicable equipment and characteristics.
11. Wiring Diagrams: Generalized diagrams are not acceptable; submittal shall be specifically prepared for this Project.

F. The following diagrams, schematics, and lists shall be laminated (8-1/2" x 11" or 11" x 17" as needed for clarity):

1. Valve diagrams of each sprinklered building indicating the locations of all control valves, low point drains, inspector tests, and air vent valves. The diagrams shall be neatly drawn and color-coded to indicate the portion of the building protected by each system.
2. Provide two copies – one to be kept in the Operations and Maintenance Manual and one to be installed on the wall adjacent to the fire riser.

3.5 ENGINEERING FIELD REPORTS AND FINAL INSPECTION REPORTS

A. The Architect/Engineer will review the Contractor's work periodically throughout the project. A report will be submitted to the Contractor.

B. The reports shall be responded to within ten days of receipt by the Contractor. Each item shall be addressed with comments written on the inspection report if possible. The contractor's response shall address the status of each item and all discrepancies.

3.6 BACKFLOW PREVENTER FORWARD FLOW TEST

A. Before instructing the Owner’s Representatives on the operation and maintenance of the systems installed, the Contractor shall conduct a forward flow test of the backflow preventer.

B. The contractor shall measure, and record flow discharged through the Backflow Preventer Test Connection. Flow shall be equal to sprinkler system flow demand including hose

stream demand where hydrants or inside hose stations are located downstream of the backflow preventer.

C. The contractor is to provide sufficient hoses, pitot tubes, measuring devices, etc. to properly measure flow and discharge water away from the building.

3.7 OPERATION AND MAINTENANCE INSTRUCTIONS

A. After all final tests and adjustments have been completed, the Owner's Representatives shall be instructed in all details of operation and maintenance for the systems installed.

B. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.

C. The contractor shall provide all training aids, manuals, etc. for the Owner’s staff at the training classes. These are in addition to whatever is required for the Operations and Maintenance manuals. The contractor shall coordinate the number required with the Owner but shall include a maximum of 8 sets for the training class.

D. Instruction shall be provided as follows:

1. Equipment: Trained factory representative
2. System: Competent employee of the Contractor

3.8 ACCEPTANCE

A. Upon notification by the Contractor and after completion of Operation and Maintenance Instructions, the Architect/Engineer will visit the project for a demonstration of the building system and an inspection of the completed work.

B. Items that do not comply with the Contract Documents or that function incorrectly will be listed. The list will be provided by the Architect/Engineer to the Contractor for correction of the installed work.

C. After all corrections have been made, the Contractor shall notify the Architect/Engineer who will recheck the systems for compliance of all items listed.

PART 4 - STANDARD FORMS

4.1 GENERAL

A. All forms shall be filled out by the Contractor before acceptance of the project by the Architect/Engineer.

4.2 FIRE PROTECTION CLOSEOUT LIST

FIRE PROTECTION CLOSEOUT DOCUMENT **PROJECT: Clarendon County 911 EOC** **BGA PROJECT NO.: 24004**			
DOCUMENT	**DATE REVIEWED**	**DATE RETURNED**	**COMMENTS**
Fire Protection O&M Manual			
Contractor As-Built Submittal Drawings – Printed (1 set minimum)			
Contractor As-Built Submittal Drawings/Holder Located in Riser Room (1 set per Riser room)			
Contractor As-Built Submittal Compact Disc PDF Format			
Backflow Preventer Forward Flow Test Report			
NFPA 13 Contractor's Material and Test Certificate for Aboveground Piping (as applicable)			
Valve diagrams (laminated)			
Punchlist dated _____			
Punchlist dated _____			
Punchlist dated _____			
Walk-Through with Owner			
NOTE: Not all closeout documents may be listed. See other sections of specifications for additional requirements.			

4.3 FIRE PROTECTION INSTRUCTIONS TO OWNER

FIRE PROTECTION INSTRUCTIONS TO OWNER

PROJECT: Clarendon County 911 EOC

BGA PROJECT NO.: 24004

INSTRUCTIONS	DATE/TIME SCHEDULED	MINIMUM SPECIFIED HOURS	ESTIMATED HOURS OF INSTRUCTION	PERSONS ATTENDING	COPY OF SIGN-IN LIST SENT TO BGA
Fire Suppression Systems		4			
Gaseous Fire Suppression (i.e., Clean Agent) System		4			
Nitrogen Generation Systems		4			

NOTE: Not all instructions may be listed. See other sections of specifications for additional requirements. Up to 8 sets of training material required. Provide per number of persons indicated. Where no minimum specified hours indicated, training shall be provided as necessary for technician to provide the Owner a good understanding of the operation, function, and maintenance requirements of the equipment or system installed.

4.4 FIRE PROTECTION SPARE MATERIALS

FIRE PROTECTION SPARE MATERIALS LIST PROJECT: Clarendon County 911 EOC BGA PROJECT NO.: 24004			
ITEM	**DATE DELIVERED**	**ACCEPTED BY**	**COPY OF RECEIPT SENT TO BGA**
Gauges			
Tools			
Keys			
Spare Sprinklers			
NOTE: Not all spare materials may be listed. See other sections of specifications for additional requirements.			

END OF SECTION

SECTION 210511 - SUBMITTALS

PART 1 - GENERAL

1.1 GENERAL

A. Refer to Division 1 specification for information and shop drawings and submittals requirements. When conflicts exist, more stringent requirements shall apply.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 21 specifications apply to this section.

1.3 PREPARATION OF SUBMITTALS

A. Before preparing submittals, consult all contract drawings and specifications in detail, obtain the manufacturer's recommended installation instructions, and have shop drawings prepared based on specific equipment and materials intended for installation. Obtain all drawings and submittals from other trades as necessary to coordinate submittals.

B. Sign all shop drawings indicating conformance with contract documents before submitting them to the Architect/Engineer.

1.4 SUBMITTALS

A. General:

1. Submittals are required on all items of equipment.
2. Submittals shall include, but not be limited to:

    a. All requirements of Division 1.
    b. Complete information about appurtenances and accessories
    c. Information properly marked with service or function identification as related to the project.
    d. Where the submittal consists of catalog sheets displaying other items that are not applicable, the proper features shall be identified.
    e. External connections are properly marked, as related to the specific use intended, on standard factory assembly and field installation drawings.
    f. All performance characteristics and physical characteristics.
    g. Wiring and control diagram.
    h. All requirements listed in the specific section of specifications.
    i. Electrical data on all motors greater than one horsepower. Data shall include horsepower unit served, power factor, efficiency, and product of P.F. x EFF.

1.5 REVIEW OF SUBMITTALS

A. Review of submittals or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless the Contractor has, in letter form, called attention to such deviations at the time of submission and secured written approval of the specific deviations.

B. Any materials and equipment listed that are not per the equipment shown on the schedule shall be of the size and physical arrangement to allow unobstructed access, when installed, for routine maintenance, motor removal, and other similar operations. Deviation from the characteristics of that equipment or layout system components will not necessarily be cause for rejection.

C. A review of the submittal does not relieve the Contractor of his responsibility. Should an installation not meet the intent of the contract documents, the Contractor may be required by the Architect/Engineer to modify or replace equipment or system components with all costs, direct and indirect, borne by the Contractor.

D. It is strongly recommended that the Contractor not purchase or install any equipment or system components before receipt of reviewed shop drawings.

E. Reviewed with notations on the submittal shall not prohibit the Contractor from purchasing equipment. If the Contractor does not comply with the notations, the submittal shall be deemed rejected.

F. Submittal documents shall be submitted for approval to the Architect/Engineer. Once approval has been obtained from the Architect/Engineer, the submittal shall be submitted to the Authority Having Jurisdiction and/or State Fire Marshal for final approval. Fire suppression system installation shall not begin until the Authority Having Jurisdiction and/or the State Fire Marshal's acceptance of submittal documents has been received.

1.6 EQUIPMENT DIMENSIONS AND WEIGHTS

A. The contract documents may indicate specific equipment dimensions. The Contractor is responsible for verification of the dimensions of the equipment submitted before submitting shop drawings. Equipment larger than the equipment indicated on the contract documents may not be acceptable to the Architect/Engineer.

B. The contract documents may indicate specific equipment weights. The Contractor is responsible for verification of the weight of the equipment submitted before submitting shop drawings. Equipment weighing more than the equipment indicated on the contract documents may not be acceptable to the Architect/Engineer.

C. If equipment is not acceptable to the Architect/Engineer due to dimensions or weights exceeding those indicated on contract documents, the Contractor shall accept all responsibility and costs for providing equipment that meets the dimension and weight requirements of the contract documents.

1.7 ELECTRICAL CHARACTERISTICS

A. Electrical characteristics for fire suppression equipment are indicated on the fire suppression documents. The electrical documents indicate power and wiring requirements for each piece of fire suppression equipment.

B. It shall be the fire suppression installer's responsibility to verify before submitting shop drawings that the equipment submitted meets the electrical requirements of both the fire suppression and electrical documents. If there is a discrepancy, the contractor shall bring the discrepancy to the Architect/Engineer's attention before submitting shop drawings.

C. If the discrepancy is brought to the Architect/Engineer's attention before ordering the fire suppression equipment or electrical materials associated with that equipment, the Architect/Engineer will issue additional instructions to the Contractor.

D. If the discrepancy is not brought to the Architect/Engineer's attention before ordering the fire suppression equipment and electrical materials (i.e., the Contractor does not verify electrical requirements), the Contractor shall be responsible for all costs except those that would have been incurred if the discrepancy was determined before ordering the fire suppression equipment and electrical materials.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PRODUCT SUBMITTALS

A. The following list may be used as a checklist for the contractor and Architect/Engineer. All products may not be listed.

- Air Compressors and Receiver
- Backflow Preventer Test Connection
- Clean Agent System
- Equipment and Pipe Identification
- Escutcheons
- Flexible Pipe Connections (sprinkler piping)
- Hydraulic Calculations
- List of Pipe and Fitting Material for Each System
- Nitrogen Generator System
- Pipe Hangers and Supports
- Pipe Sleeves
- Seismic Products and Calculations
- Sprinklers

- Submittal Drawings (Pipe/Sprinkler Layout, Seismic Zone of Influence, etc.
- Supervisory Devices
- Thermometers and Gauges
- Valves
- Water Flow Alarm Devices

3.2 TEST AND REPORT SUBMITTALS

A. The following list may be used as a checklist for the Contractor and Architect/Engineer. All tests may not be listed.

1. Fire suppression piping.
2. System start-up
3. Backflow preventer
4. Nitrogen Generator start-up

3.3 SUBMITTAL DRAWINGS

A. This section may not include all drawings required. See specific specifications for additional requirements. All drawings shall be drawn 1/8" = 1'0" minimum. Riser rooms shall be drawn 1/4” = 1’-0” minimum.

B. Review structural and architectural drawings to determine the method of attachment or support of pipe and equipment to slabs, walls, and other structural elements.

C. Provide dimensional drawings on a plan indicating the following:

1. Size and location of all roof penetrations.
2. Size and location of all concrete housekeeping pads.
3. Size and location of all slab penetrations.

D. All roof penetrations and equipment shall be drawn on approved roof structural plans to coordinate openings with structural elements.

E. When equipment is to be installed on supports provided by installers other than Division 21, the Division 21 installer shall provide:

1. Size, orientation, weights, and connection locations for all equipment to be installed. Information shall include all seismic components, point loads, elevations, etc.
2. Location and required size and elevation of all pipe supports.

F. Provide a completely reflected ceiling plan indicating the locations of each sprinkler in addition to other utilities (i.e., lights, diffusers/grilles, speakers, etc.) Provide additional sprinklers (over Code minimum quantities) if requested by the Architect, to obtain symmetrical layouts.

G. Provide a separate piping plan indicating seismic bracing locations, seismic zones of influence, flexible coupling locations, and all other seismic-related items.

3.4 SUBMITTAL DRAWINGS TO AUTHORITY HAVING JURISDICTION AND/OR STATE FIRE MARSHAL

A. At the time of submission to the Authority Having Jurisdiction and/or State Fire Marshal, the Contractor shall provide an electronic copy in PDF format of the Fire Sprinkler Submittal Plans to the Engineer.

END OF SECTION

SECTION 210548 - SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 21 specifications apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Isolation pads
2. Isolation mounts
3. Restrained elastomeric isolation mounts.
4. Restraining braces

1.3 DEFINITIONS

A. IBC: International Building Code

B. ICC-ES: ICC-Evaluation Service

C. NFPA: National Fire Prevention Association

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class and Seismic Design Category as Defined in the IBC: Obtain from architectural and/or structural drawings.
2. Assigned Seismic Occupancy Category as Defined in the IBC: Obtain from architectural and/or structural drawings.

    a. Component Importance Factor, Ip: 1.5

3. Mapped MCE Spectral Response Acceleration at Short Periods (0.2 second), Ss: 0.532
4. Seismic coefficient, Cp, per NFPA 13: 0.406

1.5 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
3. Design calculations.

B. Submittal Drawings:

1. Submit drawings indicating the following items as a minimum:

a. Zone of influence areas
b. Flexible coupling locations
c. Location of piping penetrating masonry walls and/or impact-resistant gypsum board indicating either flexible couplings or annular clearances per NFPA 13.
d. 4-way bracing
e. Restraint of the end of sprinkler lines and branch lines
f. Restraining straps as required by NFPA 13

2. Submittal drawings shall be separate from fire sprinkler drawings and shall include minimal information needed from fire sprinkler drawings (i.e., sprinkler piping and sprinklers) to complete seismic drawings.

1.6 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC and NFPA 13 unless requirements in this Section are more stringent.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

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

1. AFCON: an ASC Engineered Solution
2. TOLCO Incorporated; a brand by EATON

B. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to the braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

2.1 ANCHORAGE TO BUILDING STRUCTURE

A. General:

1. Anchorage to the building structure shall meet the latest requirements of:

   a. International Building Code (Chapter 19)
   b. ASCE Standard 7-16 (Chapter 13)
   c. American Concrete Institute (ACI) 318
   d. NFPA 13 (Chapter 18)

2. Requirements of this section of specifications are minimum requirements. When other requirements are indicated, the greater requirement shall be met or exceeded.

B. Anchorage in Concrete or Masonry:

1. The following anchorage and attachments are not permitted:

   a. Powder-driven fasteners for tension load applications in Category D, E, and F unless specifically approved for this application.
   b. Friction clips.

C. Post-Installed Anchors:

1. Post-installed anchors for Seismic Design Category C, D, E, and F shall meet the requirements of ACI 318.

2.2 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. All hardware shall be electro-galvanized. Hot-dip galvanized metal components for exterior use.
2. Baked enamel or powder coat for metal components on isolators for interior use.
3. Bolts shall be zinc-coated for interior applications and stainless steel for exterior applications.
4. Seismic restraint devices shall have a hot-dipped galvanized finish for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

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

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze members with clamps approved for application by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.

B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

C. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between the anchor and adjacent surface exceeds 0.125 inches.
2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for the component.

D. Piping Restraints:

1. Comply with requirements in MSS SP-127 and NFPA 13.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.

E. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for the component.

F. Attachment to Structure: If a specific attachment is not indicated, anchor bracing to the structure at flanges of beams, at upper truss chords of bar joists, or concrete members.

G. Drilled-in Anchors:

1. Identify the position of reinforcing steel and other embedded items before drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduits, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with the sleeve fully engaged in the structural element to which the anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust before installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid the introduction of air pockets in the adhesive.
5. Set anchors to the manufacturer's recommended torque, using a torque wrench.

6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

END OF SECTION

SECTION 210553 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 21 specifications apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels
2. Miscellaneous signs and labels
3. Fire Department Connection signs.
4. Backflow Preventer Test Connection signs
5. Flexible Sprinkler Hose Fittings label
6. Stock of spare sprinklers sign
7. Sprinkler System General Information sign

1.3 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.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. General:

1. Nameplates shall be black plastic with white engraved lettering.
2. All information shall be provided on a single nameplate per device if practical.
3. Nameplates shall have screw holes and screws for mounting unless screws would damage the intended use of the product to which it is attached (i.e., NEMA4 panel, etc.). In that case, provide stick-on nameplates.
4. Nameplates shall be 1/16" thick.

B. Size:

1. Three-quarter inch (3/4") high nameplate when located on ceiling grid.
2. Two-inch (2") high nameplate when located on fire protection equipment located either indoors or outdoors.
3. Three-quarter inch (3/4") high nameplates when located on starter and panels.

2.2 MISCELLANEOUS SIGNS AND LABELS

A. Metal labels:

1. Material and Thickness: Aluminum, 0.020" minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum label size: Length and width vary for required label content, but not less than 2-½ x ¾ inch.
3. Minimum letter size: ½ inch.
4. Fasteners: Stainless steel rivets or self-tapping screws.
5. Chain: #16 single jack chain length as required.

B. Label content: As required.

C. Signage for miscellaneous valves, hydraulic placards, inspector's test connection, etc. Refer to NFPA 13 for identification requirements for valves.

2.3 FIRE DEPARTMENT CONNECTION SIGN

A. Metal sign:

1. Material and Thickness: Aluminum, 0.20" minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Signage Size: 8 x 8 inches. Verify size with the local Fire Chief before fabrication.
3. Minimum Letter Size: 6-inch.
4. Color: Red reflective letters with white background. Red perimeter borders are encouraged but not required. Verify with the local Fire Chief before fabrication.
5. Label: AUTOMATIC SPRINKLERS

2.4 BACKFLOW PREVENTER TEST CONNECTION SIGN

A. Metal sign:

1. Material and Thickness: Aluminum, 0.20" minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Signage Size: 8 x 8 inches.
3. Minimum Letter Size: 6 inches.
4. Color: Red reflective letters with a white background.
5. Label: BFP TEST CONNECTION.

2.5 STOCK OF SPARE SPRINKLERS SIGN

A. Material: 8½ x 11-inch bond paper laminated and framed, mounted on the wall, or attached to the inside face of the spare sprinkler cabinet.

B. Information required:

1. Sprinkler Identification Number (SIN) if equipped, or the manufacturer, model, K-factor, deflector type, thermal sensitivity, and pressure rating.
2. General description.
3. Quantity of each type to be contained in the cabinet.
4. Issue or revision date of the list.

C. Sample sign:

Sprinklers Contained in this Cabinet			
Sprinkler Identification, SIN	General Description	Temperature Rating, ºF	Sprinkler Quantity Maintained
TY9128	Extended Coverage, K=25, upright	155	6
VK425	Concealed pendent residential	145	6
Issued: 10/3/21	Revised:		

2.6 SPRINKLER SYSTEM GENERAL INFORMATION SIGN

A. Metal Sign:

1. Material and Thickness: Anodized aluminum, 0.20" minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Lettering: Permanent lettering, size as required.

B. Information Required:

1. Name and location of the facility protected.
2. Occupancy classification
3. Commodity classification
4. Presence of high-piled and/or rack storage
5. Maximum height of storage planned.
6. Aisle width planned.
7. Commodity classification
8. Encapsulation of pallet loads
9. Presence of solid shelving
10. Flow test data.
11. Presence of flammable/combustible liquids
12. Presence of hazardous materials
13. Presence of other special storage
14. Location of venting valve
15. Location of auxiliary drains and low point drains on dry pipe and preaction systems
16. Original results of main drain flow test
17. Name of installing contractor or designer
18. Indication of presence and location of antifreeze or other auxiliary systems
19. Where injection systems are installed to treat MIC or corrosion, the type of chemical, concentration of the chemical, and where information can be found as to the proper disposal of the chemical.

Sample sign:

SPRINKLER SYSTEM – GENERAL INFORMATION
for

_____
_____
_____

High-piled storage □ Yes □ No Date: _____

Rack storage: □ Yes □ No Flow test data:

Commodity class: _____ Static: _____ psi

Max. storage height _____ ft. Resid: _____ psi

Aisle width (min.) _____ ft. Flow: _____ gpm

Encapsulation □ Yes □ No Pitot: _____ psi

Solid Shelving: □ Yes □ No Date: _____

Flammable/
combustible liquids: □ Yes □ No Location: _____

Other storage: □ Yes □ No

_____ Location of aux/low point drains:

Hazardous materials: □ Yes □ No _____

Idle pallets: □ Yes □ No _____

Antifreeze systems □ Yes □ No Dry pipe/double interlock preaction test results

Location: _____ Original main drain test results:

Dry or aux systems □ Yes □ No Original main drain test results:

Location: _____ Static: _____ psi

Residual: _____ psi

Venting valve location:_____

Where injection systems are used to treat MIC or corrosion:

Type of chemical: _____Concentration: _____For proper disposal, see:

_____

Name of contractor or designer:_____

Address: _____

Phone: _____

2.7 FLEXIBLE SPRINKLER HOSE FITTINGS

A. Where flexible sprinkler hose fittings are used to connect sprinklers to branch lines in suspended ceilings, a label limiting relocation of the sprinkler shall be provided on the anchoring component.

1. An example of language for the label is as follows:

CAUTION: DO NOT REMOVE THIS LABEL.

Relocation of this device should only be performed by qualified and/or licensed individuals that are aware of the original system design criteria, hydraulic criteria, sprinkler listing parameters, and knowledge of the state and local codes including NFPA 13 installation standards. Relocation of the device without this knowledge could adversely affect the performance of this fire protection and life safety system.

2.8 CEILING LOCATION MARKERS

A. Provide nameplates to indicate the location of equipment and devices located above the ceiling.

B. Equipment shall include:

1. Floor control valves assemblies
2. Control valves
3. Drain valves, plugs, etc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair the bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of fire suppression equipment.

B. Locate equipment labels where accessible and visible.

3.3 FIRE DEPARTMENT CONNECTION AND BACKFLOW PREVENTER TEST CONNECTION SIGN

A. Mounting height: Position the sign above the FDC or BFP Test Connection location at a height not less than five feet (5'-0") above finished grade.

3.4 STOCK OF SPARE SPRINKLERS SIGN

A. Mount on the wall adjacent to the sprinkler cabinet or the inside face of the spare sprinkler cabinet.

3.5 SPRINKLER SYSTEM GENERAL INFORMATION SIGN

A. The sign shall be installed at each system control riser, antifreeze loop, and auxiliary system control valve.

3.6 CEILING LOCATION MARKERS

A. After A/E approval, attach the nameplate to the ceiling grid as close to the device as practical.

3.7 NAMEPLATES

A. Submit a listing of all nameplates with associated information to A/E for approval before fabrication.

B. Coordinate the method of attachment and location of the nameplate with the contractor who is responsible for the installation of the device (i.e., control panel, air handler, etc.).

END OF SECTION

SECTION 211300 – FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties
2. Fire-protection valves.
3. Hose connections
4. Fire Department Connections
5. Backflow Preventer Test connections
6. Sprinklers
7. Sprinkler specialty pipe fittings
8. Packaged PreAction Systems and related appurtenances.
9. Alarm devices
10. Pressure gages

B. Related Sections:

1. Division 21 Section "Seismic Controls for Fire Suppression Piping and Equipment" for vibration and seismic-related items.
2. Division 21 Section "Identification for Fire Suppression Piping and Equipment" for signs, labels, and identification requirements.
3. Division 21 Section “Nitrogen Generating System for Fire Protection Systems” for nitrogen generating systems.
4. Division 28 Section "Fire Alarm System" for alarm devices not specified in this Section.

1.3 DEFINITIONS

A. High-Pressure Piping: System piping designed to operate at working pressure higher than standard 175 psi but not higher than 250 psig.

B. Standard-Pressure Piping: System piping is designed to operate at a working pressure of 175 psig maximum.

1.4 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for a 175-psig minimum working pressure.

B. High-Pressure Piping System Component: Listed for 250-psig working pressure.

C. Fire Suppression system design shall be approved by the State Fire Marshal. Approval by State Fire Marshal shall be received before any installation work commences.

1. Fire Suppression systems shall be hydraulically calculated.
2. The margin of Safety for Available Water Flow and Pressure: 10 percent or 5 psi, whichever is greater, including losses through water-service piping, valves, and backflow preventers. If submittals for review by the State Fire Marshal are submitted one year or more after the date of the water flow test date noted on the "FIRE SPRINKLER SPECIFICATION SHEET" in Part 3 of this Section, the Contractor shall provide a new water flow test at no additional cost to the Owner. Any additional hydraulic calculations required due to the requirement of a new water flow test will be conducted by the Contractor at no additional cost to the Owner.
3. Refer to Part 3 of this Section for a completed "FIRE SPRINKLER SYSTEM SPECIFICATION SHEET" for bidding and design purposes.

D. Sprinkler design shall be hydraulically calculated based on the following:

1. Wet sprinkler systems are as follows:

a. Light Hazard Areas: Minimum 0.10 GPM per square foot over the most remote 1,500 square feet with a maximum sprinkler spacing of 225 square feet per sprinkler or UL listing. Reduction in remote area size is allowed when using quick response sprinklers per paragraph 19.3.3.2.3 of NFPA 13/2019. Calculations shall include a 100 GPM hose stream allowance.

1) Office/Administration areas
2) Conference rooms
3) Where noted on plans?

b. Ordinary Hazard (Group 1) Areas: Minimum 0.15 GPM per square foot over the most remote 1,500 square feet with a maximum sprinkler spacing of 130 square feet per sprinkler or per UL listing. Reduction in remote area size is allowed when using quick response sprinklers per paragraph 19.3.3.2.3 of NFPA 13/2019. Calculations shall include a 250 GPM hose stream allowance.

1) Mechanical rooms
2) Electrical rooms
3) Storage areas
4) Where noted on plans?

2. Dry sprinkler systems (Double Interlocked Preaction Systems) are as follows:

a. Ordinary Hazard (Group 1) Areas: Minimum 0.15 GPM per square foot over the most remote 1,950 square feet with a maximum sprinkler spacing of 130 square feet per sprinkler or per UL listing. Calculations shall include a 250 GPM hose stream allowance.

1) IT Server (used as a backup system to the Clean Agent Extinguishment System)
2) Where noted on plans?

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For fire suppression systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. HVAC ductwork and equipment
3. Items penetrating the finished ceiling include the following:

a. Lighting fixtures
b. Air outlets and inlets
c. Speakers
d. Projectors

4. Drawings shall include sections and elevations as required to indicate pipe routing and coordination with other utilities.

D. Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, shall be submitted to the Architect/Engineer, including hydraulic calculations. Once the Architect/Engineer's approval has been received, the Contractor shall submit plans and calculations to the State Fire Marshall for final approval.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping" as applicable.

F. Field quality-control reports.

G. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. The systems shall be designed, fabricated, and installed by a licensed fire protection contractor or contracting firm regularly engaged in the installation of fire protection systems. The Architect may require evidence to support the above requirements and may reject any proposed contractor who cannot show suitable experience.
2. The Contractor must be certified as a NICET Level III, minimum, for fire sprinkler systems and shall submit data showing the same.
3. The Contractor shall furnish evidence that there is an experienced and effective service organization that carries a stock of repair parts for the system to be furnished. Should

the Contractor fail to comply with the service requirements of this Section, the Owner or his Representative will then have the option to make the necessary repairs and back-charge the Contractor without any loss of warranty or guarantee as provided by the Contract Documents.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 (2020 Edition), by a qualified testing agency, and marked for intended location and application.

C. NFPA Standards: Fire Suppression system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13 (2019 Edition), "Installation of Sprinkler Systems."
2. NFPA 25 (2020 Edition), "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems."

D. Piping: The Owner and Architect/Engineer reserve the right to inspect, sample, and test any pipe after delivery and to reject all pipes represented by any sample which fails to comply with the specified requirements. Inspection of the pipe shall be for pits, blisters, rough spots, breakage, or other imperfections. Any pipe which has been rejected because of the above shall be conspicuously identified and immediately removed from the construction site.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Fire Suppression Service: Do not interrupt fire suppression service to facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire suppression service according to the requirements indicated:

1. Notify Architect and Owner no fewer than two days in advance of the proposed interruption of sprinkler service.
2. Do not proceed with the interruption of sprinkler service without the Architect's and the Owner's written permission.

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match the products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for a minimum of six spare sprinklers plus sprinkler wrench. Provide a minimum of two sprinklers of each type and temperature rating. Include a separate cabinet with sprinklers and a wrench for each type of sprinkler used on the Project. Provide “Stock

of Spare Sprinkler Sign" as required by NFPA 13 and section 21 0553 of these specifications.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Piping shall meet the requirements of NFPA 13. The contractor shall base his bid on the use of one or a combination of the following:

1. Above Grade Piping:

a. Piping 1-1/4" and larger shall be Schedule 10 (meeting ASTM A-135 or A-795 requirements) or Schedule 40 (meeting ASTM A-53 requirements) steel piping with welded outlets and mechanically grooved ends.
b. Piping 1 through 2" shall be Schedule 40 with threaded fittings.
c. Instead of threaded steel piping systems, Victaulic Installation-Ready™ Fittings for sizes 1-1/4" thru 2-1/2" and FireLock IGS System with "Installation-Ready™ fittings and couplings may be used for 1" diameter Schedule 10 and 40 steel pipe. The system shall be rated for a working pressure of 365 psi.

1) Installation-Ready™ fittings shall consist of a ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, pre-lubricated Grade "E" EPDM Type 'A' gasket, and ASTM A449 electroplated steel bolts and nuts. UL listed for a working pressure of 300 psi and FM approved for a working pressure of 365 psi.
2) Groove: IGS "Innovative Groove System" groove with shortened "A" dimension and tapered groove backside for ease of installation.

a) Grooving Tool: Victaulic RG2100, with IGS Confirmation Gauge.

3) IGS Fittings:

a) Ductile iron housing conforming to ASTM A-536, Grade 65-45-12. Orange enamel-coated or galvanized.

i. Victaulic Style 101 (90-degree elbow), Style 102 (tee), and Style 108 (coupling) with Installation-Ready™ ends.
ii. Style 108 single-bolt coupling provided with EPDM Type A pressure-responsive gasket with Vic-Plus lubricant, and ASTM A449 compliant electroplated steel bolt and nut. CrMo alloy steel coupling linkage.

b) Thread x Groove adapter fittings and welded outlets with IGS grooved end, ASTM A53, grade A.

d. Pipe and fittings used in pre-action systems shall be Schedule 40 (meeting ASTM A-53 requirements) steel piping with mechanical cut grooved pipe couplings and fittings for piping 1-1/2" and larger; threaded fittings for piping 1-1/4" and smaller.

e. Piping and fittings exposed to ambient conditions or installed on the exterior shall be hot-dipped zinc-coated (galvanized).
f. Pipe and fittings exposed to the weather shall be hot-dipped zinc-coated (galvanized) including drain piping (main and auxiliary) downstream of the drain valve; aboveground piping between fire department connection and check valve; and piping between backflow preventer test connection and associated control valve.

B. Malleable- or Ductile-Iron Unions: UL 860, 2" and smaller.

C. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Material shall be new of standard manufacture suitable for specified use. The installing contractor shall select one manufacturer to be used throughout the project. The use of multiple manufacturers is not acceptable. Subject to compliance with requirements, provide products by one of the following:

a. Victaulic Company
b. Anvil International, Inc./ASC Engineered Solutions
c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP

2. Pressure Rating: 175 psig minimum.
3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A536, ductile-iron casting; with dimensions matching steel pipe. In applicable sizes, fittings shall be short pattern, with flow equal to standard pattern fittings. Basis of Design: Victaulic FireLock.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, Grade "A" EPDMA-rubber gasket, and bolts and nuts.

a. Provide Installation-Ready center-leg gaskets with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth where applicable.
b. Provide Tri-Seal or Flush Seal® Grade "E" EPDM-rubber flush seal gaskets for preaction service.
c. Rigid Type: Housings cast with offsetting angle-pattern bolt pads to provide rigidity and system support and hanging per NFPA 13, fully installed at visual pad-to-pad offset contact. Couplings that require exact gapping at specific torque ratings are not permitted.

1) Installation-Ready, for direct stab installation without field disassembly. Basis of Design: Victaulic Style 009N and 107N.

d. Flexible Type: For use in locations where vibration attenuation, and stress relief or seismic areas as required by NFPA 13.

1) Basis of Design: Victaulic Installation-Ready Style 177.

2.2 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8-inch-thick or ASME B16.21, nonmetallic, and asbestos-free.

1. Class 125, Cast-Iron Flanges, and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges, and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts, and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Grooved Joint Lubricants: Lubricate the gasket per the manufacturer's published instructions with lubricant approved for the gasket elastomer and fluid media.

2.3 HANGERS AND SUPPORTS

A. General: The Contractor shall provide all necessary hangers, supports, bracing, accessories, etc., as required for proper installation of the work, and only approved type hangers shall be used. All piping must be substantially supported by the building structure.

B. Structural steel, other than the building structure or special supports provided under another section of the specifications, required for proper supporting of piping and equipment shall be furnished and installed under this section of the specifications.

C. Piping supported from floors shall be provided with steel support bases.

D. All hangers on piping including clevis hangers, inserts, clamps, stanchions, and brackets, shall be dipped in zinc chromate primer before installation. Rods shall be galvanized.

E. All threaded rods, bolts, clamps, fasteners, concrete inserts, saddles, and accessories installed on the roof, in the crawl space, or exposed to ambient shall be 304L stainless steel.

F. All auxiliary support steel installed on the roof, in the crawl space, or exposed to ambient may be hot-dipped galvanized if not welded or field cut or drilled, and 304L stainless steel if welded or field cut or drilled.

G. Piping shall be seismically restrained as required in Section 210548.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed, or FM approved.
2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
3. Minimum Pressure Rating for High-Pressure Piping: 250 psig.

B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Victaulic Company
    b. Anvil International, Inc./ASC Engineered Solutions

2. Standard: UL 1091 except with a ball instead of a disc.
3. Valves NPS 1-1/2 and Smaller: Bronze or brass body with threaded or grooved ends.
4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
5. Valves NPS 3: Ductile-iron body with grooved ends.

C. Iron Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Victaulic Company
    b. Anvil International, Inc./ASC Engineered Solutions
    c. Kennedy Valve; a division of McWane, Inc.
    d. Milwaukee Valve Company
    e. NIBCO INC.
    f. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP

2. Standard: UL 1091.
3. Pressure Rating: 300 psig.
4. Body Material: Cast or ductile iron
5. Seat: Pressure responsive elastomer
6. Stem: Stainless steel, offset from the disc centerline to provide complete 360-degree circumferential seating.
7. End Connections: Grooved

D. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Victaulic Company
    b. Anvil International, Inc./ASC Engineered Solutions
    c. Fire-End & Croker Corporation
    d. Globe Fire Sprinkler Corporation
    e. Kennedy Valve; a division of McWane, Inc.
    f. Mueller Co.; Water Products Division
    g. NIBCO INC.
    h. Reliable Automatic Sprinkler Co., Inc.
    i. Tyco Fire & Building Products LP
    j. Viking Corporation

2. Standard: UL 312
3. Pressure Rating: 250 psig minimum.
4. Type: Spring-assisted swing check
5. Body Material: Cast ductile iron.
6. Spring: Stainless steel
7. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Victaulic Company
   b. Anvil International, Inc./ASC Engineered Solutions
   c. Kennedy Valve; a division of McWane, Inc.
   d. Milwaukee Valve Company
   e. NIBCO INC.
   f. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP

2. Standard: UL 1091
3. Pressure Rating: 175 psig minimum.
4. Valves NPS 2 and Smaller:

   a. Valve Type: Ball or butterfly.
   b. Body Material: Bronze or brass
   c. End Connections: Threaded or grooved.

5. Valves NPS 2-1/2 and Larger:

   a. Valve Type: Butterfly
   b. Body Material: Cast or ductile iron
   c. Seat: Pressure responsive elastomer
   d. Stem: Stainless steel, offset from the disc centerline to provide complete 360-degree circumferential seating
   e. End Connections: Flanged, grooved, or wafer.

6. Valve Operation: Weatherproof actuator housing with integral electrical, 125-V ac, prewired, two-circuit, supervisory switch visual indicating device.
7. Valves installed on the backflow preventer test connection line and elsewhere, as noted on plans, shall be designed for normally closed position monitoring.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing
2. Pressure Rating: 175 psig minimum.

B. Universal Test & Drain Assembly:

1. A single-body universal test and drain valve with a 3-way body shall be of bronze body construction, incorporating stainless steel components, and shall be rated for a working pressure of 300 psi., and a universal test orifice of K2.8 (1-1/2” pipe and smaller), K4.2 (2”-3” piping), and K5.6 (4” and larger piping); to provide testing capabilities of systems with k-factors ranging from K5.6 and larger.
2. UL listed and FM approved.

3. Basis of Design: Victaulic Series UTD; Universal Test & Drain Valve with Victaulic Series ARV; Adjustable Relief Valve.

2.6 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
    a. Standard-Pressure Piping Specialty Valves: 175 psig minimum
    b. High-Pressure Piping Specialty Valves: 250 psig minimum
3. Body Material: Cast or ductile iron
4. Size: Same as connected piping
5. End Connections: Flanged or grooved.

B. Riser Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Victaulic Company
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP
    d. Viking Corporation
2. Standard: UL listed
3. Design: For horizontal or vertical installation
4. Spring-loaded check valve capable of holding air pressure in the system without the use of priming water.
5. Working Pressure: 250 psi.
6. Include tappings and valving for the main drain and 300 psi pressure gauge connection with a 3-way bronze globe valve located on both the upstream and downstream side of the riser check.
7. Removable access cover for valves 3” and larger.

C. Riser Manifold Assembly and Floor Control Valve Assembly:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Victaulic Company
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP
    d. Viking Corporation
2. Standard: UL listed
3. Design: For horizontal or vertical installation
4. Working Pressure: 250 psi minimum.

5. Assembly shall identify pipe size, flow direction, cULus Listing/FM Approval, test, drain, and gauge outlets.
6. Assembly trim shall include a 3-way valve and associated cULus Listed, FM Approved pressure gauge, a dedicated water flow detector containing two sets of SPDT (Form C) contacts, having an electrical rating of 10A @ 125/250 VAC/2.5 A @ 24VDC, and an appropriately sized main drain or test and drain assembly with pressure relief valve.

D. Universal Manifold Check Valve:

1. Universal manifold check valves, ductile iron construction, incorporating a control valve, check valve, flow switch, test & drain assembly, adjustable relief valve, and system gauges in one compact body/footprint, and shall be manufactured for “right” and “left”-hand orientations.
2. The test & drain assembly shall contain an adjustable relief valve, with a range of 175 to 310 psi, and a universal test orifice of K2.8 (1-1/2” pipe and smaller), K4.2 (2”-3” piping), and K5.6 (4” and larger piping); to provide testing capabilities for systems with k-factors ranging from K5.6 and larger.
3. Universal manifold check valve shall be rated for use at the maximum service pressure of 300 psi and shall be UL-listed and FM-approved.
4. Basis of Design: Victaulic Company Model UMC.

E. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Reliable Automatic Sprinkler Co., Inc.
    b. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP

2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check
5. Size: NPS 3/4
6. End Connections: Threaded

2.7 PREASSEMBLED PREACTION AND CLEAN AGENT SYSTEM

A. General:

1. The double interlocked preaction and clean agent system shall be of a fully integrated, assembled package type. The assembly shall be contained within a fully finished cabinet and shall be complete with the required electrical control panel for the system.
2. The system shall be UL listed, and FM approved as an assembled unit. The system shall include a preaction cabinet, automatic sprinkler system, clean agent system, fire detection system, and connections for nitrogen supply.
3. All system components shall be “compatible” and UL, C-UL listed, or FM approved. Note: The word compatible used in this specification means that the items concerned have been tested and/or approved for their use together.
4. Acceptable manufacturers include:

    a. "FireFlex DUAL" by FireFlex Systems, Inc.(Basis of Design)

B. Cabinet:

1. All system components shall be installed within a 14-gauge minimum steel cabinet, painted inside and outside (powder-coated finish) with internally mounted NEMA 12 junction boxes for easy connection of power and devices. A separate junction box shall be provided for power connections.
2. The cabinet door shall be lined with a neoprene gasket and shall contain viewing ports for water supply pressure, supervisory air pressure, and system pressure gauges that are securely mounted.

C. Components:

1. The following components shall be installed, but not limited to, within the cabinet:

a. Deluge valve with basic electrical activation, drain, and alarm trimmings, pre-piped, and factory tested. Valve trim to be galvanized.
b. Main water supply control valve with a tamper switch.
c. The main drain valve, test drain valve, and related appurtenances shall be piped to a drain header.
d. Check valve.
e. Solenoid coil supervisory switch equal to Potter Electric “CoilKeeper”.
f. Supervisory air supply shall be nitrogen.
g. Pressure Maintenance Device containing regulator, check valve, strainer, rapid fill option, pressure gauge, and all required fittings.
h. Release control panel complete with two 12V, 12 amp-hour standby batteries capable of operating the system for up to 90 hours. The release control panel shall be listed and compatible for service with detection devices. The release control panel shall have an alphanumeric display. The releasing control panel shall have four fully supervised Class A initiating circuits capable of supporting the operation of the manufacturer’s specified number of compatible detectors on two circuits, water flow, and dedicated low air. It shall also include one fully supervised Class A supervisory circuit for the monitoring of the system control valve. Four fully supervised Class B output circuits shall be provided for notification appliances and the solenoid releasing circuit. The releasing circuit shall be supervised and shall be programmable for cross-zoning operation.
i. Hydraulic manual release unit with tamper-resistant cover.
j. Electrical connections: A separate 120 VAC power connections shall be provided for the releasing panel. All of the terminals from the releasing control panel shall be translated to two watertight terminal boxes mounted inside the cabinet. One box will contain all of the 24 VDC connections and the other shall contain the 120 VAC connections. All field wiring shall be connected to these boxes.
k. Clean agent (FK-5-1-12) system and related items. Refer to specification section 21 2200 “Clean Agent Fire Extinguishing Systems” for additional information.
l. Complete wiring.
m. Provide an additional isolation control valve on the system riser so the system can be tested without flowing water. The isolation control valve shall be supervised and factory wired.

D. Nitrogen Supply:

1. The use of a stand-alone compressed nitrogen bottle system is not permitted.
2. Nitrogen shall be provided by the nitrogen generation system. Refer to Section 21 2301 “Nitrogen Generation Systems for Fire Protection Systems” for additional information.

E. Preaction Detection and Signaling System:

1. Supply and install a complete electrical detection system including, but not limited to, system conduit, system wiring, smoke detectors, and signaling devices.
2. Smoke detectors:

    a. The system shall operate on a cross-zone operation. Each zone will consist of photoelectric smoke detectors. Zone 1 shall be the area beneath the raised floor and Zone 2 shall be the area above the raised floor.
    b. The smoke detectors and the audible devices must be compatible with the release control panel.
    c. Smoke detector spacing and installation shall comply with NFPA 72 standard and manufacturer’s listing.

F. Sequence of Operation:

1. The activation of BOTH the detection condition AND the opening of an automatic sprinkler is necessary to cause the water discharge.
2. Cross Zone Operation: The activation of EITHER detection zone 1 or 2 will cause the system to indicate an alarm and sound alarm devices. Activation of BOTH detection zone 1 and 2 will activate the solenoid valve, sound an alarm, and activate alarm contacts for auxiliary functions but will not cause the system to fill with water.
3. The opening of an automatic sprinkler OR damage to system piping without the detection condition satisfied will activate the pneumatic actuator, sound a supervision signal and activate dry contacts for auxiliary functions but will not cause the system to fill with water.
4. Activation of BOTH the detection condition AND the opening of an automatic sprinkler will activate both the solenoid valve and pneumatic actuator, open the deluge valve and sound an alarm. This will activate the alarm and water flow contacts connected to the remote-control panel.
5. Pressure loss (and low nitrogen condition) on the sprinkler system will activate supervisory conditions and auxiliary contact indicating the condition.
6. The operation of the emergency manual release will drain the priming chamber of the deluge valve, causing the system to immediately fill the piping network with water, and activate alarm and water flow contacts connected to the building fire alarm panel.

2.8 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fire-End & Croker Corporation

b. Elkhart Brass Mfg. Company, Inc.
c. Guardian Fire Equipment, Inc.
d. Potter Roemer.

2. Standard: UL 405.
3. Type: Flush, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass-lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: Two.
12. Outlet Location: Top.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR"
14. Finish: Polished chrome plated.
15. Outlet Size: NPS 4.

2.9 BACKFLOW PREVENTER TEST MANIFOLD

A. Backflow Preventer Test Manifold:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Potter Roemer
b. Fire-End & Croker Corporation (Fig. No. 6610 Basis of Design)
c. Guardian Fire Equipment, Inc.

B. Manifold Assembly:

1. Header Pipe: ASTM A53/A53M, Schedule 40, galvanized steel with ends threaded according to ASME B1.20.1.
2. Header Pipe Fittings: ASME B16.4, galvanized cast-iron threaded fittings.
3. Manifold:

a. Test Connections: Comply with UL 405 except provide outlets without clappers instead of inlets.
b. Body: Flush type, brass or ductile iron, with 2 outlets.
c. Nipples: ASTM A53/A53M, Schedule 40, galvanized-steel pipe with ends threaded according to ASME B1.20.1.
d. Adapters and Caps with Chain: Brass or bronze, with a threaded outlet according to NFPA 1963 and matching local fire-department threads.
e. Escutcheon Plate: Brass or bronze; rectangular
f. Exposed Parts Finish: Polished Chrome plated.
g. Escutcheon Plate Marking: Equivalent to "BACKFLOW PREVENTER TEST CONNECTION."

2.10 SPRINKLER SPECIALTY PIPE FITTINGS

A. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AGF Manufacturing Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP.
    d. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with an orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

B. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AGF Manufacturing Inc.
    b. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP.
    c. Victaulic Company.
    d. Viking Corporation.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.
7. Accessories: Pressure relief valve.

C. Flexible, Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Victaulic, VicFlex AH2
    b. FlexHead Industries, Inc. Superflex

2. Standard: UL 2443 and FM 1637.
3. Type: Braided flexible hose for connection to a sprinkler, and with a bracket for connection to the ceiling grid. Coordinate with ceiling grid requirements for bracket length.
4. Pressure Rating: 175 psig minimum.
5. Bend radius to 2 inches (UL Listed) for proper installation in confined spaces.

6. The hose shall be listed for (4) bends at 31” length, (5) bends at 36” length, (8) bends at 48” length, (10) bends at 60” length, and (12) bends at 72” length. Union joints shall be provided for ease of installation.
7. Size: Same as connected piping, for a sprinkler.

D. In-Line Corrosion Monitor for Wet and Dry Pipe Fire Sprinkler Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. AGF Manufacturing Inc.; CORRinSITE™ Model 7700.

2. Standards:

   a. NFPA 13 and NFPA 25.

3. Specifications:

   a. Service Pressure: 300 PSI.
   b. Operating Temp.: -40°F to 200°F.
   c. Material: Mild Carbon Steel.
   d. Wear Dimension: 0.040 inches.
   e. Sizes: As required for piping; 2” through 8” diameter.
   f. Pipe Schedule 10.
   g. Pipe System Application For Black and Galvanized Pipe to match the piping material used for the fire sprinkler system.

4. Model 7700 is an In-Line Spool version.
   Model 7800 is a Mechanical Tee version.
5. Finishes:

   a. Powder-coat.

      1) Color: Red.

E. Automatic Air Vent Assembly:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. AGF Manufacturing Inc. PURGE$_N$VENT model

2. Automatic Air Vent:

   a. Pressure Rating: 300 psig and 175 psi for air vent.
   b. Body Material: Forged brass body.
   c. Components: Integrated ball valve, stainless steel strainer, purge valve with hose connection (field adjustable), thread cap with lanyard, automatic air vent.
   d. Size: NPS 1 NPT inlet by NPS 3/4 NPT outlet.
   e. Drainage Piping: NPS 1/2.

3. Pressure Rating: 175 psi.

2.11 BACKFLOW PREVENTERS

A. Double-Check, Detector-Assembly Backflow Preventers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product by one of the following:

    a. Ames Deringer, a division of Watts Water Technologies; Deringer 30/30G/30X/30GX
    b. Apollo Valves Model DCDALF4A Series with Type 1 Bypass Apollo Valves; a division of Aalberts.
    c. Ames Fire & Waterworks, a division of Watts Water Technologies; Maxim Series LFM300.
    d. Watts Water Technologies, Inc.; LF757DCDA
    e. Zurn Plumbing Products Group; Wilkins Water Control Products Division

2. Standard: ASSE 1048, USC FCCC&HR, LEAD-FREE (NSF/ANSI 372 or NSF/ANSI 61), local authority's approved manufacturer list.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. Pressure Loss: 6 psig maximum, through the middle one-third of the flow range.
5. Body Material: stainless steel (sizes 2-1/2"-8"); ductile iron with an interior lining that is FDA approved (sizes 10" and 12").
6. End Connections: Flanged or grooved.
7. Configuration: Designed for horizontal, straight-through flow, or vertical flow up.
8. Accessories:

    a. Valves: Gear-operated butterfly value valves are acceptable if the assembly has passed all listing requirements. Provide a tamper switch for each valve.
    b. Bypass: With displacement type water meter, shutoff valves, and either double check valve (Type I) or single-check valve (Type II).

2.12 SPRINKLERS

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

1. Reliable Automatic Sprinkler Co., Inc.
2. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP.
3. Victaulic Company.
4. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
3. Sprinklers installed in light hazard occupancies shall be quick response.

C. Sprinkler Types:

1. Refer to plans for sprinkler types and locations.

D. The actual sprinkler count, by sprinkler type, shall be provided by the Contractor.

E. Install sprinklers of proper temperature rating, as required by NFPA 13, and as follows:

1. Intermediate temperature-rated sprinklers shall be installed in mechanical rooms, electrical rooms, and other areas with high ambient temperatures identified by the Contractor.
2. Ordinary temperature-rated sprinklers shall be installed in other areas.

2.13 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Exterior Alarm Bell: Provided by Division 28.

C. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Potter Electric Signal Company.
b. System Sensor; a Honeywell company.
c. Viking Corporation.
d. Watts Industries (Canada) Inc.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends a signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Potter Electric Signal Company.
b. System Sensor; a Honeywell company.
c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP.
d. Viking Corporation.

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

E. High-Low Air Pressure Switch:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Potter Electric Signal Company
    b. System Sensor; a Honeywell company
    c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP
    d. Viking Corporation

2. Type: Electrically supervised pressure type supervisory switch.
3. Components: Two single-pole, double-throw switches
4. Design Operation: Indicate a pressure decrease of 10 psi from normal and a pressure increase of 120 psi from normal.

F. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Kennedy Valve; a division of McWane, Inc.
    b. Potter Electric Signal Company.
    c. System Sensor; a Honeywell company.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that the controlled valve is in other than a fully open position.

2.14 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AMETEK; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 250 psig minimum.

E. Accuracy: Plus, or minus 3-2-3 percent minimum.

F. Pressure gauges installed on Fire Pump lines shall be liquid-filled.

G. Water System Piping Gage: Include a "WATER" or "AIR/WATER" label on the dial face.

H. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on the dial face.

I. Nitrogen System Piping Gage: Include retard feature and “NITROGEN” label on the dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water service piping for service entrance to building located 1’-0” AFF in Fire Riser room.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate the general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File the written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with a shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install an automatic (ball drip) drain valve at each check valve for the fire-department connection, to drain piping between the fire-department connection and check valve. Install drain piping to and spill over the floor drain or to the outside building.

K. All drain lines, relief lines, etc. shall extend to the exterior unless noted otherwise. Piping shall discharge to a 24” square x 4” thick concrete pad.

L. Install alarm devices in piping systems.

M. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13 unless noted otherwise in this section.

N. Pressurize and check dry preaction sprinkler system piping and air-pressure maintenance devices.

O. Fill sprinkler system piping with water.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings the same as or higher than the system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and removes any burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. 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:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove at the end of the pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with the materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open (unless noted otherwise), located to control sources of water supply except fire-department connections. Install permanent identification signs indicating the portion of the system controlled by each valve.

C. Specialty Valves:

1. General Requirements: Install in a vertical position for proper direction of flow, in the main supply to the system.

D. In-Line Corrosion Monitor for Wet and Dry Pipe Fire Sprinkler Systems: Install at each fire riser assembly and per manufacturer's requirements.

E. Automatic Air Vent Assembly (Wet Systems):

1. Install per manufacturer's recommendations.
2. Provide at least one Automatic Air Vent Assembly per sprinkler zone/system connected at the high point of the fire protection (wet) system in an accessible location. A system is defined as a sprinkler piping network served by a separate check valve/flow switch or floor control valve.
3. The installing contractor shall leave the ball valve in the open position after the installation of the Automatic Air Vent Assembly, and the final testing of the system has been completed.

F. Backflow Preventer Assemblies:

1. Provide a minimum of 18" clear beneath the lower portion of the assembly and the floor for horizontal assemblies.

3.5 PREASSEMBLED PREACTION AND CLEAN AGENT SYSTEM INSTALLATION

A. In addition to the standard hydrostatic test as required by NFPA 13, an air pressure leakage test at 40 psi shall be conducted for 24 hours. Any leakage that results in a loss of pressure over 1½ psi during the 24 hours of the test shall be corrected.

B. A drain test using the auxiliary drain valve fully open (drain located on the water supply side, deluge valve inlet) must be performed to make sure that no backpressure in drain piping exists, which could affect the proper operation of the preaction system.

C. The verification of the fire alarm system must be done per the NFPA 72 (2019 Edition), Chapter 7.

3.6 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in the center of the narrow dimension of and at quarter points (for 2' x 4' acoustical panels) acoustical ceiling panels.

B. Install dry-type sprinklers with a water supply from a heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Sprinklers installed in lay-in suspended ceilings shall be installed into flexible, sprinkler hose fittings and install hose into the bracket on ceiling grid when installed in projects with Seismic Design Category C, D, or E.

3.7 FIRE DEPARTMENT CONNECTION AND BACKFLOW PREVENTER TEST CONNECTION INSTALLATION

A. Install wall-type, connections.

B. Install an automatic (ball drip) drain valve at each check valve for a fire-department connection.

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Refer to Division 21 "Identification for Fire Suppression Piping and Equipment" for additional information.

C. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Flushing and pressure testing of piping (above grade) shall be witnessed by a third-party inspection service, engineer of record, or local fire official. Invitations to witness flushing and/or testing shall be provided to all parties noted above. Provide a minimum of forty-eight (48) hours of notification before flushing and/or testing the system.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Leak Test: After installation, charge systems, and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are the same as local fire department equipment.

D. The sprinkler piping system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.10 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than the factory finish.

3.11 FIRE SPRINKLER SYSTEM SPECIFICATION SHEET

A. Attached is a completed fire sprinkler system specification sheet for bidding and design purposes.

Fire Sprinkler System Specification Sheet

(Per §40-10-250)

Project Data			
Project name: Clarendon County 911 EOC			
Location in South Carolina:	Address (street & name): 919 Commerce Street		State Project: ☐ Yes ☒ No
	City: Manning	County: Clarendon	State Project #: N/A

NFPA Hazard Classification
(Attach additional continuation pages when necessary)

Date test conducted: 11/08/2024	Static pressure (psi): 60	Residual pressure (psi): 35	Flow (gpm): 1,000
Distances of test gauges relative to the base of the riser:		Horizontal (ft):	Vertical (elevation difference in ft):
Source of water supply:	☐ Municipal dead-end ☒Municipal circulation ☐ existing fire pump ☐ Other:		Pipe Size (in.): 8
Test data by/from: Capital Way & Commerce St.	Name: Matthew Cartledge/Joey Jones		Title:
	Organization: Manning Fire Department		Phone: 803-495-4144
Fire pump:	☐ New ☐ Existing ☒ No Pump	Rated Pressure (psi):	Churn Pressure (psi):
		Rated Capacity (gpm):	Pressure @ 150% flow (psi):
On-site water storage:	☐ Yes ☒ No ☐ New ☐ Existing	☐ Tank ☐ Other:	Capacity (gal):

NFPA Hazard Classification
(Attach continuation page when necessary)

Area #	Hazard Class or Code Reference	**Description of Hazard Protected** (including occupancy use group, and details of storage arrangement as applicable (including commodity class, rack arrangement/type, ceiling and storage height.))
1	Light Hazard	Office/Administration areas;Conference rooms, Where noted on plans
2	Ord. Hazard Group I	Mechanical rooms; Electrical rooms; Storage areas, Where noted on plans

Design Parameters
(Attach continuation page when necessary)

Area #	System Type	**Density**(gpm/ft^2)/**Area**(ft^2), **or Other** (Reference code sections)	**Inside Hose** (gpm)	**Outside Hose (**gpm)
1	Wet Sprinkler	0.10 gpm/ft^2 / 1,500 ft^2 *	0	100
2	Wet Sprinkler	0.15 gpm/ft^2 / 1,500 ft^2 *	0	250

Seismic Design Data:	**S_S= 0.289**	**Site Classification= D**	**Seismic Design Category= D**

Codes and Standards
(Attach continuation page when necessary)

Applicable Codes, Standards, & Editions (i.e., 2018 IBC, 2016 NFPA 13, etc.) **for the Scope of Work on the Fire Sprinkler System**
IBC/2021; IFC/2021; NFPA 13/2019
* - Reduction in the hydraulically remote area when using quick response sprinklers per paragraph 19.3.3.2.3 of NFPA 13/2019.
Scope of work (i.e., sprinkler system A.G. from 1'-0" A.F.F., U.G. from tap to 5'-0" outside, etc.) and **notes** (attach continuation page when necessary): Scope of work begins 1'-0" AFF.

Specifier's Information

Name: Mark L. Watts	
Engineering services provided through a firm: ☒ Yes ☐ No	
Firm name: Buford Goff & Associates, Inc.	
Address: 1331 Elmwood Avenue, Suite 200	
City: Columbia	
State: South Carolina Zip: 29201	
Phone #: 803-254-6302 Fax #: 803-771-6142	
E-mail: Mark.Watts@bgainc.com	

Certificate of Authorization

Professional Engineer's Seal

Signature: Mark L. Watts

Date: 05/01/2025

Fire Sprinkler System Specification Sheet

(Per §40-10-250)

Project Data			
Project name: Clarendon County 911 EOC			
Location in South Carolina:	Address (street # & name): 919 Commerce Street		State Project: ☐ Yes ☒ No
	City: Manning	County: Clarendon	State Project #: N/A

NFPA Hazard Classification
(Attach additional continuation pages when necessary)

Area #	Hazard Class or Code Reference	Description of Hazard Protected (including occupancy use group, and details of storage arrangement as applicable (including commodity class, rack arrangement/type, ceiling and storage height.))
3	Ord. Hazard Group I	IT Server (used as a backup system to the Clean Agent Extinguishment System); Where noted on plans

Design Parameters
(Attach additional continuation pages when necessary)

Area #	System Type	Density(gpm/ft^2)/Area(ft^2), or Other (Reference code sections)	Inside Hose (gpm)	Outside Hose (gpm)
3	Dry Pipe Sprinkler	0.15 gpm/ft^2 / 1,950 ft^2 **	0	250

Additional notes and/or additional scope of work (Attach additional continuation pages when necessary

** - 30% increase in remote area due to dry system

Specifier's Information

Name: Mark L. Watts	
Engineering services provided through a firm: ☒ Yes ☐ No	
Firm name: Buford Goff & Associates, Inc.	
Address: 1331Elmwood Avenue, Suite 200	
City: Columbia	
State: South Carolina Zip: 29201	
Phone: 803-254-6302 Fax: 803-771-6142	
E-mail: Mark.Watts@bgainc.com	

Certificate of Authorization

Professional Engineer's Seal

Signature: Mark L Watts

Date: 05/01/2025

END OF SECTION

SECTION 212200 – CLEAN AGENT FIRE EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Design, installation, and certification of Clean Agent Fire Suppression Systems with Addressable Detection.
2. Fire suppression agent using FK-5-1-12 agent.
3. Agent storage and distribution components.
4. Alarm, controls, and detection system.
5. System to be provided as part of Packaged Preaction and Clean Agent System. Refer to Section 21 1300 FIRE SUPPRESSION SPRINKLER SYSTEMS for additional information.
6. Signs and identification.
7. Pipe, fittings, wire, and conduit.

B. Related Sections:

1. Division 21 Section “Documentation and Closeout” for documentation and closeout requirements related items.
2. Division 21 “Submittals” for submittal related items.
3. Division 28 Section "Fire Alarm System" for alarm devices not specified in this Section.

1.3 QUALITY ASSURANCE

A. NFPA Standards: Fire Suppression system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 2001 (2018 Edition), “Standard on Clean Agent Fire Extinguishing Systems."
2. NFPA 70 (2020 Edition), "National Electrical Code."
3. NFPA 72 (2019 Edition), " National Fire Alarm and Signaling Code"

B. FM – Factory Mutual Approval Guide

C. Department of Transportation (DOT) Title 49 Code of Federal Regulations

1.4 QUALITY CONTROL

A. Qualifications of Installer:

1. The system installer or subcontractor for this work shall possess a valid South Carolina Contractor's license. The installing contractor shall employ a NICET-certified Special Hazards Suppression Systems, Level IV, who will be responsible for this project. The fire suppression system shall be designed by an experienced and qualified individual or firm regularly engaged in the design of clean agent fire extinguishing systems.
2. The installing contractor must have a minimum of five (5) years experience in the design, installation, and testing of Clean Agent, or similar, fire suppression systems. A list of systems of a similar nature and scope shall be provided on request.
3. The installing contractor shall show proof of emergency service available on a twenty-four-hour-a-day, seven-day-a-week basis.
4. The installing contractor shall maintain, or have access to, a clean agent recharging station. The installing contractor shall provide proof of his ability to recharge the largest clean agent system within 24 hours after a discharge. Include the amount of bulk agent storage available.
5. The installing contractor shall be an authorized stocking distributor of the clean agent system equipment so that immediate replacement parts are available from inventory.

B. Equipment and Materials:

1. All equipment and materials required for installation under these specifications shall be new and unused, of the best grade and quality, shall be of the latest design of the manufacturer, and shall be listed as approved by U.L. and Factory Mutual. All components shall be suitable for the pressures to be encountered.
2. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment for a minimum of five (5) years and, if so directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.

1.5 SUBMITTALS

A. Working plans drawn to scale (minimum 1/4" = 1'-0") indicating the detailed layout of the system, locating each component (e.g., agent cylinder, control panel, electric/manual pull station, audible and visual alarms). Include isometric piping layouts, control diagrams, wiring diagrams, and written sequence of operation or cause to affect matrix along with battery calculations, and pipe locations including size and length. Refer to NFPA 2001 Section 5.1.2.

B. Product data for each piece of equipment comprising the system including storage cylinders, control valves and pilot controls, control panels, nozzles, manual stations, detectors, alarm bells or horns, switches, and annunciators.

C. Design calculations derived from the manufacturer's/supplier's computer program and verified by Underwriters Laboratories. The analysis shall include calculations to verify system terminal pressures, nozzle flow rates, orifice code number, piping pressure losses, component flow data, and pipe sizes considering actual and equivalent lengths of pipe and elevation changes. Designers using this software shall be trained and certified by the manufacturer.

D. Manufacturer's installation and operation manual.

1.6 WARRANTY

A. Warranty system for parts and labor for not less than a period of 12 months from the date of Substantial Completion.

B. False Discharge Warranty: Warranty replacement and associated costs of the clean agent in the event of a false discharge attributable to defects in installation or parts for a period of 12 months from the date of Substantial Completion.

C. Warranty capability to recondition the complete system within 24 hours in the event of system activation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. The clean agent fire extinguishing system shall be a Total Flooding System utilizing FK-5-1-12 agent. The system is a fixed installation where equipment is designed and installed to provide fire extinguishing capability for hazards described.

B. Manufacturers:

1. SevoIFP

C. The system shall provide a minimum agent design concentration of 4.5% by volume for Class C hazards, in all areas and/or protected spaces, at the minimum anticipated temperature within the protected area. The amount of clean agent to be provided shall be the amount required to obtain a uniform concentration 1.2% greater than the concentration required in NFPA 2001 for the agent being used for a minimum period of 10 minutes. The Contractor shall take into consideration such factors as non-closeable openings, “rundown” time of fans, the time required for dampers to close, requirements for any additional dampers, and other features of the facility that could affect concentration.

D. The system shall be complete in all ways. It shall include all mechanical and electrical installation, all detection and control equipment, agent storage cylinders, amount of clean agent, discharge nozzles, pipe and fittings, manual release and abort stations, audible and visual alarm devices, auxiliary devices and controls, shutdowns, alarm interface, caution/advisory signs, functional checkout and testing, training and all other operations necessary for a functional, UL Listed Clean Agent Suppression System including interface and monitoring of Preaction Sprinkler System.

E. The system shall be actuated by photoelectric detectors installed for a maximum area coverage of 250 ft² per detector in the room.

F. Detectors shall be Cross-Zoned detection requiring two detectors to be in alarm before release.

G. Sequence of Operation:

1. The Preaction System serves as a Secondary system to the Clean Agent Fire Extinguishing System. Refer to Specification Section 21 1300 – FIRE SUPPRESSION SPRINKLER AND STANDPIPE SYSTEMS for additional information.
2. Actuation of one (1) smoke detector, within the system, shall:

    a. Energize the “ALARM” lamp on the activated detector, display detector location on control panel.
    b. Energize first stage alarm bell and a visual indicator.
    c. Transfer modules or auxiliary contacts which can perform auxiliary system functions such as:

        1) Transmit an alarm signal to the building fire alarm system.

3. Actuation of a second smoke detector, within the system, shall:

    a. Energize a lamp on the activated detector, display detector location on control panel.
    b. Illuminate the “PRE-DISCHARGE” lamp on the control panel face.
    c. Energize a pre-discharge horn/strobe device within and outside the hazard area. The audio tone shall pulse.
    d. Operate auxiliary contacts for shutdown of HVAC system and/or dampers.
    e. Start time-delay sequence (not to exceed 60 seconds)
    f. System abort sequence is enabled at this time.

4. After completion of the time-delay sequence, the Clean Agent system shall discharge, and the following shall occur:

    a. Appropriate cylinder electric actuator shall activate. Display location on control panel.
    b. Upon activation of the clean agent actuator, the preaction solenoid valve will open to allow water to fill the sprinkler piping system. This will sound an alarm at the preaction system and activate alarm and water flow contacts at the preaction system connected to the Clean Agent control panel.
    c. Illuminate the “SYSTEM FIRED” lamp on the control panel face.
    d. Shutdown of all power to high-voltage equipment.
    e. Energize visual indicator outside the hazard in which the discharge occurred.
    f. Energize a “SYSTEM FIRED” audible device. The audio tone shall go steady.

5. The system shall be capable of being actuated by manual discharge devices located at each hazard exit. Operation of a manual device shall duplicate the sequence description above, except that the time delay and abort functions shall be bypassed. The manual discharge station shall be of the electrical actuation type and shall be supervised at the main control panel.
6. Abort stations shall be provided at each exit of the protected area and shall, when operated, shall interrupt the discharge of clean agent. The abort stations shall be momentary contacts (dead-man) requiring constant pressure to maintain contact closure.

2.2 PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53, Grade A or B or ASTM A 106, Grade A, B, or C; Schedule 40, or Schedule 80, seamless steel pipe; black or galvanized. ASTM A-120, ordinary cast-iron pipe, aluminum pipe, or non-metallic pipe shall not be used.

B. All piping and fittings shall comply with NFPA 2001.

C. Piping design per NFPA 2001, manufacturer's recommendations, and approved piping and hanger standards and guidelines including seismic requirements.

D. Routing: All piping shall be adequately supported and anchored at all directional changes and nozzle locations. Layout piping to give maximum flow and to avoid possible mechanical, chemical, or other damage.

2.3 MATERIALS AND EQUIPMENT

A. General Requirements:

1. Equipment and accessories furnished hereunder shall be standard components of a specified manufacturer.

B. Clean Agent Storage Containers and valving

1. Each system shall have its own supply of cleaning agent.
2. The cleaning agent shall be stored in Agent Storage Cylinder Assemblies. Cylinders shall be super-pressurized with dry nitrogen to an operating pressure of 360 psi @ 70°F. Cylinders shall be of high-strength low alloy steel construction and conform to NFPA 2001.
3. Cylinders shall have a threaded protection ring on the tank collar and ¼" steel protection cap for handling and shipment.
4. Valve shall be constructed of forged brass and operate by means of pressure differential. Valve shall be constructed as to not require rebuild after discharge, Valve shall allow for means to pressurize cylinder without need for valve operation.
5. The primary cylinder assembly shall be actuated by a resettable electric actuator. Non-re-settable or explosive devices shall not be permitted.
6. The cylinders shall be mounted using wall racks.
7. Each cylinder assembly shall have a contact pressure gauge with integrated low-pressure switch to provide visual and electrical supervision of the cylinder pressure. The low-pressure switch shall be wired to the control panel to provide an audible and visual supervisory condition signal in the event the cylinder pressure drops below 10% working pressure. The pressure gauge shall be color coded to provide an easy, visual indication of cylinder pressure.
8. Each cylinder assembly shall have a pressure relief provision that automatically operates before the internal pressure exceeds 710 psi.

C. Discharge Nozzles

1. Engineered discharge nozzles shall be provided within the manufacturer's guidelines to distribute the clean agent throughout the protected spaces. The nozzles shall be designed to provide proper agent quantity and distribution. Nozzles shall be available

in ½ in. through 2 in. pipe sizes. Each size shall be available in 180°and 360 º distribution patterns.

a. Nozzles shall be permanently marked as to part number and orifice diameter.
b. Nozzles shall be of the type utilizing internal orifice plates.
c. Nozzles should be listed and/or approved to be used in the upright or pendant position.
d. Ceiling plates can be used with nozzles to conceal pipe entry holes through ceiling tiles.

D. Control and Supervisory Systems

1. Intelligent addressable control panel system shall be UL listed and Factory Mutual Global approved for use as a releasing panel.
2. The Intelligent Addressable Fire Alarm System shall perform all functions necessary to operate the system detection, actuation, notification and auxiliary functions as outlined.
3. Standby battery power supplies capable of providing not less than 24 hours plus 5 minutes of alarm upon a normal power failure. Batteries shall be maintenance free.
4. The Fire Alarm System shall support Cross-Zoned, Single Detector Release and Manual Release detection/actuation methods.
5. The Fire Alarm System shall provide the following capabilities and functions:

a. The system shall include one isolated intelligent Signaling Line Circuit (SLC), Style 4, 6, or 7
b. Up to 159 detectors and 159 modules for a system capacity of 318 devices maximum
c. A 6.0 Amp power supply with four Class A/B built in Notification Appliance Circuits (NAC). selectable System Sensor, Wheelock, or Gentex strobe synchronization
d. Standard 80-character display LCD
e. Built in Alarm, Trouble, Security, and Supervisory relays.
f. Certified for seismic applications when used with the appropriate seismic mounting kit.
g. Online or offline programming utility. Upload/Download, save, store, check, compare, and simulate panel databases. Upgrade panel firmware.
h. Auto programming and Walk Test reports.
i. 80-character remote annunciator (up to 32)
j. EIA-485 annunciator, including custom graphics.
k. Printer interface.
l. History file with 800-event capacity in nonvolatile memory, plus separate 200-event Alarm only file
m. Alarm Verification selection per point, with tally.
n. Pre-signal/Positive Alarm Sequence (PAS)
o. Silence inhibit and Auto Silence timer options.
p. NAC coding functions: March time, Temporal, California two-stage coding, Canadian two-stage
q. Strobe synchronization
r. Field-programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
s. Full QWERTY keypad

t. Battery charger supports 18 – 200 AH batteries.
u. Non-alarm points for lower priority functions
v. Remote ACK/Signal Silence/System Reset/Drill via monitor modules.

E. Detectors

1. The detectors shall be spaced and installed in accordance with the manufacturer's specifications and the guidelines of NFPA 72.
2. Analog Addressable Photoelectric Smoke Detector: The detectors shall use the photoelectric (light-scattering) principle to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
3. Addressable-analog communication.
4. Two-wire SLC connection.
5. Remote test feature from the panel.
6. Built-in functional test switch activated by external magnet.
7. Built-in tamper-resistant feature.
8. Optional relay, isolator, and sounder bases.

F. Manual Release (Electric)

1. The electric addressable manual release station shall be a dual action device which provides a means of manually discharging the clean agent fire extinguishing system when used in conjunction with the Detection System.
2. The manual release station shall be a dual action device requiring two distinct operations to initiate a system actuation. Stations shall be suitable for semi-flush mounting and shall be installed not less than 42 in. and not more than 48 in. above the finished floor.
3. The manual release station shall bypass the time delay and abort functions, shall cause the system to discharge and shall cause all release and shutdown devices to operate in the same manner as if the system had operated automatically.
4. A manual release station shall be located at each exit from the protected hazard.

G. Abort Station

1. The Abort Station shall be "Dead Man" type and shall be located next to each manual release station.
2. "Locking" or "Keyed" abort stations shall not be permitted. Stations shall be suitable for semi-flush mounting and shall be installed not less than 42 in. and not more than 48 in. above the finished floor.

H. Audible and Visual Alarms

1. Audible alarm and visual signal devices shall operate from the Detection System control panel.
2. Alarms shall be UL Listed or FM Approved and operate on 24 VDC nominal.
3. Audible alarms shall provide continuous or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device. The appliance shall be placed 80 in. above the highest floor level within the space, or 6 in. below the ceiling, whichever is lower.
4. A Strobe device shall be placed outside, and above, each exit door.
5. Alarm bell shall be UL Listed or FM Approved and operate on 24 VDC nominal.

6. The appliance shall be placed 80 in. above the highest floor level within the space, or 6in. below the ceiling or whichever is lower.

I. Modules

1. Provide addressable control and relay modules as required to accommodate system.

J. Caution and Advisory Signs

1. Signs shall be provided to comply with NFPA 2001 and the recommendations of the 3M™ Novec™ 1230 equipment provider.
2. Entrance sign: One required at each entrance to a protected space.
3. Manual discharge sign: One required at each manual release station.
4. Flashing light sign: One required at each flashing light over each exit from a protected space.

2.4 HANGERS AND SUPPORTS

A. General: The Contractor shall provide all necessary hangers, supports, bracing, accessories, etc., as required for proper installation of the work, and only approved type hangers shall be used. All piping must be substantially supported from building structure.

B. Structural steel, other than the building structure or special supports provided under another section of the specifications, required for proper supporting of piping and equipment shall be furnished and installed under this section of the specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with applicable requirements of NFPA 2001.

B. Piping:

1. All piping shall be reamed, blown clear and swabbed with suitable solvents to remove burrs, mill varnish and cutting oils before assembly.
2. All male threads on pipe shall be taped with approved Teflon tape.

C. Electrical Installation:

1. Installation shall be in accordance with the NFPA 70 (NEC), NFPA 72, NFPA 2001, local and state codes, as shown on the drawings, and as recommended by the equipment manufacturer.
2. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Conduit installation shall be in accordance with The National Electrical Code (NEC), local and state requirements. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

3. All fire detection and alarm system devices, control panels and remote annunciators shall be flush or semi-flush mounted.

3.2 SYSTEM INSPECTION CHECKOUT AND ROOM INTEGRITY TESTING

A. Pressure Test:

1. Pneumatically test system discharge piping in a closed circuit for a period of ten minutes at 40psi.
2. Pressure drop shall not exceed 20% of the test pressure.

B. Flow Test:

1. Perform flow test using nitrogen on the pipe network to verify that flow is continuous and that the piping and nozzles are unobstructed.
2. Install 'telltales' Styrofoam cups over each nozzle that will easily blow off when nitrogen pressure reaches the nozzle.

C. Functional Test Inspection

1. Upon completion of installation, the system shall be electrically and mechanically inspected by an individual certified by the equipment manufacturer.
2. The complete system shall be functionally tested in the presence of the owner or his designated representative, and all functions shall be reviewed for compliance with this specification no less than ten (10) days prior to the scheduled test.
3. Provide requisite equipment, personnel, and independent testing consultants to complete tests and provide written reports of results.
4. An inspection shall be made by the clean agent system installer to ensure that all required dampers, door bottom seals, weather-stripping, caulking, and foam sealant have been installed and that the areas protected will, in fact, contain the clean agent for the full ten minutes required. While the responsibility for this work may lie with other contractors or the owner, the responsibility for determining the corrective action required is that of the clean agent system installer and shall not relieve him of his obligation to conduct any required retest of the system at no cost to the owner should the test fail due to inadequate room tightness, faulty design, installation, or equipment failure.

D. Room Integrity:

1. Upon completion of the Functional Testing above, written reports detailing all inspections made, corrective action taken, and corrective action required shall be submitted to the owner or his designated representative.
2. At the same time, a test plan shall be submitted detailing the procedure and time required for owner approval. At this time a test date and time shall be determined, based on the owner's requirements and estimated completion of any outstanding items requiring corrective action. All testing shall be done in accordance with NFPA 2001.
3. If required, the tests may be conducted on weekends and after normal working hours. In this case, no additional charges will be allowed for overtime or weekend work.
4. Separate room integrity tests shall be conducted for each individual zone.
5. Room integrity tests shall be conducted by a qualified representative of the equipment manufacturer or testing consultant, who shall certify the system as complete and ready

for testing. The manufacturer of the test equipment or clean agent manufacturer shall provide a specification for the room integrity test.

6. Provide a written test report to Owner's Representative.
7. Correct deficiencies and retest.

3.3 TRAINING

A. Prior to final acceptance, the installing contractor shall provide operational training to owner's personnel. Each training session shall include control panel operation, manual and abort functions, trouble procedures, supervisory procedures, auxiliary functions and emergency procedures.

END OF SECTION

SECTION 212301 – NITROGEN GENERATION SYSTEMS FOR FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Design, installation, and certification of Nitrogen Generation System to provide Nitrogen to all preaction sprinkler systems as hereinafter described and indicated on drawings.
2. Nitrogen Generation System wall mount with integral oil-less air compressor
3. Air Maintenance Device
4. Oxygen Removal Vent (electric)
5. Handheld Gas Analyzer
6. Signs and Identification
7. Pipe, tubing, fittings, and conduit

B. Related Sections:

1. Division 21 Section 21 1300 “Fire Suppression Sprinkler and Standpipe Systems”

1.3 QUALITY ASSURANCE

A. NFPA Standards: Fire Suppression system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13 (2019 Edition), “Installation of Sprinkler Systems."
2. NFPA 25 (2020 Edition), “Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems”

B. All corrosion Monitoring Devices must be provided to achieve compliance with Section 23.1.5.2 (4) of the 2010 Edition 5.1.5.2 of the 2019 Edition of NFPA 13, Standard for the Installation of Sprinkler Systems and must be U.L. 2987 listed for monitoring corrosion in fire sprinkler systems

C. Manufacturers:

1. Engineered Corrosion Solutions (Basis of Design)
2. Tyco Fire, a division of Johnson Controls

PART 2 - PRODUCTS

2.1 NITROGEN GENERATION SYSTEM

A. The Nitrogen Generation System shall be sized to provide all preaction fire sprinkler systems with supervisory nitrogen gas. Sizing shall be based on the total volume of all fire sprinkler systems being served by the nitrogen generator as determined by hydraulic calculations for each system. Sizing shall be based on leakage rates allowed by NFPA 25 for an existing system and not for a new system. Documentation of the calculations and nitrogen generator sizing must be provided with the submittals. Where the number of systems, the total cumulative volume of systems, or the physical location of system risers is required, multiple nitrogen generators shall be supplied.

B. Electrical: 120v, 20 amp.

C. The Nitrogen Generation System's cabinet shall be wall-mounted or standalone as noted on contract documents.

D. The Nitrogen Generation System must be capable of achieving a minimum of 98% Nitrogen purity throughout all of the preaction system piping within fourteen (14) days from the commencement of the inverting process.

E. System must employ membrane type nitrogen separators that provide "instant on-instant off" nitrogen gas production without the need for nitrogen storage tanks or refrigerated dryers.

F. The nitrogen generator must include a LCD display screen to operate and control the nitrogen generator and provide internet connectivity for remote monitoring and transmitting alerts via email.

G. Nitrogen separation membranes must provide a useful service life of at least ten (10) years of continuous operation in accordance with the membrane manufacturer's specifications.

H. The nitrogen generator system must provide an automatic "fill and purge" (variable pressure) breathing process. This must be done while the fire sprinkler system is fully functional and must not alter or affect the design performance of the sprinkler system.

I. A process that involves fixed pressure differential gas exchange is not permitted.

J. The Nitrogen Generation System shall include the following items:

1. Supervisory Gas Monitoring
2. Filtration system to remove residual water and hydrocarbons (if needed) from the compressed air stream.
3. Integral oil-less air compressor to be capable of producing a continuous volume of compressed air that is sufficient to fill the largest fire protection system being supplied by the air compressor to operating pressure within thirty (30) minutes per NFPA 13 requirements and meet the compressed air requirements of the nitrogen generator.
4. Building Management System and/or Fire Alarm Integration

K. Nitrogen Control Panel

1. The nitrogen control panel shall include a run time monitor with an excess runtime alarm.
2. The panel shall have an audible alarm and visual indication.
3. Building Management Systems (BMS) Alarm Integration:

    a. Provide a nitrogen generation system with integrated leak detection and bypass alarms. Program alarms into the controller.

        1) The leak detection system is to alarm if leaks develop within the fire suppression system piping.
        2) The air bypass alarm is to alarm if the nitrogen generation system is bypassed by the air compressor.

L. Vent System (Electric):

1. Vents for removal of oxygen gas from the preaction fire sprinkler system piping must be installed on the riser above the control valve for each fire sprinkler zone that is being nitrogen inerted.
2. Vent installed outside of the fire sprinkler valve room is not permitted.
3. The venting device which allows for venting of gas and not water must include a float valve to prevent the discharge of water.
4. Vents must include a device to prevent accidental depressurization of system if the supervisory gas source is lost.
5. Vents must close automatically at the completion of the nitrogen inerting process without manual intervention.
6. Vents must include a connection to sample the purity of nitrogen within the FPS. Purity sampling device can be portable or fixed.
7. Vents must not require plumbing to drain.
8. Vents must include isolation ball valve for maintenance.
9. The Contractor shall confirm that the ball valve on each purge/vent system is left in the “open” position during normal operation and shut off/taken out of service during hydro-testing by turning the ball valve to the “closed” position.

M. Portable Gas Analyzer

1. The fire sprinkler contractor shall furnish a handheld gas analyzer with each nitrogen generator or as directed by the design engineer.
2. The handheld gas analyzer shall be equipped with a quick-connect fitting compatible with gas sampling ports on all nitrogen generation system equipment and inerting vents.
3. The handheld gas analyzer shall include a one-button calibration feature.
4. The oxygen sensing element of the handheld gas analyzer shall have a minimum useful life of two (2) years.

2.2 AIR MAINTENANCE DEVICE

1. The Air Maintenance Device shall be equipped with an adjustable pressure regulator (sized to meet Supervisory Pressure settings) for setting the maximum pressure on the Fire Protection System.

2. The Air Maintenance Device shall be the equivalent of an AMD-1 and not contain a pressure switch.
3. The Air Maintenance Device shall be installed per the manufacturer's specifications.

2.3 NITROGEN PIPING

1. Piping shall be either copper, galvanized, or black steel rated at 175 PSI.
2. Pipe size shall be ½" for piping between the Nitrogen Tank and connection to each preaction valve connected to the nitrogen system. Note: if the components are connected further than 250' from each other or the dry pipe system valves, 1" piping is recommended (consult the factory if the connection between components exceeds 1000').

PART 3 - EXECUTION

3.1 COORDINATION WITH OTHER TRADES

A. Coordinate closely with the General Contractor, other trades, and the Owner to expedite construction, and commissioning, and avoid interference.

3.2 NITROGEN GENERATOR SYSTEM INSTALLATION

A. System, devices, and all related appurtenances shall be installed in accordance with the manufacturer's installation guidelines.

B. Locate the purge vent/valve in accordance with the manufacturer's written installation instructions.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate the general location and arrangement of piping. Install piping as indicated, as far as practical.

3.4 SYSTEM OPERATING PRESSURE

A. The operating pressure range of the Dry Pipe fire protection system shall be determined by the Contractor. The Contractor shall also set the system Air Maintenance Device accordingly for each Zone to the proper setting. Final settings shall be implemented with input from the Nitrogen Generation System manufacturer.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. The Contractor shall confirm that all connections between Nitrogen Purity Sensors and the specified connection points have been successfully achieved as indicated by the manufacturer.

C. System Startup and Technical Training

1. Provide on-site guidance and training by the manufacturer's representative.
2. Provide one (1) printed copy and an electronic file of the Owner's Installation and Operations Manual for all corrosion control equipment. The Owner's Manual shall include protocols for the operation and maintenance of all equipment installed as part of this scope of work.

END OF SECTION

SECTION 220500 - GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Plumbing Work shall include, but not be limited to, the following:

1. Soil and waste and vent systems
2. Storm drain system
3. Domestic water systems
4. Domestic water heating
5. Plumbing fixtures and trim
6. Pumps for plumbing systems

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 DELINEATION OF WORK

A. Provide all necessary supervision and coordination of information to installers who are performing work to accommodate Division 22 installations.

B. Where the Division 22 installer is required to install items which they do not purchase, they shall include for such items:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected.
5. Their field assembly and internal connection as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

C. Items which are to be installed by the Division 22 installer but not purchased as part of the work of Division 22 shall be carefully examined upon delivery to the project. The Division 22 installer shall provide all work necessary to properly install these items.

D. If any items have been received in such condition that their installation will require additional work beyond the project scope of the work, the A/E shall be notified in writing within 10 working days of the date of delivery of the items. Any claims beyond 10 days will not be considered by the A/E.

1.4 QUALITY ASSURANCE

A. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be furnished. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.

B. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.

C. All equipment of one type (such as pumps, valves, etc.) shall be the products of one manufacturer unless specifically stated otherwise.

D. Where the specifications do not list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.

E. All materials with a manufacturers listed shelf life shall be used at least six months prior to the expiration of the materials' shelf life.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

A. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.

B. All work shall conform to the following Building Codes (latest edition):

1. International Building Codes
2. National Fire Protection Association

C. All work shall conform to all federal, state, and local ordinances.

D. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:

1. Factory Mutual Laboratories (FM)
2. Underwriters Laboratories, Inc. (UL)

E. All fuel fired equipment shall meet the requirements of the insurers and agencies listed and also meet the owner's insurer requirements.

1.6 STANDARDS AND PROCEDURES

A. All work shall meet or exceed the standards and procedures of the following:

1. AGA: American Gas Association
2. ANSI: American National Standards Institute
3. ASME: American Society of Mechanical Engineers
4. ASTM: American Society of Testing and Materials
5. AWWA: American Water Works Association
6. IBR: Institute of Boiler and Radiator Manufacturers
7. MSS: Manufacturers Standardization Society
8. NBBPVI: National Board of Boiler and Pressure Vessel Inspectors
9. NEMA: National Electrical Manufacturer's Association
10. OSHA: Occupational Safety & Health Administration
11. IRM: Improved Risk Mutuals

1.7 APPROVAL OF SUBSTITUTIONS

A. Specific reference in the specifications to any article, device, product, materials, fixture, form or type of construction, etc., by name, make, or catalog number, with or without the words "or equal", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the A/E expressed in writing, is equal to that named. Where quality and other characteristics are very nearly the same, the question of determining equal materials and readily available service sometimes resolves itself to a matter of personal opinion and judgment and in these and all other cases involving the approval of materials, the opinion, judgment and decision of the A/E shall be final and bind all parties concerned.

B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for approval in writing ten (10) calendar days prior to bid opening date to the A/E. Requests shall be accompanied by samples, literature, and information as necessary to fully identify and allow appraisal of the material or equipment. Submittals shall be concise, clear, and brief as possible. Incomplete submittals or submittals requiring lengthy research to ascertain quality will not be considered.

C. Approval of the A/E to use materials or equipment, if granted, will be in the form of a written addendum. Approved substitutions may be used at the Contractor's option. No substitutions will be allowed if substitutions are requested later than ten (10) days prior to bid opening date.

D. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly indicated in the form of a letter that is enclosed with the submittals. The Contractor shall be responsible for verifying all dimensions

with available space. If, in the opinion of the A/E, the physical dimensions do not permit the substituted material or equipment to be properly operated, maintained, serviced, or otherwise accessed, or the physical dimension adversely impact other components, a system's ability to be operated, maintained, serviced or otherwise accessed, the material or equipment shall be replaced at the Contractor's expense.

1.8 VERIFICATION OF DIMENSIONS AND LOCATIONS

A. The Contractor shall visit the facility and become thoroughly familiar with all details of the work, working conditions, dimensions and clearances.

B. Notify the A/E of any discrepancy between actual conditions and conditions indicated on the contract documents that could cause changes, other than minor ones, to the installation of any systems or equipment.

1.9 EQUIPMENT CONNECTIONS

A. The contract documents may indicate specific electrical, duct, and piping connection locations to equipment. Each manufacturer approved for bidding may have different connection arrangements. The Contractor is responsible for the modifications to and the extension of connecting components as required for the equipment provided.

B. The Contractor shall bear all costs for required changes in connection to equipment.

1.10 WORKMANSHIP

A. Workmen shall be thoroughly experienced and fully capable of installing the work. Work shall be in accordance with the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to Owner.

B. All material and equipment to be installed in accordance with manufacturer's printed recommendations using recommended accessories. Retain a copy on job site and submit others for approval when required.

1.11 GUARANTEES AND WARRANTIES

A. General:

1. Furnish to the A/E a guarantee form, included in these specifications, signed by the Contractor and Owner agreeing to the start and end dates of all systems and equipment under warranty.
2. All defective materials or inferior workmanship shall be replaced or repaired as directed by the Owner's representative during the guarantee period.

B. Equipment Warranties:

1. Equipment shall be warranted by the equipment manufacturer. Where labor is included in the warranty, the manufacturer, at his option, may permit the contractor to provide the required repairs on the equipment.
2. The equipment manufacturer shall include a written guarantee with the closeout documentation.

C. Duration Period:

1. For work not otherwise specified, the duration shall be one year from substantial completion including all parts, labor, and other charges.
2. The Contractor is responsible for purchasing from the equipment manufacturers any additional warranties to ensure that the equipment is warranted by the manufacturer through the duration period specified.

D. Extended Warranties:

1. Warranty periods shall be extended where specifically stated in these specifications.
2. The extended warranties shall meet the requirements of the base warranty unless specifically noted otherwise.
3. The extended warranty time listed is time in addition to the base warranty period.
4. The following systems or equipment shall have extended warranties:

    a. Variable frequency drives shall have a one year extended warranty.

E. Non-Warranted Items:

1. Non-durable replaceable items do not require replacement after the date of acceptance.

F. Warranty Repair:

1. Repair shall take place as soon as possible but not later than the following:

    a. Items not essential for facility operation - 7 days.
    b. Items that have a small impact on facility operation - 2 days.
    c. Items that have a significant impact on the facility operation - immediately begin repairs or work necessary to minimize operational impact to Owner.

2. The determination of the impact on the facility is solely that of the Owner and A/E.
3. Where life safety issues are impacted, the contractor shall take all steps necessary to ensure the facility can continue to function in a safe manner.
4. If repairs cannot be made in the required time period, temporary systems shall be installed until repairs can be completed.
5. All costs associated with warranty work shall be borne by the contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRIOR CONDITIONS

A. Prior to the installation of any equipment or system component, the Contractor shall review any prior work that has been completed to accommodate the equipment or system component to be installed.

B. If the prior work does not make a proper installation of any equipment or system component possible, notify the A/E prior to installation of any equipment or system component.

3.2 INSTALLATION

A. Install all equipment and appurtenances in strict accordance with the manufacturer's recommendations and the manufacturer's shop drawings.

B. If any equipment cannot be installed in accordance with Codes, contract documents, manufacturer's recommendations and accepted practices, notify the A/E in writing prior to installation of equipment.

C. If any system component cannot be installed in accordance with Codes, contract documents and accepted practices, notify the A/E in writing prior to installation of the system component.

3.3 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage prior to final inspections, repair or replace damaged items as determined by the A/E, at no cost to the Owner.

B. Store equipment on elevated supports and cover them on all sides with securely fastened waterproof coverings. All equipment openings shall be securely sealed.

C. Piping shall be protected by storing it on elevated supports and capping the ends.

D. During construction, all open ends of pipe, floor drains, etc. which could collect construction debris shall be properly capped.

3.4 CLEANING OF SYSTEMS AND EQUIPMENT

A. All equipment and systems shall be cleaned of all extraneous materials to leave equipment and system finish in a new condition.

B. Where equipment and systems cannot be properly cleaned, take all measures necessary to replace or repair equipment and systems to bring back to a "like new" condition. All costs shall be borne by the Contractor.

C. All extraneous materials shall be removed on the site on a regular basis to provide access to all work as well as a safe working environment.

3.5 SUPPORT OF SYSTEMS

A. Hanging piping or equipment from un-reinforced metal roof decks (i.e., metal roof deck w/o concrete is not permitted).

B. The following methods of support are not permitted:

1. Wire hangers unless specifically indicated
2. Perforated straps

3.6 COORDINATION WITH COMMISSIONING AGENT

A. Contractor shall coordinate their work with the Owner's Commissioning Agent. Provide necessary labor, materials, test equipment, etc. Attend meetings with the Commissioning Agent and participate in the development and implementation of the Commissioning Plan.

B. Perform necessary corrective work to comply with deficiencies noted by the Commissioning Agent.

END OF SECTION

SECTION 220501 - COMMON PLUMBING MATERIALS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of the plumbing systems where shown on the drawings and specified hereinafter.

B. Description:

1. Rooftop curbs shall include all supports for rooftop pipe and accessories.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. All work shall meet or exceed the standards and procedures (latest edition) of the following:

1. AISC Steel Handbook

B. All work shall be applicable by mechanics normally employed in the trade. All work shall be installed in accordance with the manufacturer's recommendations.

C. Manufacturers:

1. The following access door manufacturers are acceptable:

a. Karp Associates
b. Inland Steel Products
c. Milcor

2. The following paint manufacturers are acceptable:

a. Glidden
b. Sherwin-Williams
c. Devoe Paints

3. The following caulking manufacturers are acceptable:

    a. TREMCO
    b. Sonneborn - Contech
    c. W. R. Meadows

4. The following acoustical sealant (gypboard) manufacturers are acceptable:

    a. USG or equal

PART 2 - PRODUCTS

2.1 PRODUCT REFERENCES

A. Unless specifically indicated otherwise, the following products or product accessories shall be provided with the indicated equipment.

1. Roof curbs and piping support curbs shall be provided for all flues and piping located on a roof.

2.2 PAINT

A. General:

1. Painting shall be in strict accordance with the paint manufacturer with regards to surface preparation, priming, and finish painting.
2. High temperature paint, chemical resistant paint, and similar special paints shall be provided as required for specific application.
3. Color shall be as selected by A/E. Color can be any available color from manufacturer.
4. In addition to prime coat, two finish coats shall be applied.
5. Refer to Section 22 0553 “Identification for Plumbing Piping and Equipment” for additional materials to be painted.

B. The following items shall not be painted unless specifically specified otherwise:

1. Concealed Supports and Accessories
2. Hot Dipped Galvanized Steel
3. Stainless Steel
4. Aluminum
5. Threaded Rods
6. Factory Painted Items

C. In addition to equipment and materials specified elsewhere to be painted, the following shall be painted (except where excluded elsewhere in this section of specifications):

1. All hangers, non-threaded rods, fasteners, supports, and accessories where not located in concealed locations.
2. Flues on the exterior of the building.

D. Paint shall be:

1. Glidden Industrial Enamel
2. Sherwin-Williams Industrial Enamel
3. Devoe Paints Industrial Enamel

E. PVC Jacket:

1. When PVC jacket is specified to be painted, the jacket shall be primed with a plastic primer by Rustoleum.

2.3 ACCESS DOORS IN FINISHED CONSTRUCTION

A. (Furnished by Division 8. Refer to Section 08 3113 “Access Doors and Frames” for additional information.)

B. General:

1. Doors shall be minimum size 16" x 16".
2. Doors shall be factory primed with corrosion resistant paint.
3. Latch shall be screwdriver operated unless noted otherwise.
4. Doors shall have continuous concealed piano hinge.
5. Frames shall be welded minimum 16 gauge steel, mitered corners ground smooth with anchors.
6. Doors shall have frame suitable for anchoring and attachment in assembly in which it is to be installed (i.e. masonry straps, flange, etc.).

C. Non-Rated Assemblies:

1. Doors shall be suitable for masonry and gypboard walls and ceilings.
2. Doors shall be minimum 14 gauge steel.
3. Door shall be:

a. KARP DSC-214M

D. Rated Assemblies:

1. Doors shall be suitable for masonry and gypboard walls.
2. Doors shall be 20 gauge steel, welded pan type, double wall with 2" thick fire rated insulation. Door shall be automatic closing, self-latching with interior latch release.
3. Latch shall be bolt type operated by a ring.
4. Door shall be:

a. Karp KRP-150 FR

E. Furnish doors for the following:

1. Concealed equipment, valves, actuators, dampers, sensors, trap primers, and controls requiring access for operation or maintenance.
2. All other devices requiring inspection, maintenance or repair.

2.4 FLASHING

A. General:

1. Provide flashing and counter flashing on all pipes, flues, and other plumbing system components which penetrate exterior walls or roofs.
2. Flashing sizes where shown are minimum sizes but in no case shall they be less than size required by roofing manufacturer.

B. Plumbing Vents:

1. Plumbing vents through the roof shall be flashed and made watertight using 16 ounce soft sheet copper.
2. Rubber flashing caps shall be provided on metal roofing systems in accordance with the metal roofing manufacturer's requirements.

C. Plumbing Pipe:

1. See detail on plans.
2. Rubber flashing caps shall be provided.

2.5 HOUSEKEEPING PADS

A. General:

1. Housekeeping pads shall be constructed of concrete and shall meet the requirements of the Concrete specifications.
2. Concrete shall develop a minimum strength 3000 psi at 28 days or as specified in the concrete specification, whichever requirement is greater.
3. Housekeeping pads shall extend six inches past equipment and supports in all direction.

B. Pads:

1. All floor mounted equipment shall be provided with a four inch high reinforced-concrete housekeeping pad.

2.6 MARKING (UNDERGROUND PIPE)

A. All underground gas, helium and plumbing piping shall be marked.

B. Provide detectable aluminum plastic or backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried utility piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3" minimum width, color coded and with warning and identification imprinted in bold black letters continuously and repeatedly over entire length. Use permanent code and letter coloring unaffected by moisture or other substance contained in trench backfill material.

2.7 DRAINS AND DRAIN PANS

A. General:

1. Drain shall be full size of connections, size indicated on drawings, or 3/4" minimum, whichever is largest.

B. Auxiliary Drain Pans:

1. All storage tank type water heaters shall be provided with auxiliary drain pans.

C. Drain Pans (Over Electrical Equipment):

1. Provide 20 gauge galvanized drain pan with drain connection under all pipe located within three feet horizontally of any electrical panels, switchboards, or transformers.
2. Drain pan shall have soldered or welded corners and shall be 2" deep and extend 12" past pipe and 36" beyond electrical equipment.

2.8 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS

A. Provide vents, reliefs, and overflows for all equipment provided with these connections, where indicated on plans, and when needed for proper system operation.

B. Vent, relief, and overflows shall be run full size of connection or size indicated on drawings, whichever is larger.

2.9 FASTENERS, ANCHORS, AND ACCESSORIES

A. Unless indicated otherwise, all fasteners, anchors, and accessories shall be metallic.

B. Materials provided shall be considered industry standard for commercial or industrial use.

C. All materials shall be installed in accordance with the manufacturer's recommendations for the intent use and application.

D. Materials installed outdoors, in attics, in crawl spaces, in tunnels and other areas exposed to ambient temperature or humidity shall be stainless steel or hot dipped galvanized.

E. Unless otherwise specified or required by the manufacturer, bolts shall meet or exceed the following strengths:

1. Proof Load: 74 ksi
2. Yield Strength: 81 ksi
3. Tensile Strength: 105 ksi

2.10 SEALANT

A. Exterior joint sealant shall be polyurethane base, multi-component; self-leveling type for application in vertical joints; capable of withstanding movement of up to 50% of joint width

and satisfactorily handled throughout temperature of 4 to 27 degrees C.; uniform, homogeneous, and free from lumps, skins and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining; non-bleeding.

B. Penetrations and fire rated assemblies shall meet the requirements of the Firestopping and Smokestopping specification.

C. Color shall be approved by A/E.

2.11 ACOUSTICAL SEALANT (GYPBOARD)

A. General:

1. Acoustical sealant shall be provided at gypboard where noted on drawings or indicated elsewhere in the contract documents.
2. Product shall be latex based and bond with porous and non-porous materials.
3. Product shall be permanently resilient.

B. Properties:

1. Flame spread: 0
2. Smoke spread: 0
3. Viscosity: 250K - 400K CPS

C. Manufacturer shall be:

1. USG Sheetrock Brand Acoustical Sealant

2.12 VOC's (ADHESIVES, SEALANTS, AND SEALANT PRIMERS)

A. All adhesives, sealants, and sealant primers shall meet the latest requirements of LEED or Green Globes or the following, whichever has the lower values:

1. Substrate Applications:

a. Metal to Metal - 30 g/L

2. Specialty Applications:

a. PVC welding – 510 g/L
b. CPVC welding – 450 g/L
c. ABJ welding – 325 g/L
d. Plastic cement welding – 250 g/L
e. Adhesive primer for plastic – 550 g/L
f. Sheet applied rubber lining – 850 G/L
g. Contact adhesive – 80 g/L

3. Insulation:

a. Piping - 50 g/L

B. The VOC limits are g/L less water.

C. Adhesives, sealants, and sealant primers shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168.

PART 3 - EXECUTION

3.1 FLASHING

A. Plumbing Vents:

1. Vent piping shall terminate a minimum of twelve (12) inches above finished roof level unless noted otherwise. Where vent piping is located in a roof “well” area or areas enclosed with high parapet walls, vent piping shall terminate a minimum of twelve (12) inches above highest parapet wall.
2. Metal flashing shall extend at least 12" in all directions from pipe and be turned down a minimum of 3" inside top of pipe.
3. Rubber flashing shall be secured to pipe with stainless steel clamps.

3.2 EQUIPMENT INSTALLATION (SLABS NOT ON GRADE)

A. Submit to the A/E a detailed description and sketches indicating the method of transporting heavy equipment within the building to its final installed location.

B. The submittal shall indicate maximum point loading on the structure, method to distribute load, and shoring of structure.

3.3 PAINTING

A. All vapor barriers shall be sealed as specified elsewhere in the appropriate sections before painting.

B. All conditions that prohibit proper application of paint shall be reported in writing to the A/E.

C. Submit manufacturer of paint, type, and paint color samples to the A/E for review.

3.4 EQUIPMENT STORAGE

A. Facilities for storing materials and equipment shall be provided by the Contractor.

B. All equipment and materials shall be protected from ambient conditions including freezing and exposure to sunlight when these conditions could affect the product.

C. All stored items shall be elevated off slab or grade.

3.5 HOUSEKEEPING PADS

A. All concrete housekeeping pads shall be properly coordinated with construction of floors and other building work. All exposed surfaces shall be steel troweled smooth with beveled edges. Bond foundations to floor unless otherwise indicated. Pad shall be level within 1/16 inch for the length and width of the pad.

B. Reinforce concrete with 4 inch by 4 inch wire mesh, No. 6 gauge, unless specified otherwise.

C. Provide all required foundation bolts, washers, sleeves, plates, templates, etc., for mechanical equipment. Foundation bolts shall be embedded in concrete, set in place before concrete is poured and securely held in place with templates.

D. Furnish shop drawings showing adequate concrete reinforcing steel details and templates for all concrete foundations and supports, and all required hanger bolts and other appurtenances necessary for the proper installation of this equipment. All such work shall be shown in detail on the shop drawings, showing the complete details of all foundations including necessary concrete and steel work, fasteners and vibration isolation devices.

E. Set all equipment on their foundations and shim level with steel shims and grout up under base for uniform bearing.

F. Equipment shall be fastened to housekeeping pads as required by seismic design.

G. Housekeeping pad shall be fastened to structural slab as required by seismic design or as indicated by structural or mechanical details, whichever requirement is greater.

3.6 MARKING (UNDERGROUND PIPING)

A. Bury tape with the printed side up at a depth of 12" below the top surface of earth or 12" below the top surface of subgrade below pavements.

3.7 ACCESS DOORS IN FINISHED CONSTRUCTION

A. Provide a schedule with location and type to the installing contractor.

B. Coordinate required location of all access panels with installing contractor.

3.8 DRAINS AND DRAIN PANS

A. General:

1. All horizontal drain piping shall be installed with a uniform grade of not less than 1/8" per foot of fall in direction of flow except as noted otherwise.
2. All drain lines installed at floor in mechanical rooms shall be supported by threaded rods and pipe clamps. Rod shall be anchored into the floor slab.

B. Equipment and Miscellaneous Drains:

1. Run drain to roof drain, janitor sink, equipment room drain, or grade if not indicated otherwise on plans.

C. Auxiliary Drain Pan:

1. Run drain to roof drain, janitor sink, equipment room drain, or grade if not indicated otherwise on plans.

3.9 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS

A. Run vents and reliefs to location indicated on plans or, if none indicated, to a location where they can discharge safety without presenting a hazard to personnel. Terminate with appropriate fitting.

B. Run overflow similar to drain.

3.10 EXTERIOR SEALANT

A. Submit color charts to A/E.

3.11 EQUIPMENT PENETRATIONS

A. Seal all openings into equipment resulting from installation of equipment such as conduit and flex.

3.12 EQUIPMENT INSTALLATION

A. Repair all insulation damaged during installation of equipment.

3.13 EQUIPMENT ATTACHMENT

A. Equipment shall be secured to the building or structure. Where equipment is provided with a method of attachment, they shall be used to attach the equipment. Where equipment is not provided with a method of attachment, the contractor shall add gussets, angles, or similar material to the unit without affecting the performance or warranty of the equipment, which shall be used to attach the equipment.

END OF SECTION

SECTION 220505 - TRENCHING AND EXCAVATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the trenching and excavation of grade required for the installation of pipe, conduit, and other below grade systems where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section. In addition, refer to these specification sections:

1. Section 221100.1 – Underground Pipe Coating

1.3 QUALITY ASSURANCE

A. All work shall meet or exceed the standards and procedures (latest edition) of the following:

1. OSHA
2. ASTM D698

PART 2 - EXECUTION

2.1 TRENCH EXCAVATION

A. Trench excavation shall be open cut to the depth required and shall be kept free of water using well points if required. Trenches will be sheeted and braced as soil conditions indicate and required by the Occupational Safety and Health Act. Such sheeting shall be removed after backfilling has progressed to a stage that no damage to pipe lines or structures will result from its removal.

B. When rock excavation is encountered at grade in trenches, the trench shall be excavated not less than six (6) inches below the bottom of the pipe bell, refilled with gravel or crushed stone, thoroughly tamped in place, and shaped to the pipe as heretofore specified.

C. Excavated rock shall not be mixed with material selected for tamped backfilling under and around the pipe up to a level at least one (1) foot above the pipe.

D. If in the opinion of the A/E the material excavated is objectionable, the Contractor shall be required to remove and properly dispose of the excavated material and provide acceptable fill material.

2.2 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. Width of trenches at any point below top of pipe shall not be greater than outside diameter of pipe plus 16 inches for pipes measuring up to 30 inches, and 24 inches for pipe measuring greater than 30 inches, to permit satisfactory jointing and thorough tamping of bedding material under and around pipe.

B. When the excavation is in firm earth, care shall be taken to avoid excavation below the established grade. If this should occur, the area so excavated shall be backfilled in two-inch lifts thoroughly compacted with mechanical tampers or with granular fill. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints and as hereinafter specified. Bell holes and depressions for joints shall be dug after the trench bottom has been graded, and, in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, bell holes and depression shall be only of such length, depth, and width as required for properly making the particular type of joint.

C. Where unstable earth or muck is encountered in the excavation, a minimum of 6" below grade will be removed and backfilled with stone, sand or other suitable material to give a stable subgrade.

2.3 BACKFILLING

A. Backfill for trenches shall be suitable earth free of rocks, large roots, excessive sod, broken pavements, or other objectionable foreign matter. Backfill shall first be carefully hand tamped under and around the pipe and then thoroughly compacted by mechanical tampers in layers not over 8" in loose depth. Top of the backfill shall be carried above the surrounding grade so that upon subsequent settlement, the backfill will be at proper elevation. In all cases mechanical tamping must be carried evenly on both sides of the pipe to the top of the excavation. All pipe that has its line or grade disturbed, or becomes defective in any other manner whatsoever, shall be removed and replaced at the Contractor's expense.

B. All backfill material shall be compacted to a density equal to 95% of the Standard Proctor maximum dry density as defined by ASTM D698. The Contractor may add moisture or dry the backfill material as required.

C. Compaction shall be done in such a way so that the equipment is not used directly over the pipe until sufficient backfill has been placed so that the equipment will not have a damaging effect on the pipe.

2.4 STONE STABILIZATION

A. When trench conditions or the bottoms of excavations for structures are such as to require stabilization of the bed, the Contractor shall remove the unstable material in the excavation and replace it with stabilizer material. Stabilizer material shall be either stone having a maximum size of 3/4", or other hard, durable material obtained from local sources and approved by the A/E.

2.5 PIPE LAYING

A. Proper implement tools and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of the work. All pipe, fittings, valves and specials shall be carefully lowered into the trench, piece by piece, by means of a derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to the water line materials and protective coating and linings. Under no circumstances shall water line materials be dropped or dumped into the trench.

B. All pipe and fittings shall be carefully examined for defects and no piece shall be laid which is known to be defective. Before lowering, and while suspended, cast and ductile iron pipe may be gently tapped with a hammer to sound for cracks. Any defective, damaged, or unsound pipe shall be rejected. If any defective piece shall be discovered after having been laid, it shall be removed and replaced with sound ones at the Contractor's expense. All pipes and fittings shall be thoroughly cleaned before they are laid, and shall be kept clean until accepted in the completed work.

C. The pipe shall be supported its full length by the uniform grade of the trench, and a bell hole shall be dug at each joint, said hole being of sufficient size to ensure the proper "making up" of each joint. Pipe ends shall not be left open such as at the end of a day's work or during temporary suspension of construction, but shall be securely covered to prevent the entry of foreign matter or small animals. Kinks or sharp bends giving excessive deflection or which put pipe joints in strain will not be permitted. Horizontal and vertical curvature, where fittings are not specified, can be obtained by cutting pipe to short lengths.

D. When cutting short lengths of pipe, pipe cutter will be used, and care will be taken to make the cut at right angles to the centerline of the pipe.

E. Thrust blocking, pads, straps and clamp, and rod assemblies shall be provided at fittings, valves, and changes of direction.

F. Clamps, rods, straps, nuts, and bolts shall be coated with coal tar enamel after assembly and installation.

G. All underground water piping shall have a minimum depth of cover of at least 30 inches.

2.6 SEPARATION

A. Water and sewer pipes shall be separated by not less than five (5) feet of undisturbed or compacted earth.

1. Exceptions:

a. The required separation distance shall not apply where the bottom of the water pipe within five feet of the sewer pipe is not less than twelve inches above the top of the highest point of the sewer pipe. The water pipe is permitted to be located in the same trench with the sewer pipe.
b. The required separation distance shall not apply where a water line crosses a sewer line, provided the water line is sleeved to a point not less than five feet horizontally from the sewer pipe centerline on both sides of such crossing.

2.7 SHEETING, SHORING, AND BRACING

A. Furnish and install all sheeting, shoring, and bracing required for the protection of trench and structure excavations, existing structures, and utilities including such temporary sheeting as may be required by the Contractor's operation not specifically shown or specified.

B. Sheeting, shoring, and bracing shall meet the requirements of the following standard publications.

1. AASHTO M 168 Standard specifications for structural timber, lumber and piling.
2. ASTM D 390 Specification for coal-tar creosote for the preservation treatment of piles, poles, and timbers for land and fresh water use.
3. ASTM D 1760 Specification for pressure treatment of timber products.

2.8 CLEARING

A. Perform all clearing work required for the installation of the complete work. Clearing shall consist of the removal and disposal of all trees, stumps, roots, brush, or debris in the way of the work and the disposal of such items at an approved landfill.

2.9 UNLOADING MATERIALS

A. Pipe, fittings, and other materials shall be carefully handled so as to prevent breakage and so as to prevent damage to the cement lining in pipe and fittings. Pipe shall not be unloaded by rolling or dropping off of trucks or cars but shall be handled by carefully lifting and lowering into position using approved slings or clamps which shall be provided for the purpose.

2.10 SIGNS, BARRICADES, ETC.

A. Furnish and install all necessary and required signs, barricades, flagmen, protection devices, etc. as required to protect persons and to protect the materials and services provided under this contract.

2.11 CARE OF EXISTING UTILITIES

A. The general location of buried utilities and structures has been indicated on the plans from the best information available. The locations shown on the plans do not imply a guarantee of their accuracy or completeness.

B. It is the Contractor's responsibility to accurately locate all utilities, structures, and appurtenances in the field. Make all arrangements and liaisons with the utility companies concerned to mark their lines, structures, and appurtenances by coded symbols on the pavement or marked stakes for flags.

END OF SECTION

SECTION 220510 – DO CUMENTATION AND CLOSEOUT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, tools and equipment and perform all operations in connection with the project documentation and closeout.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. All reports, forms, and manuals shall be submitted to the A/E in triplicate unless additional copies are noted.

B. Reports, forms, and manuals are to be submitted as soon as possible, but no later than thirty (30) days after the earliest date they can be prepared.

3.2 OWNER TRAINING

A. The contractor shall schedule the training on equipment and systems at least 21 days before the training is to take place. The contractor shall provide multiple dates and times for the training to allow the Owner to coordinate the schedules of their staff to be trained.

B. The contractor shall provide all training aids, manuals, etc. for the Owner’s staff at the training classes. These are in addition to whatever is required for the Operations and Maintenance manuals. The contractor shall coordinate the number required with the Owner but shall include a maximum of 8 sets for the training class.

C. The person providing the training shall be thoroughly knowledgeable in the subject matter.

3.3 PROJECT JOB DRAWINGS AND AS-BUILT DRAWINGS

A. Keep a record set of drawings on the job and, as construction progresses, shall show the actual installed location of all items, material, and equipment on the project job drawings.

B. At the time of final inspection, one corrected set of prints shall be delivered to the A/E. All drawing costs have to be by the Contractor.

C. As built drawings shall have the information transferred from the project job drawings including all addendum, supplemental instructions, change orders, and similar information.

D. Qualified draftsmen shall perform this task.

3.4 OPERATING AND MAINTENANCE MANUALS

A. Compile and bind three (3) sets of all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. Provide a PDF of this information on a CD.

B. The binder shall be hard cover, three-ring notebook, embossed with the name of the project, 11" x 8-1/2" with heavy duty rings. Maximum binder size shall be 2-1/2".

C. The spine of the binder shall be titled "Plumbing Operating and Maintenance Manual," with the name of the project and the date under the title.

D. Where laminated documents are required, only one set shall be provided.

E. The Operating and Maintenance Manual shall include the following:

1. Cover sheet in each binder listing the architect, engineer, and all contractors. List addresses and phone numbers.
2. List name, address and phone number of organization responsible for warranty work, if other than Contractor, and the specific work for which he is responsible.
3. List name, address and phone number of the nearest sales and the nearest service organization for each product.
4. Schedules of all equipment including identification tag numbers shown on plans cross referenced to field applied identification tag numbers.
5. Performance Curves: For pumps, balance valves, and similar equipment at the operating conditions.
6. Lubrication Schedule: Indicating type and frequency of lubrication required.
7. List of Spare Parts: Recommended for normal service requirements. Each piece of equipment shall have this list clearly marked or attached to this submittal.
8. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
9. Instruction Books: May be standard booklets but shall be clearly marked to indicate applicable equipment and characteristics.
10. Wiring Diagrams: Generalized diagrams are not acceptable; submittal shall be specifically prepared for this Project.
11. Schedule identifying valve type, size, service, and general location.
12. Ceiling marker schedule.
13. All factory test reports were specified.
14. All start-up reports.

F. The following diagrams, schematics, and lists shall be laminated 11" x 17" as needed for clarity:

1. Valve tag list and schematic.

3.5 ENGINEERING FIELD REPORTS AND FINAL INSPECTION REPORTS

A. The A/E will review the Contractor's work periodically throughout the project. A report will be submitted to the Contractor.

B. The reports shall be responded to within ten days of receipt by the Contractor. Each item shall be addressed with comments written on the inspection report if possible. Contractor's response shall address the status of each item and all discrepancies.

3.6 OPERATION AND MAINTENANCE INSTRUCTIONS

A. After all final tests and adjustments have been completed, the Owner's Representatives shall be instructed in all details of operation and maintenance for the systems installed.

B. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.

C. Fifty percent of instructions shall be in a formal classroom setting.

D. Instruction shall be provided as follows:

1. Equipment: Trained factory representative
2. System: Competent employee of the Contractor

3.7 ACCEPTANCE

A. Upon notification by the Contractor and after completion of Operation and Maintenance Instructions, the A/E will visit the project for a demonstration of the building system and an inspection of the completed work.

B. Items which do not comply with the Contract Documents, or which function incorrectly will be listed. The list will be provided by the A/E to the Contractor for correction of the installed work.

C. After all corrections have been made, the Contractor shall notify the A/E who will recheck the systems for compliance of all items listed.

PART 4 - STANDARD FORMS

4.1 GENERAL

A. All forms shall be completely filled out by the Contractor prior to acceptance of the project by the A/E.

4.2 PLUMBING CLOSEOUT LIST

PLUMBING CLOSEOUT DOCUMENT **PROJECT: Clarendon County 911 EOC** **BGA PROJECT NO.: 24004**			
DOCUMENT	**DATE REVIEWED**	**DATE RETURNED**	**COMMENTS**
Water Quality Report			
Backflow Preventer Test Report			
Plumbing marked-up As-Builts (1 set red lined)			
Factory Test Reports			
Equipment Start-Up Reports			
Piping Start-Up Reports			
Valve Tag List			
Punchlist dated _____			
Punchlist dated _____			
Punchlist dated _____			
Walk-Through with Owner			
NOTE: Not all closeout documents may be listed. See other sections of specifications for additional requirements.			

4.3 PLUMBING INSTRUCTIONS TO OWNER

PLUMBING INSTRUCTIONS TO OWNER

PROJECT: Clarendon County 911 EOC

BGA PROJECT NO.: 24004

INSTRUCTIONS	DATE/TIME SCHEDULED	MINIMUM SPECIFIED HOURS	ESTIMATED HOURS OF INSTRUCTION	PERSONS ATTENDING	COPY OF SIGN-IN LIST SENT TO BGA
Plumbing General					

NOTE: Not all instructions may be listed. See other sections of specifications for additional requirements. Up to 8 sets of training material required. Provide per number of persons indicated. Where no minimum specified hours are indicated, training shall be provided as necessary for the technician to provide the Owner a good understanding of the operation, function, and maintenance requirements of the equipment or system installed.

4.4 PLUMBING SPARE MATERIALS

PLUMBING SPARE MATERIALS LIST **PROJECT: Clarendon County 911 EOC** **BGA PROJECT NO.: 24004**			
ITEM	**DATE DELIVERED**	**ACCEPTED BY**	**COPY OF RECEIPT SENT TO BGA**
Pump Seals			
Keys for Stops			
Gauges			
Keys			
Tools			
NOTE: Not all spare materials may be listed. See other sections of specifications for additional requirements.			

4.5 INSTRUCTIONS TO OWNER:

OWNER INSTRUCTIONS SIGN-IN SHEET

PROJECT: Clarendon County 911 EOC

BGA PROJECT NO.: 24004

SYSTEM/EQUIPMENT:	DATE	TIME		LOCATION:
		START	FINISH	

INSTRUCTORS (PRINT NAME AND SIGN)

1. _____

2. _____

ATTENDEES (PRINT NAME AND SIGN)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

WRITTEN MATERIALS PROVIDED TO ALL ATTENDEES: _____ YES _____ NO

INSTRUCTIONS IN CLASSROOM: _____ YES _____ NO

INSTRUCTIONS IN FIELD: _____ YES _____ NO

END OF SECTION

SECTION 220511 - SUBMITTALS

PART 1 – GENERAL

1.1 GENERAL

A. Refer to Division 1 specification for information and shop drawings and submittals requirements. When conflicts exist, the more stringent requirements shall apply.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 PREPARATION OF SUBMITTALS

A. Before preparing submittals, consult all contract drawings and specifications in detail, obtain manufacturer's recommended installation instructions, and have shop drawings prepared based on specific equipment and material intended for installation. Obtain all drawings and submittals from other trades as necessary to coordinate submittals.

B. Sign all shop drawings indicating conformance with contract documents before submitting to the A/E.

1.4 SUBMITTALS

A. General:

1. Submittals are required on all items of equipment.
2. Submittals shall be bound with an index identifying all types of equipment or system components included. All like items shall be grouped together.
3. Submittals shall include, but not be limited to:

    a. All requirements of Division 1.
    b. Complete information pertaining to appurtenances and accessories
    c. Information properly marked with service or function identification as related to the project.
    d. Where the submittal consists of catalog sheets displaying other items which are not applicable, the proper features shall be clearly identified.
    e. External connections properly marked, as related to the specific use intended, on standard factory assembly and field installation drawings.
    f. All performance characteristics and physical characteristics.
    g. Wiring and control diagram.
    h. All requirements listed in the specific section of specifications.

i. Electrical data on all motors is greater than one horsepower. Data shall include horsepower unit served, power factor, efficiency and product of P.F. x EFF.

B. Field Fabricated Components:

1. When field fabricated components are permitted by the specifications, scaled detailed drawings shall be submitted, clearly showing the materials used, dimensions, sizes, and means of assembly. For example, drawings shall be submitted for pump housings (insulation), support stands, etc.

C. Submittal Summary:

1. A submittal summary shall be prepared by the contractor within (30) (60) days of project award.
2. The summary shall include all products and samples to be submitted along with the date the submittal will be received by the prime contractor.

1.5 SAMPLES

A. Samples shall be provided when specified or required by the A/E to check product acceptability or for coordination purposes.

B. Samples will not be returned and shall not be included in the total required on the project.

1.6 REVIEW OF SUBMITTALS

A. Review of shop drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless the Contractor has, in letter form, called attention to such deviations at the time of submission and secured written approval of the specific deviations.

B. Any materials and equipment listed which are not in accordance with the equipment shown on the schedule shall be of size and physical arrangement to allow unobstructed access, when installed, for routine maintenance, coil removal, shaft removal, motor removal and other similar operations. Deviation from the characteristics of that equipment or layout system components will not necessarily be cause for rejection. Review of submittal does not relieve the Contractor of his responsibility. Should an installation not meet the intent of the contract documents, the Contractor may be required by the A/E to modify or replace equipment or system components with all costs, direct and indirect, borne by the Contractor.

C. It is strongly recommended that the Contractor not purchase or install any equipment or system components prior to receipt of reviewed shop drawings.

D. Reviewed with notations on the submittal shall not prohibit the Contractor from purchasing equipment. If the Contractor does not comply with the notations, the submittal shall be deemed rejected.

1.7 EQUIPMENT DIMENSIONS AND WEIGHTS

A. The contract documents may indicate specific equipment dimensions. The Contractor is responsible for verification of the dimensions for the equipment submitted prior to submitting shop drawings. Equipment larger than the equipment indicated on the contract documents may not be acceptable to the A/E.

B. The contract documents may indicate specific equipment weights. The Contractor is responsible for verification of the weight of the equipment submitted prior to submitting shop drawings. Equipment weighing more than the equipment indicated on the contract documents may not be acceptable to the A/E.

C. Equipment shall not exceed maximum weight indicated on the schedules. If the equipment weight exceeds that indicated on the schedule, even where the manufacturer is an approved manufacturer, that equipment cannot be bid on for this project.

D. If equipment is not acceptable to the A/E due to dimensions or weights exceeding those indicated on contract documents, the Contractor shall accept all responsibility and costs for providing equipment that meets the dimension and weight requirements of the contract documents.

1.8 ELECTRICAL CHARACTERISTICS

A. Electrical characteristics for plumbing equipment are generally indicated on the plumbing documents. The electrical documents generally indicate power and wiring requirements to each piece of plumbing equipment.

B. It shall be the plumbing installer's responsibility to verify prior to submitting shop drawings that the equipment submitted meets the electrical requirements of both the plumbing and electrical documents. If there is a discrepancy, the contractor shall bring the discrepancy to the A/E's attention prior to submitting shop drawings.

C. If the discrepancy is brought to the A/E's attention prior to ordering the plumbing equipment or electrical materials associated with that equipment, the A/E will issue additional instructions to the Contractor.

D. If the discrepancy is not brought to the A/E's attention prior to ordering the plumbing equipment and electrical materials (i.e. Contractor does not verify electrical requirements), the Contractor shall be responsible for all costs except those that would have been incurred if the discrepancy was determined prior to ordering the plumbing equipment and electrical materials.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRODUCT SUBMITTALS:

A. The following list may be used as a checklist for the contractor and A/E. All products may not be listed.

PRODUCT SUBMITTALS

BGA NO.	PRODUCT	NO.	DATE		STATUS				ITEMS TO RESUBMIT	DATE ITEMS RESUBMITTED
			In	Out	App.	AAN	Resub.	Rej.		
	Balancing Valves									
	Chair Carriers									
	Dielectric Fittings									
	Equipment and Pipe Identification									
	Expansion Tank									
	Firestop Material									
	Fittings and Flange Certificates									
	Insulation, Mastics, and Sealants									
	List of Pipe and Fitting Material for Each System									
	No Hub Pipe Clamps									
	Pipe and Pipe Fittings									
	Pipe Hangers and Supports									
	Pipe Shields									
	Pipe Sleeves									
	Plumbing Fixtures									
	Pumps									
	Seismic Products									
	Strainers									
	Temperatures and Pressure Relief Valves									
	Thermometers and Gauges									
	Trap Seal Protection Device									
	Valves									
	Wall Hydrants									
	Water Heaters									

3.2 TEST AND REPORT SUBMITTALS

A. The following list may be used as a checklist for the Contractor and A/E. All tests may not be listed.

1. Plumbing piping.
2. Soil resistivity test for fuel oil tank installation.
3. System start-up.
4. Vibration isolation installation report.

3.3 COORDINATION DRAWING SUBMITTAL

A. This section may not include all drawings required. See specific specifications for additional requirements. All drawings shall be drawn 1/4" = 1'-0" minimum. Each system shall be represented by a different color.

B. Review structural and architectural drawings to determine method of attachment or support of pipe and equipment to slabs, walls, and other structural elements.

C. Coordination Drawings:

1. Provide dimensional coordination drawings of the following:

a. Building elements:

1) Walls
2) Casework (built-in)
3) Ceiling
4) Structure (located in ceiling plenum)

b. Plumbing elements:

1) Piping and valve
2) Water heaters
3) Other plumbing equipment (with required clearances)

c. Other system elements:

1) Lights
2) Cable tray
3) Sprinkler system
4) HVAC ductwork and equipment
5) HVAC piping
6) Conduit 1-1/2" and above

2. Drawings shall have the following line weights:

a. Building elements and lights – light
b. Duct, piping, conduit – medium
c. Equipment – heavy

3. Each system shall be provided with a different color line.
4. All non-essential text, symbols, objects, etc. (not necessary for systems coordination) shall be omitted from the coordination drawings.
5. Submit drawings for entire project.
6. Drawings shall be submitted in color.

D. Provide dimensional drawings in plan with all site utilities shown.

E. Provide dimensional drawings on a plan indicating the following:

1. Size and location of all rooftop equipment, equipment weights, and roof penetrations.
2. Size and location of all concrete housekeeping pads.
3. Size and location of all slab penetrations.
4. Size and location of all precast wall penetrations.
5. Size and location of all prestressed tee penetrations.

F. All roof penetrations and equipment shall be drawn on approved roof structural plans to coordinate openings with structural elements.

G. When equipment is to be installed on supports provided by installers other than Division 22, the Division 22 installer shall provide:

1. Size, orientation, weights, and connection locations for all equipment to be installed. Information shall include all seismic components, point loads, elevations, etc.
2. Location and required size and elevation of all pipe and duct supports.

3.4 SHOP DRAWING SUBMITTAL COVER SHEET

A. A separate cover sheet shall be submitted with each product type (i.e., valves can be submitted together, etc.).

3.5 SHOP DRAWING SUBMITTAL COVER SHEET
(Provide one page for each group of shop drawings.)

Project Name: Clarendon County 911 EOC **BGA File No. 24004-5-33**
Owner Project No. _____ **BGA Shop Dwg. No.** _____

Product: _____

Note To Contractor

1. All shop drawing comments by Buford Goff & Associates shall be complied with or the shop drawings shall be declared rejected.
2. If this form is not submitted and signed by the Contractor, the Contractor shall verify that items 1 to 8 below are answered YES or N/A or the shop drawings shall be declared rejected.
3. Valves, plumbing fixtures, etc., are reviewed for characteristics but not for size and quantity. It is the Contractor's responsibility to verify sizes and quantity.

Shop Drawing Submittal (Contractor to complete this section)

1. Does the submittal comply with the contract documents? ☐ Yes ☐ No

   If no, list all deviations on an attached page.
2. Have the electrical characteristics (i.e., volt/phase/amps, MOP, MCA, and connection location) been reviewed with the electrical schedules and the electrical circuit sizing meet the requirements of that equipment? ☐ Yes ☐ No ☐ N/A
3. Is product an approved manufacturer listed in the specifications or addendum? ☐ Yes ☐ No ☐ N/A
4. Does the product submitted meet the manufacturer's recommended service clearance for the space in which it is to be installed? ☐ Yes ☐ No ☐ N/A
5. Have the control components of the product been reviewed and do they meet with the requirements of the controls contractor? ☐ Yes ☐ No ☐ N/A
6. Have the equipment connections been reviewed (size and locations) and has the Contractor included all provisions to make the required connections? ☐ Yes ☐ No ☐ N/A
7. Has the seismic engineer reviewed and approved the method of connecting seismic restraints to equipment? ☐ Yes ☐ No ☐ N/A
8. Is the equipment within the weight limitations specified, if any? ☐ Yes ☐ No ☐ N/A

BGA's Shop Drawing Stamp (Engineer to complete this section)

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Contractor is responsible for specific compliance with the information given in the Contract Documents; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades, and the safe and satisfactory performance of his work.

☐ Reviewed ☐ Reviewed as Noted ☐ Revise and Resubmit ☐ Revise and Resubmit Items Indicated
☐ See attached for additional comments ☐ Reject

Comments: _____

_____

_____

_____ **Reviewer**: _____ **Date**: _____

END OF SECTION

SECTION 220517 - SLEEVES, SEALS, AND ESCUTCHEONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of sleeves, seals, and escutcheons where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section. In addition, refer to these specification sections:

1. Section 220503 - Demolition, Patching and Repair
2. Section 220507 - Firestopping and Smokestopping
3. Section 221100 – Plumbing Piping

1.3 QUALITY ASSURANCE

A. Manufacturers:

1. The following mechanical seal and sleeve manufacturers are acceptable:

a. Thunderline Corporation
b. Metraflex

PART 2 - PRODUCTS

2.1 SLEEVES

A. General:

1. Provide sleeves for each pipe passing through walls, partitions, floors, and roofs unless specific details indicate otherwise.
2. Provide sleeves where required by UL fire stop assembly selected.
3. Do not provide sleeve when not permitted by UL firestop assembly selected.

B. Type:

1. Sleeves in non-masonry or concrete construction shall be minimum 24-gauge sheet metal.
2. Sleeves in masonry or concrete construction shall be schedule 40 black or galvanized steel.
3. Sleeves in membrane or waterproof construction shall have flashing ring or other method acceptable to the membrane or waterproofing manufacturer.
4. Sleeves provided at floor slabs and support piping weight shall be cast in place and have a minimum of four anchoring tabs.
5. Split sleeves shall be permitted only when approved by the Engineer.

C. Sleeve Sizes:

1. Sleeves for uninsulated piping shall be two pipe sizes larger than pipe passing through or a minimum of 1/2" clearance between inside of sleeve and outside of pipe.
2. Sleeves for insulated piping shall be adequate size to accommodate the full thickness of pipe covering with clearance for packing and caulking.
3. Sleeves for branches off of risers shall be sized as required for insulated or uninsulated pipe and shall also be sized to accommodate expansion of riser.
4. Sleeves for pipe passing through a foundation wall or under a footing shall be two pipe sizes greater than pipe passing through.

D. Sleeve Length:

1. Sleeves shall be equal to the thickness of construction and terminated flush with surfaces.

E. Sleeve Packing:

1. Sleeves shall be packed as follows:

    a. As indicated on detail or firestopping specification.
    b. If not indicated otherwise, seal the entire sleeve at exterior wall with silicone caulk.

F. Fire Rated Assemblies:

1. Provide sleeve where required by UL firestop assembly utilized.
2. Do not provide sleeve where not permitted by UL firestop assembly utilized.
3. Sleeve size, length and type shall be equal to that required for the UL firestop assembly utilized.

2.2 ESCUTCHEONS

A. General:

1. Escutcheons shall be chrome plated brass.
2. Escutcheons shall be held in place by internal spring tension or set screws.
3. Escutcheon plates shall be large enough to completely close hole around pipes and sleeve and shall be square, octagonal or round.

B. Escutcheons shall be located:

1. On all exposed piping through walls, floors, partitions and ceilings except in unoccupied equipment rooms (i.e. boiler rooms and similar spaces).
2. At all piping in casework.

2.3 MECHANICAL SEALS

A. General:

1. Provide mechanical seals and sleeves at all pipe exiting building below slab and all pipe exiting basement utility spaces (i.e. mechanical room, etc.).
2. All pipe shall have seals and sleeves including but not limited to:

a. Domestic water
b. Sanitary sewer
c. Acid waste
d. Conduit

B. Sleeves:

1. Sleeves shall be constructed of high impact thermoplastic with water stop and anchor collar.
2. Sleeve shall be of length and size required for each pipe and wall thickness. Basement walls are approximately 30" thick.
3. Sleeve shall be:

a. Link Seal Type Century line sleeve model CS.
b. Metraflex wall sleeve

C. Seal:

1. The seal shall be constructed of interlocking rubber links.
2. Seal shall be:

a. Link Seal
b. Metraseal

PART 3 - EXECUTION

3.1 GENERAL

A. Installation:

1. Install sleeve at the time of construction of assembly.
2. Sleeve shall be grouted in place with appropriate grout to match construction.
3. Pipe shall be centered to the extent practical in the sleeve. Where proper firestopping or insulation cannot be installed, sleeve shall be reset.

3.2 MECHANICAL SEAL

A. Install short section of capped pipe and test integrity of sleeve as recommended by the manufacturer.

END OF SECTION

SECTION 220519 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of gauges where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Manufacturer:

1. The following thermometer, pressure gauge and accessories manufacturers are acceptable:

a. Trerice
b. Weksler
c. Weiss
d. MILJOCO

PART 2 - PRODUCTS

2.1 GENERAL

A. Gauges shall be suitable for the environment in which it is to be installed. Gauges installed outside shall be rust-proof and weather-resistant.

B. Compound gauges shall be provided when both positive pressure and a vacuum can occur.

C. All gauges shall be equipped with a 1/4" brass ball valve and shall be removable from hydronic and steam systems without loss of medium.

D. Gauges installed outside shall be nonfreeze type to 0 degrees F.

E. Gauges shall have extension to extend a minimum of 1" greater than the thickness of the insulation.

2.2 THERMOMETERS

A. Thermometer shall be provided at all thermometer wells.

B. Thermometers shall be red reading, non-mercury, adjustable stem, angle type complete with sensing element.

C. The case shall be aluminum with baked black enamel finish (or molded black nylon glass fiber reinforced). Front shall be plastic. The scale shall be 9" with black numerals on a white background. Case shall be rot. ble.

D. The sensing element shall be brass or aluminum extension, swivel union, and brass separable socket.

E. Thermometers shall be accurate to within (+) or (-) one of the smallest divisions throughout the entire range.

F. Thermometers shall be located so as to be easily read. In such cases where the thermometer cannot be easily located so as to be easily read, a remote reading type thermometer shall be installed.

G. Thermometers used for liquid temperature shall be angle or straight way, with brass separable sockets.

H. Where thermometers are installed in piping or tanks to be covered, they shall have an extension neck extending through the covering.

I. Thermometers shall be so selected that normal operating temperature will be in the mid-range of the thermometer. Thermometers shall have a maximum of 2 degrees between graduations and shall have a maximum of 10 degrees between figures.

J. Thermometers shall be:

1. Weiss Type 9 VU

2.3 THERMOMETER WELLS

A. Thermometer wells shall be provided at all heat transfer devices at inlet and outlet conditions including but not limited to:

1. Locations shown on plans and details.

B. Thermometer wells shall be designed to hold an engraved stem thermometer. The wells shall be made of heavy brass and shall be approximately 6 inches long, shall project 2-1/2 inches into the pipe and shall have dust protecting caps and chains. Pipes smaller than 3 inches shall be enlarged at the points where the wells are installed. Wells shall be set vertical or at an angle so as to retain oil.

C. Thermometer wells shall be:

1. Trerice
2. Marshalltown
3. Ashcroft

2.4 PRESSURE GAUGES

A. Pressure gauges shall be provided at all heat transfer devices at inlet and outlet conditions.

B. Pressure gauges shall be single spring bourdon tube type with wear resisting moving parts and adjustable linkage. Gauge movement shall be suitably mounted in a cast aluminum case, baked black enamel finish, with glass front and plain removable ring. Gauges shall have 4-inch dials.

C. Pressure gauges shall be accurate to within (+) or (-) 1.6% full scale.

D. Range of gauge for each particular point of application shall be selected so that pointer is approximately in midpoint of scale under normal operating conditions.

E. Pressure gauges shall be:

1. Trerice
2. Ashcroft
3. Marshalltown

PART 3 - EXECUTION

3.1 CALIBRATION

A. After installation, check and calibrate all devices where field calibration is practical.

3.2 THERMOMETERS

A. Thermometers shall be installed to be easily read from floor level, not over 8'-0" above floor. Where higher mounting heights are necessary remote reading type shall be substituted for model specified.

END OF SECTION

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING – “LEAD FREE”

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valve.
2. Ductile-iron, single-flange butterfly valve.
3. Check valves.
4. Iron, center-guided check valve.
5. Bronze gate valve.
6. Automatic Flow Control valves.
7. Balance valves (Calibrated).
8. Water Pressure Reducing valves.
9. Thermostatic Water Mixing valves.
10. Pressure Relief valves.
11. Temperature Relief valves.

B. Related Sections:

1. All sections of Division 22 Specifications apply to this section.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. PTFE: Polytetrafluoroethylene plastic.

H. SWP: Steam working pressure.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from a single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.
7. ASME B16.10 for ferrous valve dimensions.
8. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF/ANSI 61-G and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.

D. Manufacturers:

1. The following ball valve manufacturers are acceptable:

a. Apollo
b. Nibco
c. Milwaukee

2. The following ductile iron butterfly valve manufacturers are acceptable:

a. Apollo
b. Nibco
c. Milwaukee

3. The following globe and check valve manufacturers are acceptable:

a. Apollo
b. Nibco
c. Milwaukee

4. The following automatic flow control valve manufacturers are acceptable:

a. Griswold Controls
b. CircuitSolver by Therm Omega Tech

5. The following balance valve (calibrated) manufacturers are acceptable.

a. Bell and Gossett

6. The following water pressure reducing valve manufacturers are acceptable:

    a. Apollo
    b. Wilkins
    c. Watts Regulator Company

7. The following thermostatic mixing valves are acceptable:

    a. Leonard
    b. Symmons
    c. Rada
    d. Lawler
    e. Apollo

8. The following temperature and pressure relief valve manufacturers are acceptable:

    a. Watts Regulator Company
    b. McDonnel and Miller, Inc.
    c. Apollo

1.6 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 and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Products that come in contact with potable water shall be comply with NSF/ANSI 61-G and/or NSF/ANSI 372. Provide certification of product when requested by Architect/Engineer.

B. All domestic water (i.e., cold water, hot water and hot water recirculating) shut off valves shall be lead free ball valves for piping 2-1/2" and smaller and lead-free butterfly valves for piping 3" and larger unless noted otherwise.

C. Where specifically noted on drawings or acceptable (in writing) to Engineer, gate and globe valves may be used in domestic water lines where throttling flow (i.e., globe valve) is required or water hammer (i.e., gate or globe valve) is a concern.

D. Bronze valves shall be made with dezincification-resistant materials. Manufacturer shall provide third party certification. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Bronze Valves: NPS 2-1/2 and smaller with threaded or solder ends, unless otherwise indicated.

F. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

G. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

H. Valve Sizes: Same as upstream piping unless otherwise indicated.

I. Valves in Insulated Piping: With 2-1/4” inch (minimum) stem extensions and the following features:

1. Ball Valves (2" and smaller): With extended operating handle of non-thermal-conductive material that meets UL 2043 approved for inside air plenum, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.

    a. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo “Therma-Seal” insulating tee-handle (-11 suffix in figure no.), NIBCO NIB-SEAL (-NS suffix in figure no.) handle extension; or equal.

2. Ball Valves (2-1/2" and larger): Shall have minimum 2-1/4" (or ½" greater than insulation thickness) extended operating handle that allows operation of valve without disturbing insulation.
3. Butterfly Valves: Shall have minimum 2" (or ½" greater than insulation thickness) extended operating handle that allows operation of valve without disturbing insulation.
4. Gate Valves: With rising stem.

J. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES (2-1/2" and Smaller)

A. Two-piece, full port, Lead Free bronze ball valves with the capability of accepting extended operating handles.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo Model 77CLF-A Series (-11 Therma-Seal for valves installed in insulated systems).
2. Description:

a. Standard: MSS SP-110
b. CWP Rating: 600 psig
c. Body Design: Two pieces.
d. Body Material: Lead Free or Silicon bronze (ASTM Listed), corrosion resistant.
e. Ends: Threaded or soldered
f. Seats: Reinforced PTFE or TFE
g. Stem: Lead free brass
h. Ball: Lead free brass chrome plated
i. Port: Full

B. Three-Piece, full port, Lead Free or silicon bronze ball valves with the capability of accepting extended operating handles:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo Model 82LF-100 or 200 Series (-11 Therma-Seal for valves installed in insulated systems).
2. Description:

a. Standard: MSS SP-110
b. CWP Rating: 600 psig
c. Body Design: Three pieces
d. Body Material: Forged brass
e. Ends: Threaded or soldered
f. Seats: Reinforced PTFE or PTFE
g. Stem: Lead free brass or silicon bronze
h. Ball: Lead free brass or silicon bronze, chrome plated
i. Port: Full

2.3 DUCTILE IRON, SINGLE-FLANGE BUTTERFLY VALVES (3" and Larger)

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless Steel or Aluminum-Bronze Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo Model LD145 Series.
2. Description:

a. Standard: MSS SP-67, Type I
b. NPS 12 and Smaller CWP Rating: 200 psig
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 536, ductile iron

e. Seat: EPDM
f. Stem: One-piece stainless steel
g. Disc: Stainless Steel or Lead-Free Aluminum bronze

2.4 CHECK VALVES

A. General:

1. Swing check valves shall be installed in horizontal lines or vertical lines where flow is upwards.
2. Lift check valves shall be installed in horizontal lines.

B. BRONZE SWING CHECK VALVES (2" and Smaller):

1. 200 CWP, Bronze Swing Check Valves with Bronze Disc:

a. Basis-of-Design Product: Subject to compliance with requirements, provide Apollo Model 161S/T-LF.
b. Description:

1) Standard: MSS SP-139
2) CWP Rating: 200 psig
3) Body Design: Y pattern, horizontal flow
4) Body Material: ASTM B584 bronze
5) Ends: Threaded or Soldered
6) Disc: Renewable Bronze

C. BRONZE LIFT CHECK VALVES (2" and Smaller):

1. 250 CWP, Lift Check Valves with Nonmetallic TFE Disc:

a. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S-480-Y-LF.
b. Description:

1) Standard: MSS SP-139
2) CWP Rating: 250 psig.
3) Body Material: Silicon bronze (ASTM Listed), corrosion resistant.
4) Ends: Threaded or Soldered.
5) Disc: PTFE.

2.5 AUTOMATIC FLOW CONTROL VALVES – LEAD FREE (1/2" THRU 1-1/2")

A. General:

1. The flow limiting control valve shall regulate flow with ±5 %.
2. The movable parts of the flow limiting valve shall be removable from the installed valve.
3. All valve assemblies shall include, as a minimum, 2 combination P/T ports and manual air vent with cap retainers, internal 20 mesh stainless steel strainer, and union.
4. Provide manufacturer molded insulation cover and valve tag to indicate flow rate and model number.

B. Threaded and Soldered Valves:

1. Threaded and soldered valves shall have all components manufactured from brass and 316 stainless steel. Valve shall be rated to 400 psig @ 275 deg. F.
2. Soldered valves available only for ½" and ¾" valves.

C. Valve Sizing:

1. Valves shall not exceed ASHRAE recommended GPM/pipe size.
2. Valves shall have a 2-32 psi control range for all systems unless indicated otherwise.

D. Valve shall be:

1. Griswold Controls “K Valve” Series.

2.6 BALANCE VALVES (Calibrated)

A. General:

1. Valves shall have differential read-out ports with integral check valves.
2. Valve shall have adjustment knob, memory stop indicator, insulated cover, calibrated nameplate, and positive shut-off.
3. Provide manufacturer molded insulation cover.
4. Valve shall be certified in accordance with NSF/ ANSI 61 and/or NSF/ANSI 372 for low lead requirements.

B. Balance valves (calibrated) for domestic water service and hot water recirculating line:

1. Valves 3 inches and smaller shall be lead free brass body, stainless steel ball, TFE seat rings, threaded or solder end type rated for 400 psi at 250 degrees F (WOG of 200 psi, solder type).

   a. B&G Circuit Setter Plus-LF Series

2. Low flow applications (less than 2 GPM) shall be lead free brass body, stainless steel ball, TFE seat rings, solder end type for 200 psi at 300 degrees F.

   a. B&G Circuit Setter Plus RF-LF Series

2.7 THERMOSTATIC WATER-MIXING VALVES

A. General:

1. Provide a manually adjustable, thermostatic water-mixing valve with bronze body.
2. Mixing valves shall be certified in accordance with NSF/ ANSI 61 and/or NSF/ANSI 372 for low lead requirements.
3. The valve shall include checkstop and union on hot-water and cold-water supply inlets, adjustable temperature setting, and capacity at pressure loss as indicated.
4. Bimetal thermostat shall be rated for 125 psig minimum.
5. Piping component finish shall be rough brass.

B. ASSE Requirements:

1. Mixing valves at point of source shall meet ASSE 1017.
2. Mixing valves at point of use shall meet ASSE 1070.
3. High/low type mixing valves shall meet ASSE 1017 and 1069.

C. Manifolded, thermostatic water mixing valve assemblies:

1. Provide factory fabricated unit consisting of parallel arrangement of thermostatic water-mixing valves.
2. The valve shall include one large-flow thermostatic water mixing valve with flow control valve, pressure regulator, inlet and outlet pressure gauges, and one small-flow thermostatic water-mixing valve with flow control valve.
3. Assembly shall include outlet thermometer and factory or field installed inlet and outlet valves.

2.8 PRESSURE RELIEF VALVES

A. General:

1. Pressure relief valves shall have a relieving capacity not less than the gross output of the equipment each one serves.
2. Valves shall be certified in accordance with NSF/ ANSI 61 and/or NSF/ANSI 372 for low lead requirements.
3. Valves shall be ASME coded and stamped.

B. Pressure relief valves for plumbing systems:

1. Pressure relief valves shall be for water systems, water heating equipment, and elsewhere as specified.

2.9 TEMPERATURE RELIEF VALVES

A. General:

1. Temperature relief valves shall be sized according to AGA Listing.
2. Valves shall be certified in accordance with NSF/ ANSI 61 and/or NSF/ANSI 372 for low lead requirements.
3. Valves shall be ASME coded and stamped.

B. Temperature relief valves for plumbing systems:

1. Temperature relief valves shall be provided for water heating equipment and elsewhere as specified.

2.10 PVC PIPING SYSTEMS

A. Valves shall be similar to those specified for metallic system but shall be PVC suitable for service in which they are to be installed.

2.11 DRAINS AND VENTS

A. A valve shall be provided at each equipment maintenance drain and where required for manual venting of air.

B. A stainless-steel ball valve shall be provided.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem upright at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. When soldering use paste fluxes that are approved by the manufacture for use with Lead Free Alloys.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 RELIEF VALVES

A. Combination temperature and pressure relief valves may be used where applicable.

B. Pipe full size of connection to floor drain or as shown on plans.

3.5 ACCESSORIES

A. Provide one key for each ten key operated air cocks installed.

B. Provide one wrench for each twenty balance valves installed. Minimum two per type.

C. Provide one new flow balance meter with hoses, attachments, and carrying case. Should more than one meter be required to adjust flows, the contractor shall provide one of each type.

D. Provide a sufficient number of devices necessary to operate and maintain this system.

3.6 THERMOSTATIC WATER MIXING VALVE

A. Start-Up and Testing:

1. The manufacturer's representative shall demonstrate to the Owner the proper operation of the valve.
2. The mixing valve, balance valve, and other devices in the system shall not be changed or adjusted in any way by the contractor without prior approval by the Owner.

3.7 AUTOMATIC FLOW VALVES

A. Valves shall be ordered only after equipment flows have been coordinated and submitted by the Contractor and reviewed by the A/E. Automatic flow valve manufacturer shall verify equipment flows before ordering.

END OF SECTION

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of supports and anchors on all piping and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Products not otherwise specified in these documents shall be furnished by the listed manufacturers and installed in accordance with the manufacturer’s recommendation.

B. Products used shall be consistent with industry practice for use in commercial or industrial installation.

C. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. ANSI B31.3 - Pressure Piping
b. National Fire Protection Association
c. Factory Mutual
d. International Building Codes
e. Manufacturer's Standardization Society Documents, MSS-SP-58, MSS-SP-69
f. Pipe Fabrication Institute, Standard ES-26
g. AISC Specification for the Design, Fabrication, and Erection of Structural Steel Buildings

D. Manufacturers:

1. The following pipe hanger and support manufacturers are acceptable:

a. Cooper B-Line
b. Pipe Hangers and Devices Mfg. Inc.

c. Anvil International
d. Elite Components

PART 2 - PRODUCTS

2.1 GENERAL

A. It shall be the Contractor's responsibility to provide an adequate pipe support system in accordance with recognized engineering practices using, where possible, standard, commercially available hangers, support, guides, anchors and accessories.

B. Model numbers are indicated for products not exposed to ambient conditions. The products exposed to ambient conditions shall be a similar product but with the material or finish specified for products exposed to ambient conditions.

C. Materials shall be selected to prevent electrolysis and minimize corrosion for the environment in which the product is to be installed.

D. Hanger shall be sized for insulation to run through hanger except small size domestic hot water piping as indicated.

2.2 SAFETY FACTOR

A. All attachments, rods, and accessories selected based on weight load shall be selected for a two times safety factor minimum.

2.3 SEISMIC RESTRAINTS

A. Where seismic restraints of components is required, attachments shall be per the requirements of the Vibration and Seismic Control for plumbing specifications.

2.4 PRODUCTS EXPOSED TO AMBIENT CONDITIONS

A. Materials:

1. The material for all accessories including, but not limited to, rods, bolts, fasteners, inserts, saddles, supports, anchors, clamps, auxiliary steel, and accessories shall be stainless steel or hot dipped galvanized unless specifically noted otherwise.

B. Hangers:

1. Clevis hanger shall be stainless steel or hot dipped galvanized finish.
2. Swivel loop hangers shall be zinc electroplate finish.
3. Roller hangers shall be zinc electroplate finish.

C. Supports:

1. Roller supports shall be zinc electroplate finish.

D. Shields:

1. Shields shall be stainless steel.

2.5 PIPE HANGERS, SUPPORTS, AND ACCESSORIES - GENERAL (INDOOR)

A. General:

1. Other finishes may be specified for specific applications.
2. All threaded rods shall be hot dipped galvanized or stainless steel.

B. Hangers:

1. Swivel loop hangers for insulated pipe shall be carbon steel with zinc electroplate finish.
2. Clevis hangers for insulated pipe shall be carbon steel or carbon steel with zinc electroplate finish.
3. Roller hangers shall be carbon steel with cast iron roller.

C. Supports:

1. Roller supports shall be carbon steel with cast iron roller.

D. Shields and saddles:

1. Shields shall be carbon steel with zinc electroplate finish.
2. Saddles shall be carbon steel.

E. Insulation at shield:

1. The insulation shall be full pipe coverage (360 degrees).
2. The insulation shall be calcium silicate with FRK jacket and self-sealing flaps.
3. Insulation shall be suitable for 20 degrees F to 1200 degrees F temperature and 100 psi compressive strength (minimum).
4. Insulation shall overhang shield by 1" (minimum) each side. Insulation shall be equal to thickness of adjacent pipe insulation.

2.6 PIPE HANGERS - INSULATED COLD PIPING

A. Pipe 2" and smaller - Swivel loop hanger with shield:

1. B-Line Fig. 200 with B3151 shield
2. At contractor's option, clevis hanger may be used.

2.7 PIPE HANGERS - INSULATED HOT PIPING

A. Pipe 2" and smaller (domestic hot water only) - swivel loop hanger with shield, clevis hanger with shield, or long leg clevis hanger:

1. B-Line Fig. 200 with B3151 shield

2.8 PIPE HANGERS - NON-INSULATED PIPE (STEEL, ALUMINUM AND CAST IRON)

A. All pipe sizes (cast iron pipe) - clevis hanger:

1. B-Line B3102

B. All pipe sizes (steel and aluminum pipe) - clevis hanger:

1. B-Line B3100

C. All pipe sizes (galvanized pipe) - clevis hanger:

1. B-Line B3100 (with hot dipped galvanized finish)
2. B-Line B3100 (with electro galvanized finish)

2.9 PIPE HANGERS - NON-INSULATED PIPE (COPPER)

A. All pipe sizes - Swivel loop hanger:

1. B-Line B3170 CTC (with PVC coating)

2.10 PIPE HANGERS - NON-INSULATED PIPE (PVC, ABS, CPVC, POLYPROPYLENE, PVDF)

A. Pipe 2" and smaller - swivel loop hanger:

1. B-Line Fig. 200C (with PVC coating)

2.11 SPECIAL HANGERS

A. General:

1. Finishes shall be provided equal to that specified elsewhere in these specifications for the specified piping system.

B. Limited headroom - clevis hangers:

1. B-Line B3109

2.12 PIPE SUPPORTS - GENERAL

A. General:

1. Finishes, shields, saddles, and shield insulation shall be provided as specified for pipe hangers for each system requiring pipe support.

B. Roll pipe support without vertical adjustment:

1. B-Line B3117SL

C. Roll pipe support with vertical adjustment:

1. B-Line B31185L
2. B-Line B3122

2.13 PIPE HANGER SPACING

A. General:

1. The maximum spacing for pipe hangers and supports shall not exceed those stated in these specifications or the hanger manufacturer's recommendations, which is less.
2. Where concentrated loads of valves, fittings, etc. occur, closer spacing will be necessary and shall be based on the weight to be supported and the maximum recommended loads for the hanger components.
3. Hangers shall be provided within 12" of each change of direction, at each valve, and at equipment connections.
4. Pipe not listed shall meet the spacing requirements of the manufacturer.

B. Cast Iron Pipe (no hub sanitary):

1. Pipe shall be supported at each horizontal joint, at each horizontal branch connection and each terminal end. Hanger shall be within twelve inches of the coupling.

C. Non-metallic Pipe (PVC):

1. Provide spacing as recommended by the manufacturer but no greater than 4 feet.

D. Aluminum:

1. Provide spacing as recommended by the manufacturer but no greater than 8 feet.

E. Copper Pipe and Tubing:

Size	Max. Span Ft.
Smaller than 1-1/2"	5
1½" and larger	8

F. Steel (Std. Weight):

Size	Max. Span Ft.
1½" and smaller	7
2" and larger	10

2.14 HANGER RODS

A. Threaded rods, if not indicated otherwise, shall be carbon steel with zinc electroplate finish.

B. Where seismic restraints of components are required, rod sizes shall be per the requirements of the Mechanical Sound, Vibration, and Controls specifications.

C. Rod capacity based upon ASTM A107 at 650 degrees F is as follows:

Rod Dia.	Max. Load	Max. Load (@ 2 x SF)
3/8	610	305
1/2	1130	565
5/8	1810	905
3/4	2710	1355
7/8	3770	1885
1	4960	2480

2.15 MISCELLANEOUS STRUCTURES

A. Metal Roofing Systems:

1. Provide steel angle stiffeners and supplemental steel as required by the metal roofing system manufacturer to attach hangers and supports to purlins.
2. Provide steel angles or channels to support hangers located between purlins.

2.16 AUXILIARY SUPPORTS, FASTENERS, AND ACCESSORIES

A. Provide all auxiliary supports, anchors, and fasteners necessary for the installation of piping, equipment, and accessories.

B. Support shall include angles, channels, flat steel, rods, bolts and appurtenances.

C. Special supports shall be provided where standard hanger, support, or attachments cannot be used. This includes, but is not limited to, use of trapeze supports, suspending supports from other supports (where acceptable to manufacturers, etc.).

2.17 SWAY BRACING

A. Sway bracing shall be located and constructed for pipe subject to horizontal movement unless movement is specifically designed to meet seismic requirements.

B. On no hub cast iron sanitary systems where top of pipe is more than 18 inches from hanger attachment point, sway bracing shall be provided on every other hanger.

2.18 CHANNEL SUPPORTS

A. General:

1. Channel supports shall be utilized wherever practical and whenever channel support provides a cleaner installation than individual attachments to the structure.

B. Construction:

1. Channel supports shall be 12 gauge and dimensions as necessary to meet project conditions.
2. Channels in conditioned spaces or in plenums above conditioned spaces shall be pregalvanized or powder coated carbon steel.
3. Channels exposed to ambient conditions shall be stainless steel or PVC coated.
4. Channels shall have holes, slots, knockouts, etc. as required by the Contractor.

C. Clamps and Accessories:

1. Clamps, accessories, fasteners, etc. shall generally be the same materials as the channel supports unless indicated otherwise.
2. Pipe clamps for indoor pipe shall be:

    a. All piping - pipe cushion clamp

D. Manufacturers shall be:

1. Cooper B-Line
2. Unistrut
3. Pipe Hangers and Devices Mfg., Inc.
4. Anvil International

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide all steel and concrete required for support and anchoring of pipes other than shown on structural or architectural drawings.

B. The contractor shall bear all responsibility for materials and workmanship as described in this section and shall make sure that all hangers and supports are properly and permanently connected to the building structure.

C. All pipe supports shall be designed to avoid interferences with other piping, hangers, electrical conduits and supports, building structures and equipment.

D. Guide points for expansion joints shall be located and constructed wherever required or shown on drawings and at each side of an expansion joint or loop, to permit only free axial movement in piping systems. Guides shall be securely anchored to the structure.

E. Provide hanger rod nuts on both sides of clevis and trapeze hangers.

3.2 SUBMITTAL

A. The manufacturer shall be responsible for reviewing all plans, specifications, and existing conditions to determine the types, quantities, and accessories required to provide a complete system of pipe support.

B. Submit shop drawings for each product to be used and indicate where the product is to be installed (i.e., steam piping in tunnel, chilled water pipe in crawl space, etc.).

3.3 APPROVALS REQUIRED

A. The Contractor shall request and receive written approval as follows before ordering support and attachment equipment and materials:

1. Letter from lightweight metal truss manufacturer.
2. Letter from metal roofing system manufacturer.

B. The letters shall indicate methods of attachment to all structural components and the locations of these attachments.

3.4 AUXILIARY SUPPORTS, ANCHORS, AND FASTENERS

A. Supports attaching to steel structure shall be by bolting or clamping without penetrating structural member. Welding is not permitted without written permission.

B. All fasteners shall be provided which resist loosening from vibration.

END OF SECTION

SECTION 220548 - VIBRATION AND SEISMIC CONTROL FOR PLUMBING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of mechanical sound, vibration, and seismic control required on all plumbing equipment, systems, and appurtenances where shown on the drawings and specified hereinafter.

B. All foundations and supports of Division 22 equipment shall be furnished and installed by Division 22 installer except where specifically noted otherwise.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All seismic equipment and design shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

a. International Building Codes
b. SMACNA Seismic Restraint Manual
c. ASHRAE
d. ASTM E 488 (Anchor locations)

B. Mechanical sound, vibration and seismic control equipment shall be sized and provided by manufacturer only. Seismic bracing shall be a factory manufactured item listed in the manufacturers catalog for the intended use.

C. Manufacturer:

1. The following sound, vibration, and seismic control manufacturers are acceptable:

a. Mason Industries
b. Korfund Dynamics Company
c. Vibration Mountings and Controls, Inc.
d. Peabody

e. Amber Booth
f. Vibration Eliminator, Inc.
g. Vibro-Acoustics
h. Kinetics

2. The following flexible pipe connector manufacturers are acceptable:

a. Mason Industries
b. Metraflex
c. Kinetics

PART 2 - PRODUCTS

2.1 GENERAL

A. All equipment and piping shall be mounted on or suspended from approved foundations and supports as specified herein and as shown on the drawings.

B. The vibration isolation systems shall be guaranteed to have the deflection recommended by the manufacturer for the specific application but no less than shown on the schedule. Mounting sizes shall be determined by the mounting manufacturer and mountings shall be installed in accordance with the manufacturer's instructions.

C. The installed vibration isolation system for floor or ceiling supported equipment shall have a maximum lateral motion under equipment start-up or shut down conditions of 1/4 inch. Motions in excess of this amount shall be restrained by approved spring type mountings.

D. Components not exposed to ambient:

1. Steel components shall be phosphated and painted. All nuts, bolts, and washers shall be zinc-electroplated. Structural steel bases shall be thoroughly cleaned of welding slag and primed with zinc-chromate or metal etching primer.

E. Components exposed to ambient or inside air handlers:

1. All components shall be PVC coated steel, hot-dip galvanized, stainless steel, or heresite coated.

2.2 VIBRATION ISOLATORS

A. General:

1. Where steel spring isolation systems are required, the mounting assemblies shall:

a. Utilize bare springs with the spring diameter not less than 0.8 of the compressed height of the spring at rated load.
b. Springs shall have minimum additional travel to solid equal to 50 percent of rated deflection.

2. Each spring isolator shall be designed and installed so that the ends of the spring remain parallel during and after the specified minimum deflection to solid height.
3. All spring-flex mountings shall be completely stable beyond rated load and have an additional 30% capacity (minimum), and horizontal and vertical spring constants shall be equal (kx/ky=1).
4. Vibration isolation equipment submittal drawings shall include the following information:

    a. Isolation mounting deflections.
    b. Spring diameters, compressed spring heights at rated load; solid spring heights, where spring isolation mountings are used.
    c. Equipment operating speed.
    d. Clearly outlined procedures for installing and adjusting isolators.

5. Isolators for equipment installed outdoors shall be designed to provide adequate restraint due to normal wind conditions and to withstand wind loads of 30#/sq. ft. applied to any exposed surface of the isolated equipment.
6. Neoprene shall be bridge bearing type.
7. Mounts shall have holes in baseplate for anchoring to structure.
8. All baseplates shall be sized to meet manufacturer's maximum published seismic restraint rating.

B. Specification type "B" (Seismic Mounts):

1. Freestanding spring type isolators with ductile iron housing. Isolators shall include leveling bolts which shall be rigidly bolted to equipment. Mounting shall be designed to resist seismic forces in all directions.
2. Mason Industries type SSLFH.

C. Specification type "C" (Seismic Mounts with Limit Stops):

1. Freestanding spring type isolators with ductile iron housing. The housing shall include vertical limit stops to prevent spring extension when weight is removed. A minimum clearance of 1/2" shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operations. Isolators shall include leveling bolts which shall be rigidly bolted to equipment.
2. Mason Industries type SLRSO.

D. Specification type "D" (Hangers):

1. Vibration hanger shall contain a steel spring and 0.3" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing thru a 30-degree arc before contacting the hole and short circuiting the spring.
2. Mason Industries, Inc. type 30N.

E. Specification type "E" (Precompressed Hangers):

1. Vibration hanger shall contain a steel spring and 0.3" deflection neoprene element in series. They shall be precompressed to the rated deflection so as to keep the piping or equipment at a fixed elevation during installation. Deflection shall be clearly indicated

by means of a scale. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing thru a 30-degree arc before contacting the hole and short circuiting the spring.

2. Mason Industries, Inc. type PC30N.

F. Specification type "J" (Concrete Filled Bases):

1. Equipment bases shall be rectangular structural beam or channel concrete forms for floating foundations. Bases for split case pumps shall be large enough to provide support for suction and discharge base ells. The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. In general, bases shall be a minimum of 1/12th of the longest distance of the base, but not less than 6". Forms shall include minimum concrete reinforcement consisting of half-inch bars or angles welded in place on 6" centers running both ways in a layer 1-1/2" above the bottom, or additional steel as is required by the structural conditions. Forms shall be furnished with drilled steel members with sleeves welded below the holes to receive equipment anchor bolts where the anchor bolts fall in concrete locations. Height saving brackets shall be employed in all mounting locations to provide a base clearance of one inch.
2. Provide concrete fill for all type "J" (Bases) isolation.
3. Basis of design manufacturer shall be:

    a. Mason Industries, Inc. type K.

G. Specification type "L" (Pipe Connectors):

1. Flexible stainless-steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Lengths shall be as tabulated:

FLANGED		MALE NIPPLES	
3 x 14	10 x 26	1/2 x 9	1-1/2 x 13
4 x 15	12 x 28	3/4 x 10	2 x 14
5 x 19	14 x 30	1 x 11	2-1/2 x 18
6 x 20	16 x 32	1-1/4 x 12	
8 x 22			

2. Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible.
3. Mason Industries, Inc. type BSS.

H. Specification type "M" (Pipe Acoustical Seals):

1. Where piping passes through equipment walls, floors or ceilings, provide a split seal consisting of two bolted pipe halves with a 3/4" or thicker neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place

around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" past either face of the wall. Where temperatures exceed 240 degrees F., 10# density fiberglass shall be used in lieu of the sponge.
2. Provide one seal in each wythe.
3. Mason Industries, Inc. type SWS.

I. Specification type "N" (Anchors, Guides):

1. Provide an all-directional acoustical pipe anchor, consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum half inch thickness of heavy duty neoprene and duck or neoprene isolation material. Vertical restraints shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction.
2. Mason Industries, Inc. type ADA.

J. Specification type “Q” (Waffle Pads):

1. One layer of 3/4" thick neoprene pad consisting of 2" square modules.
2. Pads shall have a minimum load deflection of 10%.
3. Pads up to 36 sq. inches shall have a 1/4" thick bearing plate. Larger pads shall have a 3/8" thick bearing plate.
4. Bearing plates shall be stainless steel and shall have an appropriately sized hole for mounting.
5. Basis of design manufacturer shall be:

    a. Mason Industries, Inc. Model Super WMH

2.3 VIBRATION ISOLATOR SCHEDULE

A. General:

1. Isolator types and deflection values are shown for ground supported slabs or, when suspended equipment is shown, types are shown for slabs with maximum .67" deflection over 20-foot spans for 4" slab. Sound and Vibration Control Manufacturers shall submit recommended isolators for all deflecting slabs and structures.
2. Deflection shown is a minimum value. Higher values may be required by seismic design.

B. Inline Pumps:

1. Type E hanger, deflection 1.25"
2. Type L connector

C. Vacuum Pump:

1. Type C mount, deflection 2.0"
2. Type J base
3. Type L connector

D. Air Compressor:

1. Type Q pad
2. Type L connector

E. Pipe Penetrations:

1. Type M
2. Penetrations of Air Compressor room and Chiller room walls

2.4 SEISMIC DESIGN

A. General:

1. Specifications and plans shall indicate minimum requirements and general intent. The actual requirements shall be determined by the seismic system designer but those requirements shall not be less than indicated on the plans and in these specifications.
2. Seismic engineer shall be a professional engineer registered in the state in which the facility is to be constructed and whose principal area of practice is in seismic engineering and related fields. The engineer shall be in the full time employment of the company submitting the product. The seismic engineer shall be responsible for:

    a. Submittals (drawings and calculations)
    b. Seismic Quality Assurance Plan
    c. Certificates of Compliance

3. The following mechanical components shall be exempt from seismic design:

    a. All components in seismic design category C where Ip = 1.0.

B. Piping Systems:

1. Seismic restraints are required for all pipes unless specifically indicated otherwise.
2. Seismic restraints are not required for the following pipe provided the pipe is installed where it is protected from impact or will avoid the impact of larger pipe or equipment:

    a. Pipes are supported by clevis or roller hangers and installed 12 inches or less from the point of connection to the supporting structure above to the top of the pipe (excluding insulation or any other coverings).
    b. Pipes are supported by trapeze or roller support and are installed 12 inches or less from the point of the supporting structure above to the top of the trapeze or part of the roller support supporting the pipe.
    c. High deformity piping in Seismic Design Category C, Ip = 1.5, and a nominal pipe size of 2 inches or less.

3. Other piping systems shall meet or exceed the requirements of the IBC and the listed standard (whichever is greater):

    a. Natural Gas - ASME B31.4

C. Importance Factor (Ip):

1. Life safety components of the systems shall have an importance factor of Ip = 1.5.

2. Components containing hazardous or flammable material shall have an importance factor of Ip = 1.5 and shall include, but not be limited to:

    a. Gas systems
    b. Nitrogen and Spare Gas systems
    c. Hydrogen systems

3. Importance factor for the following equipment shall be Ip = 1.5.

    a. Air compressor
    b. Vacuum pump

4. Importance factor for other mechanical components shall be Ip = 1.0 unless indicated otherwise.

D. Anchorage and Attachments:

1. Anchorage and attachments shall meet the requirements of the IBC.
2. Threaded rod supporting duct, piping, equipment, or other components shall connect to structure by use of a swivel, eyebolt, vibration isolation hanger or other connection
3. The following anchorage and attachments are not permitted:

    a. Friction clips.
    b. Expansion anchors on non-vibration isolated equipment over 10 HP.

E. Threaded Rod Supports:

1. Rod supports shall be designed to resist bending moments.

2.5 VIBRATION AND SEISMIC ACCESSORIES

A. Provide all necessary brackets, bolts, fasteners, predrilled bases, oversized bases, accessory components and materials to install systems in accordance with manufacturer's requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. If the equipment to be mounted or restrained is not furnished with integral structural frames and external mounting lugs (both of suitable strength and rigidity), approved members shall be installed in the field which shall provide means of attaching required vibration and seismic devices.

B. The members include, but not limited to the following: gussets, rails, brackets, angles, channels and similar components. These members should be sized by the vibration and seismic vendor to provide an acceptable installation.

C. All field installed components shall be neatly installed and be of materials and/or finish suitable for the installation.

3.2 SUBMITTALS (VIBRATION ISOLATION)

A. The manufacturer shall submit drawings indicating location and type of all vibration isolation components provided.

B. A schedule shall show capacity and load of each component at each location.

C. Design shall be based upon actual installation and not contract drawing schematics.

D. Calculations shall be submitted and signed by a licensed professional engineer in the state where the project is located.

3.3 SUBMITTALS (SEISMIC)

A. Seismic Restraints:

1. Submit drawings showing seismic loading, location of bracing, and types and sizes of bracing assemblies. The level of detail and information provided shall be similar to those included in the "SMACNA Seismic Restraint Manual."
2. Submit seismic protection ratings in three principle axes certified by an independent laboratory.
3. Submit calculations for shear, pull-up, primary overturning, and secondary overturning.
4. Submit drawings indicating auxiliary supports and method of attachment.
5. Submit drawings indicating size and type of attachment (i.e., welding, bolting, etc.) to:

    a. Roof curbs and equipment supports to building structure.
    b. Attachment of equipment to roof curbs and equipment supports.
    c. Attachment of equipment to housekeeping pads or slab.

6. Submittals for seismic snubbers shall also include detailed drawings of steel sole plates and all anchorage to building structure including welding, bolting, and other methods of attachment. Submittal shall clearly indicate location of attachment and structural members.

B. Attachments and Connections:

1. Submit drawing indicating type of connection (i.e., clamp, eye bolt, swivel, etc.) to:

    a. Beams
    b. Joists
    c. Structure members

2. Submit drawings indicating type of attachment (welding, bolting, etc.) to:

    a. Structural members
    b. Components or equipment

3.4 CONCRETE FILL FOR BASES

A. Install polyethylene barrier between base and housekeeping pad.

B. Fill base with concrete in accordance with the concrete specifications.

3.5 SUPERVISION

A. The manufacturer, or his qualified representative, shall be responsible for providing such supervision as may be necessary to assure correct installation and adjustment of the isolators. Upon completion of the installation and after the system is put into operation, the manufacturer, or his representative, shall make a final inspection and submit his report to the A/E in writing certifying the correctness of installation and compliance with approved submittal data.

3.6 INSTALLATION

A. Where field conditions, construction schedule, or construction progress require that isolators be installed after the equipment or systems are installed, provide temporary supports until that time when isolators can properly be installed.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of mechanical identification on all plumbing equipment, systems, and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work furnished and installed shall comply with all local codes and ordinances and shall meet or exceed the standards and procedures (latest editions) of the following:

a. ANSI A13.1 for the identification of piping systems.
b. ANSI/NEMA Standard Z535.1.

B. Manufacturer:

1. The following mechanical tag, band, nameplate, and identification marker manufacturers are acceptable:

a. Seton Name Plate Corporation
b. T&B/Westline Products
c. Brady
d. MSI

PART 2 - PRODUCTS

2.1 VALVES

A. All valves shall be tagged except for the following:

1. Exposed shutoff valves at plumbing fixtures.

B. Attach to each valve a 1-1/2" round brass tag stamped with designating number and system type (CW, HW, CHW, etc.) 1" high filled in with black enamel. Connect with braided cable and metal clamp.

C. Coordinate valve numbering to avoid duplication.

D. Provide valve tagging in accordance with the Owner's standard practice for labeling.

2.2 NAMEPLATES

A. Nameplates shall be fabricated on black lamacoid with beveled edges. Markings shall be cut through to a white background.

B. Markings or lettering shall be minimum:

1. 1/2" high on access doors
2. 1/4" high on motor control centers
3. 3/16" high on switches and other similar devices

C. All information shall be scribed on a single nameplate per device.

2.3 MOTOR CONTROL IDENTIFICATION

A. Devices to be identified include:

1. Stand-alone controllers and starters.
2. Motor control center starters.
3. Factory mounted controllers and starter.
4. Similar equipment.

B. Nameplate shall include:

1. Equipment Description: HW Pump #1.

2.4 SWITCHES AND OTHER SIMILAR DEVICES

A. Devices to be identified include:

1. Control panels.
2. Similar equipment.

B. Nameplate shall include:

1. Equipment description: HV #1, etc.
2. Switch position as required: Summer/Winter, On/Off, etc.

2.5 PIPE CODING (STICK ON)

A. Apply color coded polyvinyl chloride pipe bands identifying service and direction of flow on all piping systems.

B. Pipe identification sizing shall be:

OUTSIDE DIAMETER OF PIPE OR COVERING	LENGTH OF COLOR FIELD INCHES	SIZE OF LETTERS INCHES
3/4 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
Over 10	32	3-1/2

C. Flow direction arrows shall be black on color background. Show flow direction arrows immediately adjacent to all pipe identification markers.

D. Markers shall be self-sticking type.

2.6 PIPE CODING (WRAP AROUND)

A. Apply color coded coiled plastic pipe bands identifying service and direction of flow on all piping systems.

B. Pipe identification shall meet ANSI A13.1 for color, letter height, and band size.

C. Bands shall have flow direction arrows.

D. Larger sizes shall have stainless steel springs.

E. Manufacturer shall be:

1. MSI MS-970

2.7 LOCATION MARKERS

A. Provide approved ceiling tile markers near removable ceiling panels to indicate the location of valves or other devices. Markers shall be adhesive type of various colors.

PART 3 - EXECUTION

3.1 PIPE CODING

A. On exposed piping apply bands at 20-foot centers on straight runs, at valve locations, and at points where piping enters and leaves a partition, wall, floor or ceiling.

B. On concealed piping installed above removable ceiling construction, apply bands in the manner for exposed piping.

C. On concealed piping installed above nonremovable ceiling construction, or in pipe shafts, apply bands at valves or other devices that are made accessible by means of access doors or panels.

D. Apply bands at exit and entrance points to each vessel, tank or piece of equipment.

E. For insulated pipes apply bands after insulation and painting work has been completed.

F. Follow manufacturer's instructions for application procedures using noncombustible materials and contact adhesives.

3.2 PIPE CODING SUBMITTAL

A. Submit a chart indicating each system and colors available for background and lettering. (The Contractor shall also include listing of existing identification colors used in this facility.)

3.3 VALVES

A. Furnish to Owner's Representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and room number, valve size and service controlled.

3.4 CEILING MARKERS

A. Ceiling markers shall be attached to the ceiling grid as close to the indicated equipment as possible.

B. A schedule of colors shall be submitted to the engineers for approval.

3.5 NAMEPLATES

A. Submit a listing of all nameplates with associated information to A/E for approval before fabrication.

B. Mount lamacoid nameplates with chromium plated acornhead screws.

C. Coordinate method of attachment and location of nameplate with contractor who is responsible for the installation of the device.

END OF SECTION

SECTION 220592 - SYSTEM START-UP

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the start-up of all building mechanical systems where shown on the drawings and specified hereinafter.

B. Description:

1. These systems shall include:

a. Domestic water systems
b. Sanitary drain, waste, storm drainage, and vent systems

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and standards:

1. All work shall meet or exceed the standards and procedures of the following (latest edition):

a. AWWA Standards
b. NFPA 99

B. Start-up of equipment shall be by manufacturer's representative unless noted otherwise.

C. Tests, in addition to those specified herein, required to prove code compliance, to meet insurance requirements, and to verify proper installation by the A/E, owner, or authorities having jurisdiction shall be provided by the Contractor.

D. All tests, instruments, and procedures shall be in accordance with the AABC National Standards and system test and balance specifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. All concealed work must remain uncovered until required tests have been completed. Sections of the system may be tested prior to concealing as outlined hereinafter.

B. The Owner and the A/E shall be notified in writing a minimum of three working days prior to any tests being performed.

C. Local, state and federal authorities having jurisdiction shall be notified in writing with sufficient time to schedule inspection as required by the authority.

D. In no case shall a system be started or operated in such a manner that the system or component pressure or temperature ratings, or the pressure or temperature to which a system or component has been tested, be exceeded.

2.2 START-UP

A. Systems shall be started up by the Contractor except as required in specific portions of the mechanical specifications and as follows:

1. Pumps - factory trained manufacturer's representative
2. Thermostatic Mixing Valves – manufacturer’s technician

2.3 STARTING THE PIPING SYSTEMS

A. Prior to putting any piping system in service, it shall be tested and thoroughly cleaned according to the procedures as specified below. The Contractors are responsible to take all precautions necessary to prevent contamination of existing domestic water and also to prevent unauthorized use, when connecting new systems to existing water lines.

2.4 STERILIZATION OF POTABLE WATER SYSTEMS

A. All pipelines and all appurtenances, both existing and new, which have been exposed to contamination by reason of this construction shall be sterilized before being placed into service.

B. Prior to chlorination, all systems shall be flushed with water at a system velocity of not less than 2.5 feet per second.

C. Sterilization shall be performed after all hydrostatic tests have been performed and before system is placed in service.

D. All potable water systems shall be chlorinated in accordance with procedures described in AWWA Standards for disinfecting water mains, AWWA C601. The entire line shall be chlorinated with a gas-water mixture, or calcium hypochlorite (70% available chlorine) and water. The chlorinating agent shall be applied at the beginning of the section adjacent to the

feeder connection and shall be injected through a corporation stop, hydrant or other connection insuring treatment of the entire line. Water shall be fed slowly into the new line with chlorine applied in such amounts as to produce a dosage of 50 parts per million. Lines previously filled shall be treated to a concentrated dosage at intervals along the line.

E. A 24-hour residual of 10 parts per million shall be produced in all parts of the line. During the chlorination process all valves, hydrants and accessories shall be operated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal bacteriologically, to those of the permanent source of supply and shall conform otherwise in all respects to the requirements of the South Carolina Department of Health and Environmental Control. Two acceptable bacteriological tests shall be obtained 24 hours apart and reported by an independent laboratory. Test results must be on file with the Architect/Engineer prior to State Inspection.

F. Furnish all HTH or liquid or gas chlorine required for sterilization and shall furnish all equipment and labor required for the work.

2.5 PIPING SYSTEM TESTS

A. General:

1. Upon completion of each system of work under this Division and at a designated time, all piping shall be pressure tested for leaks.
2. All piping located underground shall be tested before backfilling.
3. Sections of the system shall be tested prior to concealing the piping in walls, chases, false ceilings, etc.
4. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests repeated at no additional cost to Owner. Make tight any leaks. Repeat tests until system is proven tight. Caulking of leaks will not be permitted.
5. All equipment not capable of withstanding the test pressure shall be valved off during test.
6. Provide all gauges, valves, caps and accessories to properly test system.
7. At no time shall a system be tested at a pressure greater than the piping system or component is rated.

B. Drain, Waste, and Vent Pipe:

1. All drain, waste, and vent piping including branch bends and joints shall be tested before fixtures are set by closing all openings and filling entire system with water to a height of not less than ten feet above highest floor, or a pump may be used to maintain an equivalent pressure.
2. Test pressure shall be maintained for thirty minutes when using pump method. When using water column method, test period shall also be thirty minutes and water level shall not drop more than four inches.
3. No tests shall be made during freezing weather.

C. Domestic Water Pipe:

1. Where a portion of water system is to be concealed before completion, this portion shall be tested separately in a manner described for the entire system.

2. Water used for testing shall be from a potable source of supply.
3. Upon completion of rough-in and before setting fixtures, hydrostatically test water piping downstream of pressure reducing valves to 1-1/2 times the operating pressure, but not greater than 80 psig.
4. Hydrostatically test water piping upstream of pressure reducing valves to 1-1/2 times the operating pressure or 100 PSIG, whichever is greater.
5. The test shall be a minimum of two (2) hours without pressure drop.

D. Plumbing Fixtures:

1. Water shall be turned onto all supply lines, all fixtures shall be demonstrated to operate properly, valves and stops adjusted, packed and repacked as may be required to eliminate leaks and produce proper flow, piping shall be adjusted to provide proper circulation and to prevent hammer and thumping.

E. Water Closets:

1. Water closets shall be tested and adjusted to flush efficiently without undue noise.

2.6 SYSTEM START-UP

A. General:

1. System shall be started and checked to ensure safe and proper operation.
2. Minimum requirements are listed for each system and are in addition to manufacturer start-up requirements and the requirements stated in the specific sections of the specifications.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Submit to the A/E all test results including a minimum of the following information:

1. System tested.
2. Location of test.
3. Date, time, and ambient temperature at test startup and completion.
4. Persons present for test.
5. Duration of test.
6. Test equipment.
7. Test results.

B. Partial system may be done at the Contractor's option except tests shall be completed:

1. For each phase designated by contract documents;
2. And, in accordance with building contracts schedule for completion;
3. And, as required to turn over portions of the system for the Owner's use.

C. Reports shall include but not be restricted to:

1. Tests during construction.
2. Manufacturer's start-up of equipment.
3. Manufacturer's representative start-up of equipment.
4. Contractor start-up of system.

D. Reports shall be submitted within ten days of test completion.

3.2 ENGINEER REVIEW

A. The A/E shall, at his discretion, recheck any or all of the test work. Provide ample number of technicians and test equipment to perform the tests required.

B. All systems not accepted shall be retested.

C. Systems shall be retested and rechecked until accepted by all parties.

END OF SECTION

SECTION 220601 - HYDRONIC SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of hydronic specialties where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures (latest editions) of the following:

a. USA Standard Face to Face Dimensions of Ferrous Flanged Valves ANSI B16.10.
b. USA Standard for Cast Iron Pipe Flanges and Flanged Fittings. ANSI B16.1.
c. SHEMA.

B. All pressure vessels including expansion tanks, air separators and similar equipment shall be constructed, tested and stamped in accordance with ASME standards.

C. Equipment shall be stamped for 125 psig working pressure.

D. Manufacturers:

1. The following strainer manufacturers are acceptable:

a. Sarco
b. Mueller
c. Armstrong

2. The following expansion tank (domestic) manufacturers are acceptable:

a. Amtrol

b. Therm – X-Trol
c. Wessels

3. The following dielectric fitting manufacturers are acceptable:

a. Perfection Corporation
b. Victaulic

PART 2 - PRODUCTS

2.1 STRAINERS

A. All strainers shall have cast iron, forged steel, or bronze bodies of ample strength for the pressure to which they shall be subjected, removable cylindrical or conical screens of Monel or stainless steel and suitable flanges or tappings to connect with the piping they serve. They shall be of such a design as to allow discharge of accumulated dirt, and to facilitate removal and replacement of a strainer screen, without disconnection from the main piping.

B. Strainer screen perforations shall be:

1. Water (up to 3") - 1/16"
2. Water (4" thru 12") - 1/8"

C. All strainers shall be provided with flanged covers for screen removal in lieu of screwed covers wherever obtainable.

D. All strainer screens 8" and larger shall be reinforced.

E. All strainers in piping, (including all pump inlets), shall be Y-pattern, set in a horizontal (or vertical downward) run of the pipe. Where this is not feasible, strainers may be of enlarged cross-section type.

F. Provide a valve dirt blowoff with each strainer 2-1/2" and larger.

G. Provide a 6" capped nipple for strainers 2" and smaller.

2.2 UNIONS AND FLANGES

A. Steel pipe:

1. Unions shall be malleable iron, zinc coated, ground joint type for steel pipe.

B. Copper tubing and pipe:

1. Unions shall be brass.

C. Flanges or unions shall be installed in the following locations:

1. At locations indicated on plans.

2. At equipment to permit mechanical removal of equipment.
3. At equipment to permit servicing.
4. At pressure reducing valves to permit mechanical removal of the valve.

2.3 DRAINS

A. Drains are to be provided as follows:

1. Provide hose and drain valves near the heel of all main water risers in an accessible location. Drain shall be 3/4" or size indicated, whichever is larger.
2. Provide drain valves for complete drainage of piping, including the system side of all pumps. Drain shall be 3/4" or size indicated, whichever is larger.

B. Provide deep seal P-traps from all condensate drain pans.

2.4 MAKE-UP WATER

A. Provide domestic water connections from valved outlets to any equipment requiring make up water, including cooling tower(s) expansion tanks, and water-cooled stuffing boxes.

2.5 EXPANSION TANK (DOMESTIC)

A. Tanks shall be constructed of steel in accordance with ASME standards.

B. Tank shall be painted on the exterior with a rust inhibiting paint.

C. Tank shall have a precharged air chamber, heavy duty butyl diaphragm and rigid polypropylene liner.

D. Tank shall be equipped with:

1. Stainless steel connections

2.6 DIELECTRIC FITTINGS

A. Dielectric nipples shall have a high temperature, inert, thermoplastic copolymer liner. The nipple shall be electro-zinc plated steel. Current flow across a 3/4" nipple shall not exceed .010 ma.

B. Provide dielectric fittings:

1. To isolate dissimilar metals in piping systems
2. At connections to all water heaters
3. At water lines at building entrance points
4. To isolate dissimilar metals in piping systems and equipment

C. Dielectric fitting shall be:

1. Hydronic systems 4" and smaller - dielectric nipple

PART 3 - EXECUTION

3.1 STRAINERS

A. There shall be approved strainers in the inlet connections to each pump, each automatic valve, each pressure reducing valve, and as shown on drawings.

B. Strainers shall be so arranged as not to "trap" lines and to facilitate disconnection and opening-up for cleaning. Unless otherwise indicated, strainers shall be line size.

C. Dirt blowoff valves shall be 6" to 1'-0" below strainer or as directed. Nipples and valves to be full size of strainer blowoff tapping. For all strainers, the blowout connection is to terminate in an approved manner, at a point where there will be no risk of flooding or damage.

D. All strainers installed in horizontal piping shall be installed flat (on side) except strainers at pumps shall be installed in a vertical position.

3.2 EXPANSION TANK (GENERAL)

A. Provide threaded rod supports mounted to building structure to support tank.

B. Tanks over 50 gallons shall be provided with a steel support saddle.

END OF SECTION

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all piping including valves, mechanical couplings, fittings, flanges, strainers, expansion joints, and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section. In addition, refer to these specification sections:

1. Section 220700 – Plumbing Insulation

1.3 QUALITY ASSURANCE

A. Manufacturers:

1. The following fiberglass piping insulation manufacturers are acceptable:

a. Owens/Corning
b. Knauf
c. Johns Manville

2. The following elastomeric pipe insulation manufacturers are acceptable:

a. Armacell
b. K-Flex
c. Nomaco Insulation

3. The following aluminum jacket manufacturers are acceptable:

a. Childers
b. RPR Products

4. The following stainless steel jacket manufacturers are acceptable:

a. Childers
b. RPR Products

PART 2 - PRODUCTS

2.1 GENERAL

A. Pipe insulation shall comply with the International Energy Conservation Code or these specifications, whichever is greater.

2.2 TYPES OF INSULATION

A. Fiberglass Insulation:

1. Physical properties:

a. Thermal conductivity (k) is 0.25 at 100 degrees F.

2. Jacket:

a. ASJ jacket with or without self-sealing adhesive system.

3. Insulation shall be:

a. Owens/Corning Heavy Density Fiberglass Insulation ASJ/SSL or ASJ

B. Elastomeric Insulation:

1. General:

a. The insulation shall have a factory applied adhesive closure system.

2. Physical properties:

a. Thermal conductivity (k) is 0.27 at 75 degrees F.
b. Water transmission is 0.08 perms - inch.
c. Will not significantly contribute to fire.

3. Insulation shall be:

a. Armacell type AP Armaflex SS
b. K-Flex USA type LS Seam-Seal or Insul-Lock
c. Nomaco Insulation FlexTherm

2.3 PIPE INSULATION APPLICATION

A. General:

1. All fittings, valves, and accessories in the piping system shall be insulated similar to the piping system.
2. Insulation in return air plenums shall have a flame/smoke rating not to exceed 25/50.

B. Fiberglass Pipe Insulation:

1. Fiberglass pipe insulation is required for the following piping systems:

a. Indoor piping up to 850 degrees F except for those where other types of pipe insulation is specified.

C. Elastomeric Pipe Insulation:

1. Elastomeric pipe insulation is only permitted on the following:

a. Piping concealed in walls, partitions and chases.
b. Where details or notes specifically allow the use of elastomeric or polyolefin insulation.

2.4 FITTINGS

A. General:

1. Fittings shall be factory molded except where indicated otherwise.
2. Fittings shall have a factory installed vapor barrier or have a field installed vapor barrier equal to the pipe vapor barrier.

B. Fiberglass Pipe Insulation:

1. Piping (up to 1-1/4"):

a. Fittings may be mitered at contractor's option.

2. Piping (1-1/2" and larger):

a. Fittings shall be insulated with 3/4 PCF density, all service faced FSK duct wrap, 2" thick.

C. Elastomeric and Polyolefin Pipe Insulation:

1. Piping (up to 3/4"):

a. Fittings may be mitered at contractor's option.

D. All Other Insulation:

1. Piping (all sizes):

a. Per manufacturer's recommendations.

2.5 JACKETING

A. Aluminum Jacketing:

1. General:

a. Jacketing shall be manufactured from Type 1100, 3003, 3105 and 5005 alloys.
b. Jacketing on piping shall be corrugated. Corrugation shall be 3/16 inches.
c. Jacketing on equipment shall be smooth.

2. Thickness:

a. Pipe jacket shall be .016 inches.
b. Equipment jacket shall be .024 inches.

3. Vapor Barrier:

a. Continuous lamination to jacket.
b. One mil polyethylene film with 40 lb. virgin kraft paper.

B. Stainless Steel Jacketing:

1. General:

a. Provide a complete system of manufactured jacketing for valves, piping, fittings, and equipment.
b. Jacketing shall be Type 304L stainless steel with a standard 2B mill finish.

2. Pipe:

a. Jacket shall be factory fabricated for each pipe size. The jacketing shall have a continuous modified Pittsburg Z-lock.
b. Jacket shall be smooth and shall be .016" thick.
c. Jacket shall be:
d. Childers Strap-On Fabricated Jacketing System

3. Fittings and Valves:

a. Jackets for filling, valves, and accessories shall be factory fabricated for each fitting, valve, and accessories including, but not limited to, elbows, tees, valves, and flanges.
b. Jackets larger than available from manufacturers in standard sizes shall be custom fabricated by the manufacturer.
c. Jacket shall be smooth and shall be .024" thick.

4. Equipment:

a. Jacketing shall be smooth and .016" thick.

5. Vapor Barrier:

    a. Continuous lamination to jacket.
    b. One mil polyethylene film with 40 lb. virgin kraft paper.

2.6 FINISH

A. Exposed Piping in equipment rooms and elsewhere throughout the facility shall be one of the finishes listed below as selected by the contractor unless a type of finish is specifically indicated:

    1. Glass fabric and two coats mastic, one coat vapor barrier sealant.

B. Fittings:

    1. Fittings adjacent to ASJ jacket shall be finished with PVC jacket.
    2. Fittings adjacent to jacketing other than ASJ shall be finished similar to piping.

C. Roof Drain Bodies and Accessories:

    1. Glass fabric and two coats mastic, one coat vapor barrier sealant.

2.7 GLASS FABRIC

A. General:

    1. Fabric shall be 100% fiberglass scrim with non-combustible finish.
    2. Fabric shall be 1.9 oz. + .3 oz. per square yard.
    3. Thread count shall be 20 x 10 (yarns per inch).

2.8 ADDITIONAL INSULATION REQUIREMENTS

A. Accessories subject to condensation:

    1. This shall include but not be limited to:

        a. Piping to gauge
        b. Valve stems

    2. Wrap component subject to condensation with self-stick neoprene insulating tape.

B. Where insulation is specified for piping, insulate similarly all connections, vents, drains, fitting, valves, mechanical couplings, expansion bellows and any appurtenances and piping connected to system subject to heat loss or gain. Unions, couplings, or flanges provided at equipment for removal of heat exchanger, condenser, or evaporator heads shall be insulated with removable molded blocks.

PART 3 - INSULATION THICKNESS SCHEDULES

3.1 GENERAL

A. Specific insulation requirements may be indicated elsewhere in these specifications or on the contract drawings.

B. Insulation for piping exposed to ambient conditions based upon 90 degrees F, 90% RH, and 7 MPH wind speed.

3.2 FIBERGLASS INSULATION SCHEDULE

A. Domestic Cold Water, Water Piping:

1. Up to 1-1/4" pipe - ½" thk.
2. 1½" pipe and larger - 1" thk.

B. Domestic Hot Water Piping:

1. Up to 1-1/4" pipe - 1" thk.
2. 1½" pipe and larger – 1-1/2" thk.

3.3 ELASTOMERIC INSULATION SCHEDULE

A. Domestic Cold Water Piping:

1. All pipe - ½" thk.

B. Domestic Hot Water Piping (without heat tracing):

1. All pipe - 1" thk.

C. Horizontal Drinking Fountain Waste Tubing:

1. All pipe - 3/4" thk.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Apply adhesives, sealants, coatings, and other materials as recommended by the manufacturer.

B. Outward clinching staples shall be used on ASJ jacketing and be sealed with vapor barrier sealer on cold pipe. Piping not easily accessible for repair or maintenance shall be banded with three aluminum bands per section.

C. All penetrations through vapor barrier shall be sealed with vapor barrier sealer. Where metallic jacketing is used, all penetrations through jacket and at termination of jacket shall be sealed.

D. Butt joints and seams of elastomeric and polyolefin insulation shall be sealed with contact adhesive as recommended by the insulation manufacturer. Where possible, insulation shall be used without slitting and slipped over tubing. All fittings shall be covered and sealed with fabricated pieces of the same insulation and adhesive.

E. Insulation for heat traced pipe shall be sealed with tape or adhesive. Staples shall not be used.

4.2 ANCHORS AND SUPPORTS

A. Anchors and supports that are secured directly to cold surfaces shall be adequately insulated and vapor sealed to prevent condensation.

B. Jacketing shall be carried through hanger on inside of 16 gauge sheet metal shields and sealed to maintain continuous vapor barrier except domestic hot water may be insulated around the hanger.

C. Where inserts occur at pipe supports and guides, provide the following:

1. On hot pipes apply 3" wide vapor barrier tape or band over the butt joints.
2. On cold pipes apply a wet coat of vapor barrier lap cement on all butt joints and seal the joints with 3" wide vapor barrier tape or band.

4.3 FITTINGS

A. General:

1. Apply vapor barrier to insulation and all seams.

B. FSK Ductwrap:

1. Apply pressure sensitive vapor barrier tape.

4.4 METALLIC JACKETING

A. Jacketing shall be held in place with a friction type, Z lock, or 2" overlap joint. Joints shall be completely sealed along the longitudinal seam and shall be installed to shed water. Circumferential joints shall be sealed by use of 2" wide butt strips. ½" bands shall secure jacketing. Space as recommended by the manufacturer.

B. Straps shall secure jacket. Straps shall be the same material as jacket. Provide 1/2" straps for jackets up to 12" in diameter. Provide 3/4" straps for 14" and larger diameter jackets.

4.5 FIRERATED ASSEMBLIES

A. Insulation shall run through firerated assemblies. Where insulation is not approved for routing through fire rated assemblies, transition to an approved fire rated insulation of the same thickness where the insulation is routed through the fire rated assembly. The transition

shall occur between a minimum of six (6) inches and a maximum of twelve (12) inches from assembly on both sides of assembly.

4.6 MULTI-LAYER INSTALLATION

A. Joints shall be staggered.

END OF SECTION

SECTION 221100 - PLUMBING PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of pipe, pipe fittings, accessories and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All pipe and pipe fittings shall comply with American National Standards Institute Code, all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:

a. Ferrous Pipe and Fittings:

1) Cast Iron Soil Pipe and Fittings, Hub And Spigot. ASTM A74
2) Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary System. CISPIS 301 and ASTM 888
3) Malleable Iron Screwed Fittings. ANSI B16.3
4) Steel Flanges. ANSI B16.5
5) Steel Fittings. ANSI B16.9
6) Steel Pipe, Welded or Seamless, Black or Galvanized. ASTM A53, A106, and A120.
7) Steel Pipe, Welded or Seamless (for coiling) Black or Galvanized. ASTM A53
8) Wrought Iron Pipe. ASTM A72

b. Non-Ferrous Metallic Pipe and Fittings:

1) Pipe Fittings, Brass or Bronze, 125 and 250 lbs., Cast or Wrought. ANSI B16.15
2) Solder Joint Fittings, Pressure, Copper Alloy. ANSI B16.22
3) Refrigerant Piping. ANSI B31.5, ANSI B36.40, ASTM A333

4) Copper tube (drain, vent) DWV. ASTM B306
5) Copper tube (natural gas) ACR. ASTM B280

c. Non-metallic Pipe and Fittings:

1) PVC Sewer Pipe and Fittings, Type PSM (up to 6"). ASTM D3034
2) PVC Sewer Pipe and Fittings, Type PSM (8", 10", 12"). ASTM D3034
3) PVC Plastic Pipe Schedule 40, 80, and 120 ANSI B72.7, ASTM D1785
4) PVC Plastic Pipe (SDR-PR). ASTM D2241
5) Socket-type PVC Plastic Pipe Fittings Schedule 40. ASTM D2466

d. Pipe Joining Materials, Gaskets, Methods, and Accessories:

1) Rubber Gaskets for Cast Iron Soil Pipe and Fittings. ASTM C564
2) Hubless Soil Pipe Heavy Duty Shielded Couplings (304 Stainless Steel). ASTM C1540
3) Solvent Cements for PVC Plastic Pipe and Fittings. ANSI B72.16, ASTM D2564
4) Elastomeric Gaskets for Plastic Hub and Spigot Piping. ASTM F477
5) Soldering and Brazing ANSI B9.1

e. AWWA - Standards for Plastic Water Pipe and Fittings.
f. NSF - National Sanitation Foundation Seal of Approval.

B. Material shall be new domestic materials (made in the USA) of standard manufacture suitable for specified use.

C. The Owner and A/E reserve the right to inspect, sample and test any pipe after delivery and to reject all pipe represented by any sample which fails to comply with the specified requirements. Inspection of pipe shall be for pits, blisters, rough spots, breakage or other imperfections. Any pipe which has been rejected because of the above shall be conspicuously identified and immediately removed from the construction site.

D. Manufacturer shall certify materials conform to reference specifications, or specification number shall be cast into or marked on each piece.

E. All Cast Iron soil pipe and fittings shall be labeled with the Cast Iron Soil Pipe Institute mark of quality and permanence.

F. Manufacturers:

1. The following no-hub clamp manufacturers are acceptable:

a. UPC Clamp-All
b. ANACO Husky SD 2000
c. Mifab Heavy duty
d. Ideal Heavy Duty

2. The following gasketed pipe manufacturers are acceptable:

a. Charlotte Seal
b. Tyler Pipe Industries

3. The following solder manufacturers are acceptable:

    a. United Wire
    b. Engelhard
    c. Elkhart

4. The following cast iron pipe manufacturers are acceptable:

    a. Tyler
    b. Charlotte Cast Iron Pipe
    c. AB&I Cast Iron Pipe

PART 2 - PRODUCTS

2.1 GENERAL

A. No materials shall be co-mingled within the same system except those which are specifically approved in these specifications.

2.2 PIPE SCHEDULE

A. Building Sewer Piping, and Plumbing Vent Piping:

1. Piping shall be service weight, Cast Iron, soil pipe and fittings.
2. Piping and fittings below slab (below grade) and to a point five feet outside of building shall be hub and spigot type.
3. Piping above grade shall be no-hub type. Each joint shall consist of a housing and clamp.
4. The housing and clamp assembly shall consist of type 304 stainless steel housing, type 304 stainless steel clamps, type 305 stainless steel screws, and a one-piece molded neoprene gasket.
5. Assemblies shall be provided with a minimum of two high torque clamps of 100-125 in/lbs or four clamps with a minimum rating of 80 in/lbs.
6. Housings shall be 3" wide for pipe sizes up to 4" and 4" wide for 5" thru 10" pipe sizes.

B. Sanitary Sewer Pipes, Exterior:

1. Piping installed from 5'-0" outside of building to connection with existing sanitary sewer and storm drain shall be Polyvinyl Chloride Schedule 40 Solid Wall sewer pipe and fittings.
2. Pipe and fittings shall be hub and spigot type with gasketed joints/fittings.

C. Domestic Water Piping:

1. Fittings shall be Class 150 with permanent identification markings.
2. All domestic water piping, below grade and to a point five (5) feet outside of building shall be seamless hard drawn, Type K copper pipe, with wrought copper fittings.

3. All domestic water above grade shall be seamless hard drawn, Type L, copper pipe, with wrought copper fittings. Press fittings by Viega, NIBCO and Apollo are approved to be for all water piping above grade.
4. All exposed water piping to plumbing fixtures and to kitchen equipment shall be IPS chrome-plated yellow brass pipe with polish chrome-plated 125 pound screwed brass fittings. Pipe shall be seamless drawn semi-annealed containing not less than 85% copper and conforming to ANSI H27-1.
5. All cold water mains and fittings below grade from a point five feet outside of building to connection with utilities line shall be Schedule 40, Type 1 Polyvinyl Chloride (PVC).

D. Relief Valve Discharge and Vent Piping:

1. Piping up to 2-1/2" shall be seamless hard drawn, Type L, copper pipe.
2. Piping 3" through 12" shall be schedule 40 black steel, butt weld, or threaded.

E. Pressure Gauge Piping:

1. Piping on plumbing systems shall be seamless soft or hard drawn, Type L, copper.
2. Pipe shall be same size as gauge connection.

2.3 FITTINGS AND CONNECTIONS

A. Fittings shall be the same material and weight as the pipes joined by the fitting unless noted otherwise. Fittings shall comply with all applicable standards.

B. Prohibited Fittings:

1. The following are prohibited fittings:

a. Bull head tee's
b. Street ells
c. Bushings
d. Close nipples
e. "T" drill fittings
f. No mitered fittings in welded systems

C. Welded Fittings and Pipe Connections:

1. All welded pipe and fittings shall be delivered to job with machine beveled ends. Where necessary, beveling may be done in filed by gas torch, in which case surfaces shall be thoroughly cleaned of scale and oxidation after beveling.
2. Welded pipe shall have flanges at valves and elsewhere to permit disassembly for maintenance.
3. With the exception of pipe welded end-to-end, all welded joints shall be made by the use of one-piece welding neck flanges, nozzles, elbows and tees.
4. All welding elbows shall be long radius.
5. Welding end fittings shall have the same bursting pressure as pipe of the same size and schedule. Tee fittings shall be one piece except that shaped nipples are permitted where branches are at least three pipe sizes smaller than the main.

D. Flanged Fittings:

1. Flanges and flanged fittings shall conform to ANSI standards and ASTM standards.

E. Cast Iron Fittings:

1. Fittings for sewage lines, drain lines and plumbing vents shall be the same type as the pipes joined by the fitting.
2. Cast iron pipe and joints must conform to ANSI A21.1, A21.8, A21.10, and A21.11, latest revisions.

F. Malleable Iron Fittings - Water Service:

1. All malleable iron fittings shall conform to ASA B16.3, B2.1 and ASTM A47 Grade 32510.

G. Copper Pipe Fittings - Water Service:

1. Fittings shall be wrought copper.
2. Solder used for fittings shall be zero percent lead, 200 PSI working pressure, installed as recommended by the manufacturer and applied to clean surfaces. Connections to valves and other types of piping shall be made with brass, copper or bronze adapters, sweat type to threaded type or cast copper companion flanges. Connections to valves and other dissimilar materials shall be made with dielectric unions where hereafter specified.
3. Fittings in concealed location:

    a. Fittings shall be brazed.
    b. Solder shall be:

        1) United Wire SIL-PH0S

4. Fittings in non-concealed locations:

    a. Fittings shall be soldered unless noted otherwise.
    b. Solder shall be:

        1) United Wire SIL-PH0S
        2) Engelhard Silvabrite 100

H. Copper Pipe Fittings - Gas Service (1/2 psig and less):

1. Fitting shall be cast copper flared tube type.
2. Material used in fittings shall be a silver alloy with a melting point in excess of 1000 degrees F. Phosphorous alloys are not acceptable.
3. All joints shall be brazed.

I. Brass Pipe Fittings - Exposed Water Piping to Fixture:

1. Fittings shall be polished chromium plated cast brass screwed type.

J. Plastic Fittings - Potable Water Mains:

1. Fitting shall be Type I, solvent weld type.

2.4 PIPE COVERINGS

A. Pipe Coverings:

1. Pipes not specified to be covered in the Underground Pipe Coating specification or specifically indicated elsewhere shall be covered per this section.
2. Type 1: Mechanically wrapped with asphalt primer and asphalt saturated felt or glass wrapper bonded to enamel with Asphalt Institute specification M1. Joints and pipe less than 10 feet in length may be field coated.
3. Type 2: Polyken 826 sheathing, 12 mil minimum thickness.

B. Pipe Requirements:

1. Underground Pipe - Type 1
2. Pipes in contact with masonry: Type 2

PART 3 - EXECUTION

3.1 GENERAL

A. Pipe shall be installed in strict accordance with manufacturer's recommendations.

B. Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing, properly clearing all window, doors, and other openings or obstructions. Excessive cutting or other weakening of building to facilitate piping installation will not be permitted. Piping shall line up flanges and fittings freely and shall have adequate unions and flanges so that all equipment can be disassembled for repairs.

C. Each length of pipe, as erected, shall be upended and rapped. Dirt and all foreign matter shall be cleaned from pipe and fittings before installation.

D. All turns and connections shall be made with long radius fittings as specified hereinafter.

E. Provide proper provision for expansion and contraction in all portions of pipework, to prevent undue strains on piping or apparatus connected therewith. Provide double swings at coil connections, riser transfers, and other offsets wherever necessary to take up expansion. Arrange riser branches to take up motion of riser.

3.2 ISOLATION VALVES

A. Provide shutoff valves at all major branches and at each riser.

3.3 BLACK STEEL PIPING

A. Screwed piping shall conform to the following:

1. Pipe nipples - Any piece of pipe 3" in length or smaller shall be considered a nipple. All nipples with unthreaded portion 1-1/2" and smaller shall be extra heavy. Only shoulder nipples shall be used. No close nipples shall be provided.
2. Screw threads shall be cut clean and true; screw joints shall be made tight without caulking. No caulking shall be permitted. A nonhardening lubricant shall be permitted. No bushings shall be used. Reductions shall be made with eccentric reducers or eccentric fittings to eliminate objectionable water or air pockets. All pipe shall be reamed out after cutting to remove all burrs.

B. Welded piping shall conform to the following:

1. All welded joints for steel pipe shall be of the open V-butt following approved welding procedures for metallic arc or oxy-acetylene carbon steel welded pipe joints. Pipe shall be mill-beveled or machine-beveled by this Trade. All scale and oxide must be removed with hammer, chisel or file, and the bevel left smooth and clean.
2. Weld metal shall be thoroughly fused with base metal at all sections of weld and penetration of weld shall include unbeveled portion and shall extend to inside walls of pipe.

3.4 GASKETED HUB AND SPIGOT PIPING:

A. The spigot end of the pipe shall be prepared by cleaning and applying a thin coat of adhesive lubricant.

B. The spigot end is centered in the hub and jacked on by using a special jack and choker sling.

3.5 PIPING ARRANGEMENT

A. Drainage and Vent Piping:

1. All horizontal drainage and vent piping shall be installed with a uniform grade. Piping 2-1/2" and less shall slope a minimum of 1/4" per foot of fall in the direction of flow. Piping 3" and larger shall slope a minimum of 1/8" per foot of fall in the direction of flow. Fall shall be greater where indicated.
2. Soil and waste vent pipes shall extend 12" minimum through roof full size except where noted otherwise. Vents through the roof shall be a minimum 3". Provide increasers as required.
3. Changes in direction or size of drainage piping shall be made with appropriate fittings having long radius. The use of short radius fittings shall be limited to points where the space limitations prevent the use of long radius fittings.
4. Slip joints shall be permitted only on trap connections. Couplings or hub drainage fittings shall be used for union connections.
5. All vertical stacks shall be supported at each floor with clamp anchors to relieve stresses. Vertical stacks shall be installed with provision for expansion.

3.6 PIPING TO EQUIPMENT

A. Where items in piping such as control valves, pumps, coils and equipment connections are different sizes than the piping, reducers and increasers shall be installed adjacent to such items so there is a minimum of reduced size pipe.

B. Eccentric reducers shall be installed on suction side of pumps allowing continuous flow of air.

C. All piping connections to coils, equipment, valves and other system components shall be made with offsets with flanges or unions so arranged that the equipment can be serviced or removed without dismantling the piping.

D. Provide all final pipe connections to systems and equipment.

3.7 BELOW GRADE PIPE

A. All pipe shall be inspected before backfilling.

3.8 CONCEALED PIPE

A. Test all pipe prior to concealing or insulating.

3.9 SITE UTILITIES

A. Provide all final connections to site utilities as shown on plans.

B. Provide all site surveys, excavation, and other investigative work to determine the exact location and invert of site utilities if utilities are in place prior to construction beginning. The Contractor shall perform this work prior to installation of any affected piping systems.

3.10 PIPE INSPECTION

A. The Owner and A/E reserve the right to inspect, sample and test any pipe after delivery and to reject all pipe represented by any sample which fails to comply with the specified requirements. Inspection of pipe shall be for pits, blisters, rough spots, breakage or other imperfections. Any pipe which has been rejected because of the above shall be conspicuously identified and immediately removed from the construction site.

END OF SECTION

SECTION 221123 - PLUMBING PUMPING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of pumps and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. All control panels shall be UL listed.

B. Manufacturers:

1. The following in-line domestic water circulating pump manufacturers are acceptable:

a. Grundfos
b. Taco
c. Bell and Gossett

PART 2 - PRODUCTS

2.1 GENERAL

A. Pumps shall be factory painted with machinery enamel.

B. All pump control panels shall be dead front type (power de-energized when opened).

C. All systems specified with factory mounted control panels shall be factory prewired.

D. Pump shall be type indicated on schedule.

2.2 IN-LINE CIRCULATING PUMPS

A. Performance:

1. Pumps shall be selected at plus or minus 20% of the pump best efficiency point.
2. The pump/capacity curve shall be continuously rising from maximum capacity up to the shutoff point.

B. General:

1. Pumps for domestic water shall have bronze casings and shall be bronze fitted.
2. Volute shall allow servicing without disturbing piping connections. Companion flanges for threaded connections shall be provided.
3. Pump shall be designed for 175 psi working pressure and 225 degrees F.
4. Suction and discharge gauge and vent tappings shall be provided.

C. Motor:

1. The motor shall be open, dripproof, oil lubricated, resilient mounted construction with built-in thermal overload protection (single phase motors).

D. Shaft:

1. The shaft shall be phosphor bronze or steel with integral thrust collar for vertical mounting. Flexible coupling shall dampen starting torque and shall be self-aligning.

E. Impeller:

1. Impeller shall be hydraulically and dynamically balanced and keyed to the shaft.

F. Seal:

1. The seal shall be mechanical with a carbon steel ring and ceramic seat.

PART 3 - EXECUTION

3.1 RELIEFS, DRAINS AND VENTS

A. Pipe 3/4" drains from all pump drain pans to the nearest floor drain.

B. Pipe relief and vents through roof or as shown on plans.

3.2 ALIGNMENT

A. Final alignment for base mounted pumps shall be done after piping is completed and base has been grouted, before start-up by manufacturer’s representative. Alignment shall be made with dial indicator to a tolerance of +.002". Report of alignment and start-up shall be submitted to A/E.

B. After completion of installation and realignment, rust and scale shall be removed from exposed surfaces of pump shafts. After cleaning shaft surfaces, a protective spray coating of lubricant/rust inhibitor shall be applied to the exposed to sight shaft surfaces.

3.3 SEALS

A. Seals to be replaced without charge if faulty operation or unusual wear occurs not caused by improper maintenance during guarantee period.

B. Each pump shall be provided with a spare mechanical seal. The spare seals shall be packaged in the original carton from the factory and shall be delivered to the Owner at the time of the final inspection. Each spare seal shall be labeled to identify the seal by pump number.

3.4 IMPELLER

A. After testing and balancing has been performed, the contractor shall provide a second impeller for each pump system as recommended by the Test and Balance Agency to meet design conditions.

END OF SECTION

SECTION 223300 - ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of water heaters and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All equipment shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

    a. UL Code 174 Safety Standards
    b. Industrial Risk Insurers - Automatic Single Bond
    c. NFPA 58
    d. Kemper
    e. ANSI Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems

B. All pipe, pipe fittings and vessels shall be constructed in accordance with ASME standards.

C. Manufacturer:

1. The following water heater manufacturers are acceptable:

    a. A. O. Smith Water Production Company
    b. Rheem Manufacturing Company
    c. Lochinvar
    d. Bradford White

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment shall meet or exceed scheduled efficiencies or ASHRAE 90.1, whichever is greater.

B. The water heaters physical dimension shall allow installation in space shown on plans without removal of doors or walls and only minor disassembly of water heater (i.e. removal of energy module).

2.2 CONSTRUCTION

A. Vessel:

1. The water heater tank shall be constructed in accordance with ASME Code Section IV and UL approved.
2. Water heaters shall be stamped with the appropriate ASME symbol.
3. Water heaters shall bear the UL label.
4. Water heaters shall be factory tested at 150 psi after assembly and be designated for 150 psi working pressure.

B. Lining:

1. Water heaters (less than-gallon storage) shall have all internal surfaces exposed to water completely lined with a non-soluble, non-porous glass lined material creating a corrosion resistant barrier over the steel.
2. Water heaters (-gallon storage and larger) shall have all internal surfaces exposed to water completely lined with a non-ferrous metallic coating creating a holiday free corrosion resistant barrier over the steel.

C. Insulation:

1. The tank shall be insulated and comply with the requirements of ASHRAE 90.1, Addendum 90.1b Standards and local and state energy codes (Minimum R15).

D. Finish:

1. Water heaters shall have insulation protected by a steel jacket. The jacket shall have a factory applied baked enamel finish.

E. Relief Valve:

1. Provide an ASME temperature and pressure relief valve on all water heaters.

F. Fittings:

1. All fittings directly connected to the water heater shall be cast bronze.

2.3 ELECTRIC WATER HEATER(S)

A. General:

1. Provide electric water heaters with heating elements, built-in protection, controls accessories, and factory wiring so that only power connection and piping is required in the field.
2. Coordinate current and voltage requirements with the electrical contractor.

B. Controls and Accessories:

1. Electric water heaters:

a. Immersion thermostat (minimum of 2).
b. Each heating element shall be activated by a fused magnetic contactor.
c. Step down transformer for control voltage.
d. Internal fusing for each element.
e. Temperature limiting device.
f. Anode rod.
g. Brass drain valve.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Relief lines shall be run full size to a floor drain, service sink.

3.2 INITIAL START-UP

A. Water heaters shall be inspected and started by an authorized factory representative.

3.3 WARRANTY

A. Water heaters:

1. Provide a 3-year tank warranty to protect the Owner against defects in material and workmanship, discolored water or tank perforation due to erosion or corrosion.
2. Should the water heater fail within the first three years following authorized start-up, the manufacturer shall, at their option, repair or replace the water heater at no expense to the Owner.

END OF SECTION

SECTION 224011 - PLUMBING ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the plumbing system, accessories and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All equipment shall comply with American National Standards Institute Code, all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:

a. South Carolina Department of Health & Environmental Control.
b. Plumbing and Drainage Institute Standard No. WH201 “Standard for Water Hammer Arresters.”
c. Plumbing and Drainage Institute Standard No. G-101 “Testing and Rating Procedure for Hydro Mechanical Grease Interceptors with Appendix of Installation and Maintenance.”
d. ASSE Standard 1010-2004 “Performance Requirements for Water Hammer Arresters.”
e. ASTM C1613 “Standard Specification for Precast Concrete Grease Interceptor Tanks”
f. American Concrete Institute (ACI)

B. Manufacturers:

1. The following roof drain and overflow drain manufacturers are acceptable:

a. Mifab
b. J. R. Smith
c. Wade
d. Josam

e. Zurn
f. Watts

2. The following floor drain manufacturers are acceptable:

a. Mifab
b. J. R. Smith
c. Wade
d. Josam
e. Zurn
f. Watts

3. The following floor clean out manufacturers are acceptable:

a. Mifab
b. J. R. Smith
c. Wade
d. Josam
e. Zurn
f. Watts

4. The following backflow preventer manufacturers are acceptable:

a. Apollo
b. Conbraco
c. Watts
d. Wilkins

5. The following water hammer arrester manufacturers are acceptable:

a. Mifab
b. J. R. Smith
c. Sioux Chief
d. Watts
e. Zurn

6. The following trap seal protection device manufacturers are acceptable:

a. SureSeal Manufacturing; Inline Floor Drain Trap Sealer

PART 2 - PRODUCTS

2.1 ROOF DRAINS

A. Provide roof drains at locations shown on plans. Where no size is shown, provide drain same size as connecting piping.

B. Drains shall be cast iron body with combined flashing collar and gravel stop with non-ferrous dome.

C. Expansion joints shall be provided as required. Provide Mifab Model R1900 vertical expansion joint.

D. Roof drains shall be:

1. Poured concrete decks: Provide Mifab Series R1200-M-80 set in poured roof deck slab with an aluminum dome. Flashing is secured by a non-puncturing type of flashing device.
2. Pre-cast deck: Provide Mifab Series R1200-U-M-80 drain body with underdeck clamp. Use where roof drain openings are pre-sleeved in the slab. The Underdeck clamp shall provide positive anchoring of the drain body.
3. Insulated deck: Provide Mifab Series R1200-B-E-U-M-80 drain body with sump receiver, adjustable extension, underdeck clamp, and aluminum dome. Adjust extension for insulation thickness.
4. Promenade deck drain: Provide Mifab R1100-P-3 drain with 1” thick, 8” square adjustable ductile iron tractor grate with stainless steel veneer.

E. Roof Drain Flashing:

1. Flashing sizes where shown are minimum sizes but in no case shall they be less than the size required by the roofing manufacturer.
2. Drains shall be flashed and made watertight using a 4-pound sheet lead. Flashing shall extend 18 inches from the drain body in all directions.

2.2 OVERFLOW DRAINS

A. Provide overflow drains at locations shown on drawings. Where no size is shown, provide drain the same size as connecting piping.

B. Drains shall be cast iron body with combined flashing collar and gravel stop, non-ferrous dome, with 4" diameter PVC or ABS standpipe.

C. Overflow drains shall be:

1. Poured concrete decks: Mifab Series R1200-W-M-80
2. Pre-cast deck: Mifab Series R1200-W-U-M-80
3. Insulated deck: Mifab Series R1200-W-U-E-B-M-80
4. Overflow/downspout nozzle: Mifab Series R1940 nickel bronze finish.

D. Roof Drain Flashing:

1. Flashing sizes where shown are minimum sizes but in no case shall they be less than the size required by the roofing manufacturer.
2. Drains shall be flashed and made watertight using a 4-pound sheet lead. Flashing shall extend 18 inches from the drain body in all directions

2.3 FLOOR DRAINS (FD-X)

A. Provide floor drains at locations shown on drawings.

B. Each drain shall be provided with a cast iron p-trap. Provide full size of drain outlet.

C. Trap seal primers shall be provided where indicated on drawings. Provide trap seal protection devices for all floor drains and floor sinks.

D. Vandal proof screw where stated shall be Torx security pin type screw.

E. Provide membrane clamp (–C) in floor areas with waterproofing membrane.

F. All strainer tops to be reinforced to prevent cupping.

G. Outlet connections for floor drains installed at grade level shall be push-on. Contractor's option for outlet connection type for floor drains installed above grade.

H. Floor drains shall be:

FD-1: General Purpose Floor Drains (Toilets, Water Heater Rooms): Mifab Series F1000-S6-3-7 cast iron drain with 6" round adjustable reinforced stainless-steel top with trap seal primer tapping.

FD-2: Shower Drain: Mifab Series F1000-C-S6-7 cast iron drain and flashing collar with 6" square adjustable reinforced stainless-steel top with trap seal primer tapping.

FD-3: Mechanical Equipment Room Floor Drains: Mifab Series F1340-4-5-7-13-14 cast iron galvanized drain and sediment bucket with 12" round adjustable non-tilt ductile iron tractor grate with trap seal primer tapping.

2.4 CLEANOUTS

A. Provide cleanouts at locations shown on plans and at all bends, angles, upper terminals and each one hundred feet of pipe run.

B. All Cleanouts to have full opening 4" access. Floor cleanouts to be provided with plastic/ABS countersunk regular slotted plugs lubricated with non hardening thread lubricant.

C. Flush-with-floor cleanout tops shall have non-skid covers.

D. Flashing flange with device required on membrane floors.

E. Outlet connections for floor cleanouts installed at grade level shall be push-on. Contractor's option for outlet connection type for floor cleanouts installed above grade.

F. Cleanouts shall be:

1. Finished Room Floors (Round Top): Mifab Series C1000 -R-3 (round top) cast iron adjustable floor level cleanout assembly with stainless steel top.
2. Finished Room Floors (Square Top): Mifab Series Mifab Series C1000- S-3 (square top) cast iron adjustable floor level cleanout assembly with stainless steel top.
3. Unfinished Floors: Mifab Series C1100-XR-4 all cast iron adjustable floor level cleanout assembly with round heavy duty ductile iron top.

4. Yard Areas: Mifab Series C1300-MF w/C1230 cast iron concrete surface level cleanout assembly with lifting device.
5. Aboveground Caulk Ferrule Cleanouts: Mifab Series C1460-RD cast iron ferrule with 6” diameter stainless steel cover. Mifab Series C1460 for plug only.

2.5 VACUUM BREAKERS

A. Vacuum breakers shall be constructed as follows:

1. Body shall be chrome plate brass.
2. Retainer tube screen, cap and collar shall be stainless steel.
3. Ball check shall be stainless steel.
4. Seat shall be resilient "O" ring.
5. Size shall be line size or as indicated on drawing.

B. Vacuum breakers shall be installed on all flush valves, service sinks, mop sinks, hose bibbs, wall hydrants, hose reels, threaded hose connections, any devices which can be installed or placed below a fixture flood rim, and elsewhere as specified.

C. Dishwashers shall be provided with a satin chrome lead-free anti-siphon, spill-resistant vacuum breaker. Vacuum Breaker shall be Watts LF008PCQT or equal.

2.6 BACKFLOW PREVENTERS

A. Backflow preventers shall be approved by University of Southern California’s Foundation for Cross Connection Control and Hydraulic Research (USC-FCCCHR) and local authority’s approved manufacturer list.

B. Provide an approved backflow prevention device (double check valve backflow preventer unless noted otherwise) at all points of possible backflow into potable water mains, as shown on plans and as follows:

1. At entry into building.

C. Provide an approved backflow prevention device (reduced pressure principle) as shown on plans.

D. Provide an in-line, lead free continuous pressure double check backflow preventer on both hot and cold-water supply lines to hose reels, waste pulpers, power clean-up equipment and hose connections in Kitchen facilities as required by South Carolina Department of Health and Environmental Control (SCDHEC). Backflow preventer shall meet the requirements of ASSE Standard 1024 and shall be provided with union inlet.

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Watts No. LF7
b. Conbraco No. 4NLF-300 Series

E. Each backflow preventive device shall include shut-off valves, two approved check valves, and four properly installed test cocks. Shut-off valves shall be either ball valves or resilient wedged gate valves. Ball valves shall be used through 2” size. Provide unions for non-flanged assemblies.

F. Provide bronze wye type strainer with stainless steel screen upstream of backflow prevention assemblies where indicated on drawings. Strainer shall have either threaded or flange connections. Threaded units shall have unions on each end for disassembly.

G. Reduced pressure backflow prevention devices shall be provided with air gap. Discharge from air gap shall be piped to nearest floor drain or to exterior as noted on plans.

2.7 WATER HAMMER ARRESTERS

A. Water hammer arresters shall be installed on both hot and cold-water lines.

1. Size by fixture unit rating of Plumbing and Drainage Institute (PDI).
2. Select the next larger water hammer arrester when water pressure in line exceeds 65 PSI.
3. Water hammer arresters shall conform to ASSE 1010-2004.

B. Water hammer arresters shall be permanently sealed, tested to 5000 cycles and 125 PSI working pressure. Water hammer arrestors shall be suitable for installation in concealed locations without requiring access panels.

C. Provide a water hammer arrester at the following locations:

1. Flush valves (water closet/urinal):

    a. Single fixture.
    b. When in a battery and up to twenty (20) feet at the end of the branch line between the last two (2) fixtures.

2. Quick closing valves.
3. Lavatories:

    a. When in a battery and up to twenty (20) feet at the end of the branch line.

4. Risers (at the top).
5. When fixtures in a battery and exceeds twenty (20) feet, provide an additional water hammer arrester mid point.

D. Water hammer arresters shall be, or equal to:

1. Mifab MWH Series
2. J. R. Smith No. 5000 Series Hydrotrol
3. Sioux Chief No. 650 Series Hydra-Rester
4. Watts No. 15M2 Series Water Hammer Arrester
5. Zurn 1700 Series

2.8 TRAP SEAL PROTECTION DEVICES

A. Device shall be barrier type configuration and shall be tested and certified to ASSE 1072 Standard “Performance Requirements for Barrier Type Floor Drain Trap Seal Protection Devices”.

B. Body: ABS Plastic

C. Diaphragm & Sealing Gasket: Neoprene Rubber

D. Size: 2-inch, 3 inch, 3-1/2 inch, or 4 inch.

E. Gravity Drain Outlet Connection: Compression fit sealing gasket 80 durometer.

F. Provide at each floor drain or floor sink connection whether or not the floor drain or floor sink is specified with a trap seal primer.

PART 3 - EXECUTION

3.1 TEMPORARY PLUMBING FACILITIES

A. Temporary toilet facilities, and water for construction purposes shall be as specified in Division 1, all to be provided by General Contractor. This Contractor shall cooperate to connect building facilities where required by Architect/Engineer to expedite progress of the work.

3.2 ROOF DRAINS AND OVERFLOW DRAINS

A. Roof drains shall be clamped under flashing clamp and mopped into roofing. Drains shall be provided with deck clamps as detailed. Drains shall be painted with bitumen where same are in contact with concrete.

B. Drainage shall be furnished and installed as complete system including cleanouts.

C. Expansion joints as required shall be properly supported from the roof drain body.

3.3 FLOOR DRAINS

A. All drains above grade shall be flashed with 4 lb. sheet lead clamped under flashing ring extending 18" from drain in all directions, lead shall be mopped to structural deck.

B. All drains shall be provided with deep seal p-traps.

C. Set drains to provide drainage of surrounding areas.

3.4 TRAP SEAL PROTECTION DEVICES

A. Trap seal protection devices shall be installed at trim out stage of project and not before.

3.5 VACUUM BREAKERS

A. Vacuum breaker shall be installed per code and 6" above floor rim, whichever requirement is most stringent.

3.6 WATER HAMMER ARRESTERS

A. Water hammer arresters shall be installed in an upright position.

3.7 STERILIZING AND CLEANUP

A. After system has been installed completely, Contractor shall clean all fixtures removing all plaster, labels, etc. All water piping shall be sterilized in accordance with these specifications.

3.8 INSPECTIONS, TESTS, AND ADJUSTMENTS

A. During progress and after completion of the work included under this specification, Contractor shall make all required tests at his own expense in presence of Architect/Engineer as follows and in accordance with local codes. Contractor shall furnish all testing instruments, gauges, pumps, etc.

B. All materials shall, so far as possible, be subjected to standard tests by manufacturers before shipment.

C. All tests shall be conducted in accordance with System Test And Start-Up specification.

D. Upon completion of work, Contractor shall obtain and turn over to the Architect certificates of inspection and approval from all City and State Authorities having jurisdiction.

3.9 BACKFLOW PREVENTERS

A. Backflow preventers installed above ceilings shall be observable from floor level when lay-in ceiling tile is removed where installed above accessible ceilings or when ceiling access door is accessed when installed above a non-accessible ceiling. Contractor shall provide access door per requirements of Section 21 0501.

B. Submittals:

1. Submit all backflow preventers to the local utility company for approval before submittal to A/E.
2. Submittal to utility company shall include a description of the intended application of each device.
3. Submittal to A/E shall include a copy of the letter of approval from the utility company to the contractor.

END OF SECTION

SECTION 224013 - PLUMBING FIXTURES (GENERAL)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

a. A Sanitary Cast Iron Enameled Ware Commercial Standard
b. Staple Vitreous China Plumbing Fixtures
c. U. S. Department of Commerce CS 20-49, CS 77-48.
d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following wall hydrant and Hose Bibb manufacturers are acceptable:

a. Woodford Manufacturing Company
b. MIFAB
c. Josam

PART 2 - PRODUCTS

2.1 WALL HYDRANTS

A. Wall hydrant minimum supply 3/4" with backflow preventer and vacuum breaker.

B. Fixture shall be:

P-8: Wall Hydrant (Outside Building): Wall mounted, 24" above finish grade.

Fixture: Woodford Model 67 backflow protected automatic draining freeze less wall hydrant. ASSE Standard 1052 approved.

2.2 HOSE BIBBS:

A. Hose bibb minimum supply 3/4" with backflow preventer and vacuum breaker.

B. Fixture shall be:

P-7 Hose Bibb (Toilets) Fixture: Recessed, 24” above finished floor.

Fixture: Woodford model MB26 chrome finish, backflow protected ASSE Standard 1502 approved.

2.3 WASHING MACHINE CONNECTION:

A. Minimum supply connection shall be ½".

B. Fixtures shall be:

P-9 Washing Machine Connection: Fully recessed, 9" wide x 10-3/4" Ht x 3-5/8" deep, 31" maximum mounting height from finish floor to rim.

Fixture: Guy Grey Model No. BB-200TS (top supply). Model No. B-200 (bottom supply) 2" waste.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.
4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

3.2 FIXTURE MOUNTING HEIGHTS

A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with this section of the specifications.

3.3 FIXTURE SUPPORTS

A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

3.4 CLEANING

A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.

B. Fixtures shall be cleaned spotless before final inspection.

C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION

SECTION 224100 - PLUMBING FIXTURES (SINKS AND LAVATORIES)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

a. A Sanitary Cast Iron Enameled Ware Commercial Standard
b. Staple Vitreous China Plumbing Fixtures
c. U. S. Department of Commerce CS 20-49, CS 77-48.
d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following lavatory manufacturers are acceptable:

a. Kohler Company
b. Zurn
c. TOTO
d. American Standard

2. The following sink manufacturers are acceptable:

a. Acorn
b. Elkay
c. Kohler
d. Just

e. Acorn

3. The following floor mounted service sink manufacturers are acceptable:

a. Sterns-Williams Company
b. Fiat Products, Inc.

4. The following manual faucet and handle manufacturers are acceptable:

a. T&S Brass and Bronze Works, Inc.
b. Chicago Faucet Company
c. Delta Faucet Company
d. Moen
e. Speakman
f. Symmons
g. TOTO
h. Zurn

5. The following fixture trim manufacturers are acceptable:

a. Kohler Company
b. McGuire Manufacturing Company
c. Engineered Brass Company (EBC)

6. The following handicapped insulation manufacturers for lavatories are acceptable:

a. TrueBro
b. McGuire Pro-Wrap

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND FIXTURE TRIM

A. General:

1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into the water supply system.
2. All enamel on cast iron fixtures shall be acid resisting.
3. All wall hung fixtures shall have carriers.
4. Provide lavatories with angle stops. Provide all other plumbing fixtures with either angle or straight stops.
5. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
6. All trim shall be manufactured by fixture manufacturers, unless specifically noted otherwise.
7. The color of fixtures shall be white unless specifically noted otherwise.

B. Handicap Sinks and Lavatories:

1. Provide TrueBro Model 102W (White) p-trap, hot water and cold-water angle valve insulation and fasteners. Handi Lav-Guard insulation kit. (Provide No. 105W

accessory with No. 102 for offset p-trap.) (Approved Equal: McGuire Pro-Wrap Model PW 2125 (White).

2.2 LAVATORIES (GENERAL)

A. Minimum connections shall be 3/8".

B. Enameled cast iron unless stated otherwise.

C. Lavatories shall be:

P-3: Lavatory (ADA): Undermount.

Fixture: Kohler model K-2882-0, undermount lavatory, 19 ¾" x 15 5/8".

Fitting: T&S Brass model B-2865-05-0CS8, with 4" Wrist Action Handles. With vandal resistant aerator and thermostatic mixing valve.

Drain: Kohler, K-7715 perforated strainer, 1-1/4" tailpiece.

Supply: Kohler, K-7607 LK.

P-Trap: Kohler, K-9000 1-1/4" P-trap.

Remarks: Refer to section 2.1-B.

P-3A: Lavatory (ADA): Wall hung, 20" x 18", Hudson, mounting height 29" from finish floor to bottom of apron. 8" knee clearance.

Fixture: Kohler, K-2868 (plate anchor) 8" center. Cast iron lavatory.

Fitting: T&S Brass B-2865-4 faucet with quarter-turn valve, 4" wrist handles and gooseneck spout with B-199-7 vandal proof aerator.

Drain: Kohler, K-7715 perforated grate, 1-1/4" tailpiece.

Supply: McGuire model 2165 LK.

P-Trap: McGuire model 8902 - 1-1/2" p-trap.

Remarks: Provide TrueBro lavatory shield with vandal proof screws.

2.3 UTILITY SINK

A. Utility sink minimum connections shall be 3/8".

B. The utility sink shall be 18 gauge minimum, type 302 stainless steel unless noted otherwise.

C. Fixtures shall be:

P-4A: Single Compartment Sink (ADA): undermount, 30 ½" length x 18 ½" width, Lustertone classic stainless steel. (see Arch. specs for mounting height).

Fixture: Handicapped Sink: Elkay model ELUHAD281655, 5 3/8" depth.

Fitting: Elkay, model LKGT1041, Single hole kitchen faucet with pull-out spray and lever handle.

Drain: Elkay, LKAD-35 strainer with offset drain, 1-1/2" tailpiece.

Supply: McGuire model 2165 LK.

P-Trap: McGuire model 8912 - 1-1/2" p-trap

P-4B Single Compartment Sink (ADA): undermount, 30 ½" length x 18 ½" width, Lustertone Classic Stainless Steel. (see Arch. specs for mounting height).

Fixture: Handicapped Sink: Elkay model ELUHAD281655, 5 3/8" depth.

Fitting: Elkay, model LKGT1041, Single hole kitchen faucet with pull-out spray and lever handle.

Drain: Elkay, LKAD-35 strainer, 1-1/2" tailpiece.

Supply: McGuire model 2165 LK.

P-Trap: McGuire model 8912 - 1-1/2" p-trap.

2.4 SERVICE SINK

A. Service sink minimum connection shall be 3/4 inch.

B. Fixtures shall be:

P-4 Service Sink Basin: Floor mounted, 24" x 24" x 12" Terrazzo with stainless steel cap.

Fixture: Stern-Williams, SBC-1402.

Fitting: T & S Brass model B-0665-BSTP faucet with integral stops, hook, V.B and brace, polished chrome finish.

Drain: Stern-Williams, chrome plated strainer.

Accessories: Stern Williams, T-40 stainless steel mop hanger, T-35 hose wall hook without tiling flange, and splash catcher panels of 20-gauge type 304 stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, the fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building

structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.

4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

3.2 FIXTURE MOUNTING HEIGHTS

A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with this section of the specifications.

B. Lavatories:

1. Public Facilities:

a. Public Toilets - 33" floor to rim.
b. Handicapped - 34" floor to rim (29" clearance from floor to the bottom of the apron)

3.3 FIXTURE SUPPORTS

A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

B. Lavatories and sinks mounted on stud walls:

1. Install a 1/4" thick by 6" wide steel plate which shall extend at least one stud beyond the first and last fixture mounting points.
2. In wood stud construction, the plate shall be securely attached to each stud which it crosses with two (2) 1/2" steel bolts on 4" centers with 1/8" thick by 1-1/2" wide by 6' long steel backup plates.
3. In steel stud construction the plate shall be attached to each stud which it crosses by 1/8" fillet weld across the full width of the steel stud flange or plate and support carrier J.R. Smith 800.
4. Fixture or supporting arms shall be securely and firmly attached to the steel plate in accordance with the manufacturer's instructions.
5. Lavatories shall be punched for Smith No. 723 concealed arm fixture support. The arms shall be securely bolted to the steel backing plate in the wall as hereinbefore specified. They shall have a positive mechanical locking device and shall be fully adjustable after installation of the finished wall.

C. Lavatories and sinks mounted on block walls.

1. Lavatories shall be punched for Smith No. 700 fixture support. Fixture support shall have concealed arms with positive mechanical locking device. Arms shall be fully adjustable after installation of finished wall. Uprights shall be high strength steel with block bases securely bolted to floor construction.
2. Heavy sinks shall be mounted on Smith No. 871 fixture support with porcelain enamel exposed arms. Uprights shall be high strength steel with block bases securely bolted to floor construction.

3.4 CLEANING

A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.

B. Fixtures shall be cleaned spotless before final inspection.

C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION

SECTION 224200 - PLUMBING FIXTURES (SHOWERS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

a. A Sanitary Cast Iron Enameled Ware Commercial Standard
b. Staple Vitreous China Plumbing Fixtures
c. U. S. Department of Commerce CS 20-49, CS 77-48.
d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following faucet and handle manufacturers are acceptable:

a. T&S Brass and Bronze Works, Inc.
b. Chicago Faucet Company
c. Delta Faucet Company
d. Moen
e. Speakman
f. Symmons
g. Zurn

2. The following fixture trim manufacturers are acceptable:

a. Kohler Company

b. McGuire Manufacturing Company
c. Engineered Brass Company (EBC)

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND FIXTURE TRIM

A. General:

1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into the water supply system.
2. All enamel on cast iron fixtures shall be acid resisting.
3. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
4. All trim shall be manufactured by fixture manufacturer, unless specifically noted otherwise.
5. The color of fixtures shall be white unless specifically noted otherwise.

2.2 SHOWERS

A. Showers shall be provided with a single handle anti-scald Equa Flow Pressure Balanced Mixing Valve and 2.0 G.P.M flow control.

B. The shower shall be provided with Deluxe SF shower head and soap dish.

C. Minimum connection shall be 1/2 inch.

D. Fixtures shall be:

P-5 Shower (Handicapped) (roll-in): field constructed.

Fixture: Symmons model 3605-H321-V-TRM with 3605H321TRMTD shower/hand shower system. Wall mounted with Temptrol Pressure Balancing valve, stop screw, mounting bottom of slide bar 48" from finish floor.

Drain: 2” FD-2.

Remarks: Anti-scald pressure balancing valve with integral volume control. Wall/hand shower with 69" flexible stainless-steel hose, wall connection and flange. Slide bar for hard shower mounting and in-line vacuum breaker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.
4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

3.2 FIXTURE MOUNTING HEIGHTS

A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with this section of the specifications.

3.3 FIXTURE SUPPORTS

A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

3.4 CLEANING

A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.

B. Fixtures shall be cleaned spotless before final inspection.

C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION

SECTION 224300 - PLUMBING FIXTURES (WATER CLOSETS AND URINALS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

a. A Sanitary Cast Iron Enameled Ware Commercial Standard
b. Staple Vitreous China Plumbing Fixtures
c. U. S. Department of Commerce CS 20-49, CS 77-48.
d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following water closet manufacturers are acceptable:

a. Kohler Company
b. American-Standard Company
c. Zurn
d. TOTO

2. The following urinal manufacturers are acceptable:

a. Kohler Company
b. TOTO

3. The following flush valve manufacturers are acceptable:

    a. TOTO
    b. Kohler
    c. Zurn
    d. Sloan

4. The following water closet seat manufacturers are acceptable.

    a. TOTO
    b. Kohler
    c. Olsonite Corporation
    d. Bemis
    e. Comfort Design

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND FIXTURE TRIM

A. General:

1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into the water supply system.
2. All enamel on cast iron fixtures shall be acid resisting.
3. All wall hung fixtures shall have carriers.
4. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
5. All trim shall be manufactured by fixture manufacturer, unless specifically noted otherwise.
6. Color of fixtures shall be white unless specifically noted otherwise.

2.2 WATER CLOSETS (GENERAL)

A. Minimum connection shall be 1 inch.

B. Seat shall be white unless stated otherwise.

C. Handicapped water closet: locate flush valve handle on the wide side of fixture.

D. Flush valves shall have self-generating power or be equipped with batteries with min. 10 years of battery life.

E. Secure all flush valves to wall with wall bracket.

F. Water closets shall be:

P-1 Water Closet: Floor mounted, 15” finish floor to top of rim.

Fixture: Kohler, Wellcomme Elongated toilet, model K-96053-0, 1.6 GPF.

Valve: TOTO, piston type manual flush valve model TMT1NNC-32. 1.6 GPF.

Seat: Beneke, 527 SS (White).

Bolt Caps: Supplied with water closet.

Remarks: Wall bracket shall be Sloan model J-212A or J-312A or approved equal.

P-1A Water Closet (Handicapped): Floor Mounted, 17" finish floor to top of rim.

Fixture: Kohler, Highcliff Elongated toilet, model K-96057-0. 1.6 GPF.

Valve: TOTO, piston type manual flush valve model TMT1NNC-32. 1.6 GPF.

Seat: Beneke, 527 SS (White).

Bolt Caps: Supplied with water closet.

Remarks: Wall bracket shall be Sloan model J-212A or J-312A or approved equal.

2.3 URINALS (GENERAL)

A. Minimum connection shall be 3/4 inch unless stated otherwise.

B. Urinal mounting heights shall be as listed for each fixture.

C. Handicapped urinal: locate flush valve handle on the wide side of fixture.

D. Flush valves shall have self-generating power or be equipped with batteries with min. 10 years of battery life.

E. Secure all flush valves to wall with wall bracket.

F. Urinals shall be:

P-2 Urinal: Wall hung, 24" finish floor to top of rim, urinal carrier and wall bolts and metal strainer.

Fixture: TOTO model UT447E. Top Spud Urinal 0.5 GPF.

Valve: TOTO, piston type manual flush valve model TMU1LN12#CP. 0.5 GPF.

Remarks: Wall bracket shall be Sloan model J-212A or J-312A or approved equal.

P-2A Urinal (Handicapped): Wall mounted, Dexter, 17" finish floor to top of rim, urinal carrier and wall bolts and metal strainer.

Fixture: TOTO model UT447E. Top Spud Urinal 0.5 GPF.

Valve: TOTO, piston type manual flush valve model TMU1LN12#CP. 0.5 GPF.

Remarks: Wall bracket shall be Sloan model J-212A or J-312A or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, the fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.
4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

3.2 FIXTURE MOUNTING HEIGHTS

A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with this section of the specifications.

B. Water Closets:

1. Mount all water closets at 15" top of rim to floor.
2. Mount all handicapped water closets at 17" minimum - 19" maximum top of toilet seat to floor.

C. Urinals:

1. Mount all urinals at 24" from floor to lip.
2. Mount all handicapped urinals 17" from floor to lip.

3.3 WATER CLOSETS

A. Make joints between earthenware fixtures and soil pipe by means of flange compatible to pipe. Joint shall be gastight and watertight.

B. Set all floor type water closets with a "no-seep" sleeve gasket as manufactured by William H. Harvey Company, Oatey and IPS.

3.4 FIXTURE SUPPORTS

A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

B. Wall hung siphon jet water closet supports:

1. Smith No. 100 series "adjustable" deep rough-in support.
2. Where floor construction is not suitable for deep rough-in, Smith No. 200 series shallow rough-in type may be used.
3. Where furred wall space is not sufficient for the adjustable series, Smith "compact" No. 400 series may be used.
4. Steel bolt, anchor, and toggle bolt shall be provided to secure the solid steel plate wall hanger.

C. Wall hung blowout and washout urinals:

1. Smith No. 634, 635, 636, and 637 urinal support. Uprights shall be high strength steel with block bases securely bolted to floor construction.

3.5 CLEANING

A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.

B. Fixtures shall be cleaned spotless before final inspection.

C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION

SECTION 224400 - PLUMBING FIXTURES (WATER FOUNTAIN AND WATER COOLERS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of plumbing fixtures where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 22 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All equipment shall comply with American Society of Testing Materials, all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

a. A Sanitary Cast Iron Enameled Ware Commercial Standard
b. Staple Vitreous China Plumbing Fixtures
c. U. S. Department of Commerce CS 20-49, CS 77-48
d. WW-P-542 Formed Steel Fixtures

B. Manufacturers:

1. The following water fountain and water cooler manufacturers are acceptable:

a. Elkay Manufacturing Company
b. Murdock Manufacturing Company

2. The following fixture trim manufacturers are acceptable:

a. Kohler Company
b. McGuire Manufacturing Company
c. Engineered Brass Company (EBC)

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND FIXTURE TRIM

A. General:

1. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into water supply system.
2. All wall hung fixtures shall have carriers.
3. Exposed piping fittings and trimmings shall be chromium plated over nickel plated brass with polished, bright surfaces unless specifically noted otherwise.
4. All trim shall be as manufactured by fixture manufacturer, unless specifically noted otherwise.

2.2 DRINKING FOUNTAIN (STANDARD)

A. Minimum supply connection shall be 3/8".

B. Refer to drawings for fixture information.

C. Fixtures shall be:

P-6 High & Low Electric Water Cooler with bottle filling station (Handicapped): Wall mounted, 36" wide x 19" deep.

Fixture: Elkay, LZWS-LRPBM28K - Bi- level integral Swirl Flo stainless steel drinking fountain with bottle filler. (Completely lead-free material).

Supply: Kohler, K-7606 with stop.

P-Trap: Kohler, K-9000 1-1/2" p-trap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. All fixtures shall be installed in strict accordance with the manufacturers' recommendations.
2. All fixtures shall be protected during construction by covering with manila paper glued on. In addition, fixture shall be covered with shipping box taped to fixture.
3. All equipment, fixtures or devices shown on plans as new or relocated fixtures or devices shall require the Contractor to furnish and install all braces, supports, mounting brackets, spacers, shims, pads or other appurtenances required to make the fixture level and securely anchored to the wall, floor, or other component of the building structures. Supports not specified hereinafter shall be furnished in accordance with the equipment manufacturers recommendations.

4. In the event of damage, defects or flaws, regardless of the cause, immediately make all repairs and replacements at no additional cost to the Owner.
5. All fixtures shall be caulked to floor, wall, countertop, or other finished surfaces with compound recommended by fixture manufacturer. Color shall match fixture.

3.2 FIXTURE MOUNTING HEIGHTS

A. General:

1. Mount fixtures as shown for each fixture type. For mounting heights not shown, install fixture in accordance with this section of the specifications.

B. Drinking Fountain/Water Cooler:

1. Public Facilities:

a. Mount all drinking fountains/water coolers at 40" finish floor to top of rim (42" to orifice).

2. Handicapped Fixtures:

a. Mount all handicapped fixtures 36" finish floor to orifice.
b. Provide 27" minimum clearance below fixture.

3.3 FIXTURE SUPPORTS

A. General:

1. All plumbing fixtures which are wall mounted shall be mounted and supported on concealed cast iron or steel fixture supports or carriers as hereinafter specified. These supports shall be completely concealed in the wall and shall support the load of the fixture by means of a suitable steel backing plate or face plate and base support, which is firmly anchored to the floor. In no case shall any wall mounted plumbing fixture be mounted in such a manner that the fixture load is transmitted to mounting wall surface material.

B. Drinking fountains mounted on stud walls:

1. Install a 1/4" thick by 6" wide steel plate which shall extend at least one stud beyond the first and last fixture mounting points.
2. In wood stud construction, the plate shall be securely attached to each stud which it crosses with two (2) 1/2" steel bolts on 4" centers with 1/8" thick by 1-1/2" wide by 6' long steel backup plates.
3. In steel stud construction the plate shall be attached to each stud which it crosses by 1/8" fillet weld across the full width of the steel stud flange or plate and support carrier J.R. Smith 800.
4. Fixture or supporting arms shall be securely and firmly attached to the steel plate in accordance with the manufacturer's instructions.

C. Drinking fountains mounted on block walls:

1. Water coolers shall be mounted on Smith No. 830 floor mounted water cooler support. Uprights shall be high strength steel with block bases securely bolted to floor construction.

3.4 CLEANING

A. All fixtures shall be kept in new condition during construction. Fixtures which have been obviously abused shall be replaced.

B. Fixtures shall be cleaned spotless before final inspection.

C. Cleaning agents and materials shall not scratch, mar, or otherwise harm the fixture.

END OF SECTION

SECTION 230501 - GENERAL HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Heating, Ventilation, and Air Conditioning (HVAC) work shall include, but not be limited to, the following:

1. Piping for HVAC system
2. Heating systems
3. Air Conditioning
4. Air Distribution
5. Controls and Instrumentation
6. Balancing of Air Systems

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 DELINEATION OF WORK

A. Provide all necessary coordination of information to installers who are performing work to accommodate Division 23 installations.

B. Where the Division 23 installer is required to install items which they do not purchase, they shall include for such items:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any designated point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected.
5. Their field assembly and internal connection may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

C. Items which are to be installed by the Division 23 installer but not purchased as part of the work of Division 23 shall be carefully examined upon delivery to the project. The Division 23 installer shall provide all work necessary to properly install these items.

D. If any items have been received in such a condition that their installation will require additional work beyond the project scope of the work, the Engineer shall be notified in writing within ten (10) working days of the date of delivery of the items. Any claims beyond 10 days will not be considered by the Engineer.

1.4 QUALITY ASSURANCE

A. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be furnished. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so, directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.

B. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location that is easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.

C. All equipment of one type (such as fans, valves, grilles, etc.) shall be the products of one manufacturer unless specifically stated otherwise.

D. Where the specifications do not list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.

E. All materials with a manufacturer’s listed shelf life shall be used at least six months prior to the expiration of the materials' shelf life.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

A. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits, and pay all required fees.

B. Where Codes and Standards are referenced, they shall be the date stated in these specifications or on the drawings. If none stated, they shall be the latest edition.

C. All work shall conform to the following Building Codes:

1. International Building Codes
2. National Fire Protection Association

D. All work shall conform to all federal, state, and local ordinances.

E. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:

1. Factory Mutual Laboratories (FM)
2. Underwriters Laboratories, Inc. (UL)

1.6 STANDARDS AND PROCEDURES

A. All work shall meet or exceed the standards and procedures of the following:

1. ADC: Air Diffusion Council
2. AMCA: Air Moving and Conditioning Association, Inc.
3. ANSI: American National Standards Institute
4. ARI: American Refrigeration Institute
5. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
6. ASME: American Society of Mechanical Engineers
7. ASTM: American Society of Testing and Materials
8. MSS: Manufacturers Standardization Society
9. NEMA: National Electrical Manufacturer's Association
10. OSHA: Occupational Safety & Health Administration
11. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.
12. IRM: Improved Risk Mutuals

1.7 APPROVAL OF SUBSTITUTIONS

A. Specific reference in the specifications to any article, device, product, materials, fixture, form or type of construction, etc., by name, make, or catalog number, with or without the words "or equal", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the Engineer expressed in writing, is equal to that named. Where quality and other characteristics are very nearly the same, the question of determining equal materials and readily available service sometimes resolves itself to a matter of personal opinion and judgment and in these and all other cases involving the approval of materials, the opinion, judgment and decision of the Engineer shall be final and bind all parties concerned.

B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for approval in writing ten (10) calendar days prior to the bid opening date to the Engineer. Requests shall be accompanied by samples, literature, and information as necessary to fully identify and allow appraisal of the material or equipment. Submittals shall be concise, clear, and brief as possible. Incomplete submittals or submittals requiring lengthy research to ascertain quality will not be considered.

C. Approval of the Engineer to use materials or equipment, if granted, will be in the form of a written addendum. Approved substitutions may be used at the Contractor's option. No substitutions will be allowed if substitutions are requested later than ten (10) days prior to bid opening date.

D. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly indicated in the form of a letter that is enclosed with the submittals. The Contractor shall be responsible for verifying all dimensions with available space. If, in the opinion of the Engineer, the physical dimensions do not permit the substituted material or equipment to be properly operated, maintained, serviced, or otherwise accessed, or the physical dimension adversely impact other components, a system's ability to be operated, maintained, serviced or otherwise accessed, the material or equipment shall be replaced at the Contractor's expense.

1.8 VERIFICATION OF DIMENSIONS AND LOCATIONS

A. The Contractor shall visit the facility and become thoroughly familiar with all details of the work, working conditions, dimensions and clearances.

B. Notify the Engineer of any discrepancy between actual conditions and conditions indicated on the contract documents that could cause changes, other than minor ones, to the installation of any systems or equipment.

1.9 EQUIPMENT CONNECTIONS

A. The contract documents may indicate specific electrical, duct, and piping connection locations to equipment. Each manufacturer approved for bidding may have different connection arrangements. The Contractor is responsible for the modifications to and the extension of connecting components as required for the equipment provided.

B. The Contractor shall bear all costs for required changes in connection to equipment.

1.10 ROOFTOP EQUIPMENT LOCATIONS

A. Rooftop equipment shall not be located within ten (10) feet of the roof edge. Notify the Engineer in writing of any discrepancy on the plans and the ten (10) foot requirement prior to ordering equipment.

B. All roof mounted equipment shall be located so as to provide for clearance all around and above each unit equal to or greater than that recommended by the unit manufacturer's suggested services and operating clearances. Notify the Engineer in writing of any circumstances that would prevent proper clearances from being provided prior to roughing-in equipment.

1.11 WORKMANSHIP

A. Workmen shall be thoroughly experienced and fully capable of installing the work. The work shall be in accordance with the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to Owner.

B. All material and equipment to be installed in accordance with manufacturer's printed recommendations using recommended accessories. Retain a copy on the job site and submit others for approval when required.

1.12 GUARANTEES AND WARRANTIES

A. General:

1. Furnish to the Engineer a guarantee form, included in these specifications, signed by the Contractor and Owner agreeing to the start and end dates of all systems and equipment under warranty.
2. All defective materials or inferior workmanship shall be replaced or repaired as directed by the Owner's representative during the guarantee period.

B. Equipment Warranties:

1. Equipment shall be warranted by the equipment manufacturer. Where labor is included in the warranty, the manufacturer, at their option, may permit the contractor to provide the required repairs on the equipment unless specified otherwise.
2. The equipment manufacturer shall include a written guarantee with the closeout documentation.

C. Duration Period:

1. For work not otherwise specified, the duration shall be one year from awarded substantial completion including all parts, labor, and other charges.
2. The Contractor is responsible for purchasing from the equipment manufacturers any additional warranties to ensure that the equipment is warranted by the manufacturer through the duration period specified.

D. Extended Warranties:

1. Warranty periods shall be extended where specifically stated in these specifications.
2. The extended warranties shall meet the requirements of the base warranty unless specifically noted otherwise.
3. The extended warranty time listed is time in addition to the base warranty period.
4. The following systems or equipment shall be extended warranties:

    a. All air conditioning compressors shall be provided with an extended 4-year warranty, including parts and delivery charges. Centrifugal and rotary compressors shall include motor, impeller or screw, and drive train.

E. Non-Warranted Items:

1. Nondurable replaceable items such as air filter media do not require replacement after the date of acceptance.

F. Warranty Repair:

1. Repair shall take place as soon as possible but not later than the following:

    a. Items not essential for facility operation - 7 days.
    b. Items that have a minimal impact on facility operation - 2 days.
    c. Items that have a significant impact on the facility operation - immediately begin repairs or work necessary to minimize operational impact to Owner.

2. The determination of the impact on the facility is solely that of the Owner and Engineer.
3. Where life safety issues are impacted, the contractor shall take all steps necessary to ensure the facility can continue to function in a safe manner.
4. If repairs cannot be made in the required time period, temporary systems shall be installed until repairs can be completed.
5. All costs associated with warranty work shall be borne by the contractor.

1.13 PROJECT COMMUNICATIONS

A. Where it is indicated that communication is with the Engineer or documents are to be transmitted to the Engineer, this is intended that this be done through the prime design professional. If the Architect is the prime design professional, all communication and documentation shall be sent via the Architect.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRIOR CONDITIONS

A. Prior to the installation of any equipment or system component, the Contractor shall review any prior work that has been completed to accommodate the equipment or system component to be installed.

B. If the prior work does not make a proper installation of any equipment or system component possible, notify the Engineer prior to installation of any equipment or system component.

3.2 INSTALLATION

A. Install all equipment and appurtenances in strict accordance with the manufacturer's recommendations and the manufacturer's shop drawings.

B. If any equipment cannot be installed in accordance with Codes, contract documents, manufacturer's recommendations and accepted practices, notify the Engineer in writing prior to installation of equipment.

C. If any system component cannot be installed in accordance with Codes, contract documents and accepted practices, notify the Engineer in writing prior to installation of the system component.

3.3 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage prior to final inspections, repair or replace damaged items as determined by the Engineer, at no cost to the Owner.

B. Store equipment on elevated supports and cover them on all sides with securely fastened waterproof coverings. All equipment openings shall be securely sealed.

C. Piping shall be protected by storing it on elevated supports and capping the ends.

D. During construction, all open ends of pipe, etc. which could collect construction debris shall be properly capped.

3.4 CLEANING OF SYSTEMS AND EQUIPMENT

A. All equipment and systems shall be cleaned of all extraneous materials to leave equipment and system finish in a new condition.

B. Where equipment and systems cannot be properly cleaned, take all measures necessary to replace or repair equipment and systems to bring back to a "like new" condition. All costs shall be borne by the Contractor.

C. All extraneous materials shall be removed on the site on a regular basis to provide access to all work as well as a safe working environment.

3.5 SUPPORT OF SYSTEMS

A. Hanging duct, conduit, piping, or equipment from metal decks (i.e., metal roof deck w/o concrete), wood decks, etc. is not permitted.

B. The following methods of support are not permitted:

1. Wire hangers unless specifically indicated.
2. Perforated straps
3. Vinyl or plastic straps

END OF SECTION

SECTION 230502 - COMMON HVAC MATERIALS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of the mechanical systems where shown on the drawings and specified hereinafter.

B. Description:

1. Rooftop curbs shall include all supports for rooftop equipment and accessories.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 QUALITY ASSURANCE

A. All work shall meet or exceed the standards and procedures (latest edition) of the following:

1. AISC Steel Handbook

B. All work shall be applicable by mechanics normally employed in the trade. All work shall be installed in accordance with the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless specifically indicated otherwise, the following products or product accessories shall be provided with the indicated equipment:

1. Filters shall be provided on all air systems to protect heat transfer components from outside air, building return air or other airstreams that could foul heat transfer surfaces and elsewhere as indicated. Refer to Particulate Air Filtration specification.

2.2 FLASHING

A. General:

1. Provide flashing and counter flashing on all pipes, conduits, and other mechanical system components which penetrate roofs.

B. HVAC Pipe and Conduit:

1. See details on plans.

2.3 HVAC ROOF CURBS AND SUPPORT RAILS

A. Required Locations:

1. Provide roof curb for all rooftop mechanical systems or components including, but not limited to, the following:

    a. Exhaust fans
    b. Intake hoods
    c. Relief hoods
    d. Utilities through roof
    e. Single package heat pumps
    f. Dehumidification rooftop units
    g. Elsewhere as indicated

2. Provide support rail for all rooftop mechanical systems or components including, but not limited to, the following:

    a. Condensers
    b. Elsewhere as indicated

B. Height of Roof Curbs and Support Rails:

1. Height shall be 18 inches, 8 inches above top of finished roof, whichever is greater.
2. Curb or support rail shall be sloped as required to maintain a level surface for the equipment piping.

C. Curb Construction:

1. Curb shall be manufactured specifically for the roof type on which it is to be installed.
2. Curb shall be continuously welded.
3. Curb shall have 1-1/2-inch internal rigid insulation with a 1/8-inch gasket between top of curb and equipment.
4. Curbs shall be galvanized.
5. Curbs shall be minimum 18 gauge.
6. Provide an angle on bottom of single package heat pump curbs all around for attachment of sound barrier material.

D. Support Rail Construction

1. Support rail construction shall be similar to the curb construction except rails shall be dual wall with internal insulation.
2. Support rail width shall be 6" min.
3. Curb caps shall be 16 gauge (min.) and continuously welded.
4. Curb caps shall be stainless steel.

2.4 CURB AND SUPPORT RAIL DESIGN

A. Curb and support rail shall meet or exceed the greater of the seismic requirements and wind load requirements for this project.

B. Design shall be reviewed by a registered professional engineer licensed in the state in which the project is located. The engineer's seal and signature shall be indicated on the submittals.

C. The design shall include but not be limited to:

1. Weight of load
2. Type of load (point load, center load, end reaction, etc.)
3. Safety factor (minimum of 2)
4. Curb support bearing (beam, joist, concrete roof, etc.)

2.5 DRAINS

A. General:

1. Drain shall be full size of connections, size indicated on drawings, or 3/4" minimum, whichever is largest.

B. Equipment and Miscellaneous Drains:

1. Provide drains with deep seal p-trap for all equipment provided with drain connections, where drain connections are indicated on the drawings, and when drains required for proper operation of a system.

2.6 DRAIN PANS

A. Auxiliary Drain Pans:

1. Provide for ducted VRF units.

B. Construction:

1. Drain pan shall be 16-gauge stainless steel, have welded corners, and shall be 2" deep.
2. The drain pan shall have a valved drain connection.

2.7 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS

A. Provide vents, reliefs, and overflows for all equipment provided with these connections, where indicated on plans, and when needed for proper system operation.

B. Vent, relief, and overflows shall be run full size of connection or size indicated on drawings, whichever is larger.

2.8 FASTENERS, ANCHORS, AND ACCESSORIES

A. Unless indicated otherwise, all fasteners, anchors, and accessories shall be metallic and manufactured in the United States.

B. Materials provided shall be considered industry standard for commercial or industrial use.

C. All materials shall be installed in accordance with the manufacturer's recommendations for the intent use and application.

D. Materials installed outdoors and other areas exposed to ambient temperature or humidity shall be stainless steel or hot dipped galvanized.

E. Unless otherwise specified or required by the manufacturer, bolts shall meet or exceed the following strengths:

1. Proof Load: 74 ksi
2. Yield Strength: 81 ksi
3. Tensile Strength: 105 ksi

PART 3 - EXECUTION

3.1 ROOF CURBS AND SUPPORT RAILS

A. Submit shop drawings with structural engineering calculations.

B. Curb and support rail sizes and locations shall be coordinated with building and roofing installers.

C. The Contractor shall set curb and support rail and coordinate roof flashing with roofing installer. Curbs shall be fastened to building structure by welding or fasteners as required by seismic design. Equipment shall be fastened to curbs and support rails as required by seismic design.

D. Pipe and conduit through roof shall be properly flashed and counter flashed weathertight to roof curb.

E. Curbs and support rails shall be installed to maintain a level surface plus or minus 1/4 inch for length of curb and rail.

F. Provide curb seals or gaskets on all curbs.

3.2 EQUIPMENT STORAGE

A. Facilities for storing materials and equipment shall be provided by the Contractor.

B. All equipment and materials shall be protected from ambient conditions including freezing and exposure to sunlight when these conditions could affect the product.

C. All stored items shall be elevated off slab or grade.

3.3 DRAINS AND DRAIN PANS

A. General:

1. All horizontal gravity drain piping shall be installed with a uniform grade of not less than 1/8" per foot of fall in direction of flow except as noted otherwise.
2. All drain lines installed at floor in mechanical rooms shall be supported by surface mounted pipe supports.

B. Equipment and Miscellaneous Drains:

1. Run drain to where indicated on plans.

C. Auxiliary Drain Pan:

1. Run drain to where indicated on plans.

3.4 EQUIPMENT AND MISCELLANEOUS VENTS, RELIEFS, AND OVERFLOWS

A. Run vents and reliefs to locations indicated on plans or, if none indicated, to a location where they can discharge safety without presenting a hazard to personnel. Terminate with appropriate fitting.

B. Run overflow similar to drain.

3.5 EQUIPMENT PENETRATIONS

A. Seal all openings into equipment resulting from installation of equipment such as conduit and flex.

3.6 EQUIPMENT INSTALLATION

A. Repair all insulation damaged during installation of equipment.

3.7 EQUIPMENT ATTACHMENT

A. Equipment shall be secured to the roof rails, roof curbs, or structure as indicated on the plans. Where equipment is provided with a method of attachment, that method shall be used to attach the equipment. Where equipment is not provided with a method of attachment, the

contractor shall add gussets, angles, or similar material to the unit without affecting the performance or warranty of the equipment, which shall be used to attach the equipment.

END OF SECTION

SECTION 230508 - REQUIRED COORDINATION MEETINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all personnel and materials necessary to discuss the issues related to coordination of the work.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 Specifications apply to this section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. The purpose of required coordination meetings is to minimize problems associated with the installation and operation of the mechanical system.

3.2 EQUIPMENT / CONTROL COORDINATION MEETING

A. The following persons shall attend the meeting:

1. All technical representatives of the equipment manufacturers necessary to provide in-depth understanding of the equipment control, operation, and functions.
2. All technical representatives of the control installer necessary to discuss the integration of the equipment with the building automation control system.

B. The following tasks are required to be completed prior to this meeting:

1. Equipment shop drawings submitted and not returned rejected or revise and resubmit.
2. The equipment supplier has provided the control installer with the equipment shop drawings.
3. The equipment supplier or appropriate equipment manufacturer technical staff has reviewed with the control installer the control components and interface options for that equipment and the building automation system.

4. The control installer has a good understanding of the issues related to the control of the equipment by the building automation system.

3.3 MEETING SCHEDULE

A. All parties shall complete the required tasks in a timely manner such that the project construction schedule can proceed without disruption or delay.

B. If the meeting accomplishes the intended goals, a second meeting to address the same issues will not be required. If, in the Engineer's opinion, the parties did not accomplish the intended goals, subsequent meeting will be scheduled as soon as practical.

END OF SECTION

SECTION 230510 - DOCUMENTATION AND CLOSEOUT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, tools and equipment and perform all operations in connection with the project documentation and closeout.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. All reports, forms, and manuals shall be submitted to the Engineer electronically in PDF format.

3.2 OWNER TRAINING

A. The contractor shall schedule the training on equipment and systems at least 21 days before training is to take place. The contractor shall provide multiple dates and times for the training to allow the Owner to coordinate the schedules of their staff to be trained.

B. The contractor shall provide all training aids, manuals, etc. for the Owner’s staff at the training classes. These are in addition to whatever is required for the Operations and Maintenance manuals. The contractor shall coordinate the number required with the Owner but shall include a maximum of 8 sets for the training class.

C. The person providing the training shall be thoroughly knowledgeable in the subject matter and shall be certified by the equipment or system manufacturer.

3.3 PROJECT JOB DRAWINGS AND AS-BUILT DRAWINGS

A. Keep a record set of drawings on the job and, as construction progresses, shall show the actual installed location of all items, material, and equipment on the project job drawings.

B. At the time of final inspection, one corrected set of prints shall be delivered to the Engineer. All drawing costs to be by the Contractor.

C. As built drawings shall have the information transferred from the project job drawings including all addendum, supplemental instructions, change orders, and similar information.

D. Qualified draftsmen shall perform this task.

3.4 OPERATING AND MAINTENANCE MANUAL

A. Compile and bind three (3) sets of all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. Additionally, provide this information electronically in PDF format.

B. Binder shall be hard cover, three-ring notebook, embossed with the name of the project, 11" x 8-1/2" with heavy duty rings. Maximum binder size shall be 2-1/2". Use multiple binders as necessary.

C. The spine of the binder shall be titled “HVAC Operating and Maintenance Manual, Volume No. X," with the name of the project and the date under the title.

D. The Operating and Maintenance Manual shall include the following:

1. Cover sheet in each binder listing the architect, engineer, and all contractors. List addresses and contact information.
2. List name, address and phone number of organization responsible for warranty work, if other than Contractor, and the specific work for which he is responsible.
3. List name, address and phone number of the nearest sales and the nearest service organization for each product.
4. Schedules of all equipment including identification tag numbers shown on plans cross referenced to field applied identification tag numbers.
5. Performance Curves: For fans and similar equipment at the operating conditions.
6. Lubrication Schedule: Indicating type and frequency of lubrication required.
7. List of Spare Parts: Recommended for normal service requirements. Each piece of equipment shall have this list clearly marked or attached to this submittal.
8. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
9. Instruction Books: May be standard booklets but shall be clearly marked to indicate applicable equipment and characteristics.
10. Wiring Diagrams: Generalized diagrams are not acceptable; submittal shall be specifically prepared for this Project.
11. Automatic Controls: Diagrams and functional descriptions.
12. All start-up reports for all equipment.
13. Test and balance report.
14. Filter size list for each piece of equipment. Identify filter type, size, efficiency, and equipment tag.

E. The following diagrams, schematics, and lists shall be provided:

1. Automatic control diagrams
2. Sequences of operation

F. When the test and balance report is over 50 pages, they shall be provided in a separate manual.

3.5 ENGINEERING FIELD REPORTS AND FINAL INSPECTION REPORTS

A. The Engineer will review the Contractor's work periodically throughout the project. A report will be submitted to the Contractor.

B. The reports shall be responded to within ten days of receipt by the Contractor. Each item shall be addressed with comments written on the inspection report if possible. Contractor's response shall address the status of each item and all discrepancies.

3.6 OPERATION AND MAINTENANCE INSTRUCTIONS

A. After all final tests and adjustments have been completed, the Owner's Representatives shall be instructed in all details of operation and maintenance for the systems installed.

B. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.

C. Instruction shall be provided as follows:

1. Equipment: Trained factory representative
2. System: Competent employee of the Contractor

3.7 CONTROLS OPERATION AND MAINTENANCE INSTRUCTIONS

A. Upon completion of Operation and Maintenance instructions, the Owner's representative shall be instructed in all details of operation and maintenance for the controls installed.

B. Controls Operation and Maintenance Instruction shall include the entire control system including control sequences that are inherent to equipment provided by the equipment manufacturer.

C. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.

D. Instruction shall be provided as follows:

1. Controls System: Competent employee of the controls installer

3.8 ACCEPTANCE

A. Upon notification by the Contractor and after completion of Operation and Maintenance Instructions, the Engineer will visit the project for a demonstration of the building system and an inspection of the completed work.

B. Items which do not comply with the Contract Documents or which function incorrectly will be listed. The list will be provided by the Engineer to the Contractor for correction of the installed work.

C. After all corrections have been made, the Contractor shall notify the Engineer who will recheck the systems for compliance of all items listed.

PART 4 - STANDARD FORMS

4.1 GENERAL

A. All forms shall be completely filled out by the Contractor prior to acceptance of the project by the Engineer.

4.2 HVAC CLOSEOUT LIST

HVAC CLOSEOUT DOCUMENT **PROJECT: Clarendon County 911 EOC** **BGA PROJECT NO.: 24004**		
DOCUMENT	DATE REVIEWED	COMMENTS
Test & Balance (Airside)		
HVAC O&M Manuals (3 sets plus PDF file)		
As installed Control Drawings		
HVAC marked-up As-Builts (1 set red lined)		
Equipment Start-Up Reports		
Filter List		
Duct Leakage Test		
Punchlist dated _____		
Punchlist dated _____		
Punchlist dated _____		
Walk-Through with Owner		
NOTE: Not all closeout documents may be listed. See other sections of specifications for additional requirements.		

4.3 HVAC INSTRUCTIONS TO OWNER

HVAC INSTRUCTIONS TO OWNER

PROJECT: Clarendon County 911 EOC

BGA PROJECT NO.: 24004

INSTRUCTIONS	DATE/TIME SCHEDULED	MINIMUM SPECIFIED HOURS	ESTIMATED HOURS OF INSTRUCTION	PERSONS ATTENDING	COPY OF SIGN-IN LIST SENT TO BGA
Single Package Heat Pumps		4			
Dehumidification Units		4			
Mini-Splits		2			
Controls		8			

NOTE: Not all instructions may be listed. See other sections of specifications for additional requirements. Up to 8 sets of training material required. Provide per number of persons indicated. Where no minimum specified hours indicated, training shall be provided as necessary for technician to provide the Owner a good understanding of the operation, function, and maintenance requirements of the equipment or system installed.

4.4 HVAC SPARE MATERIALS

HVAC SPARE MATERIALS LIST **PROJECT: Clarendon County 911 EOC** **BGA PROJECT NO.: 24004**			
ITEM	DATE DELIVERED	ACCEPTED BY	COPY OF RECEIPT SENT TO BGA
Spare Filters			
NOTE: Not all spare materials may be listed. See other sections of specifications for additional requirements.			

4.5 INSTRUCTIONS TO OWNER

OWNER INSTRUCTIONS SIGN-IN SHEET

PROJECT: Clarendon County 911 EOC

BGA PROJECT NO.: 24004

SYSTEM/EQUIPMENT:	DATE	TIME		LOCATION:
		START	FINISH	

INSTRUCTORS (PRINT NAME AND SIGN)

1. _____

2. _____

ATTENDEES (PRINT NAME AND SIGN)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

WRITTEN MATERIALS PROVIDED TO ALL ATTENDEES: _____ YES _____ NO

INSTRUCTIONS IN CLASSROOM: _____ YES _____ NO

INSTRUCTIONS IN FIELD: _____ YES _____ NO

END OF SECTION

SECTION 230511 - SUBMITTALS

PART 1 - GENERAL

1.1 GENERAL

A. Refer to Division 1 specification for information and shop drawings and submittals requirements. When conflicts exist, the more stringent requirements shall apply.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 PREPARATION OF SUBMITTALS

A. Before preparing submittals, consult all contract drawings and specifications in detail, obtain manufacturer's recommended installation instructions, and have shop drawings prepared based on specific equipment and material intended for installation. Obtain all drawings and submittals from other trades as necessary to coordinate submittals.

B. Sign all shop drawings indicating conformance with contract documents before submitting to the Engineer.

1.4 SUBMITTALS

A. General:

1. Submittals are required on all items of equipment and materials.
2. Submittals shall include but not be limited to:

    a. All requirements of Division 1.
    b. Complete information pertaining to appurtenances and accessories.
    c. Information properly marked with service or function identification as related to the project.
    d. Where the submittal consists of catalog sheets displaying other items which are not applicable, the proper features shall be clearly identified.
    e. External connections properly marked, as related to the specific use intended, on standard factory assembly and field installation drawings.
    f. All performance characteristics and physical characteristics.
    g. Wiring and control diagram.
    h. All requirements listed in the specific section of specifications.
    i. Electrical data on all motors greater than one horsepower. Data shall include horsepower unit served, power factor, efficiency and product of P.F. x EFF.

1.5 REVIEW OF SUBMITTALS

A. Review of shop drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless the Contractor has, in letter form, called attention to such deviations at the time of submission and secured written approval of the specific deviations.

B. Any materials and equipment listed which are not in accordance with the equipment shown on the schedule shall be of size and physical arrangement to allow unobstructed access, when installed, for routine maintenance, coil removal, shaft removal, motor removal and other similar operations. Deviation from the characteristics of that equipment or layout system components will not necessarily be cause for rejection.

C. Review of submittal does not relieve the Contractor of his responsibility. Should an installation not meet the intent of the contract documents, the Contractor may be required by the Engineer to modify or replace equipment or system components with all costs, direct and indirect, borne by the Contractor.

D. It is strongly recommended that the Contractor not purchase or install any equipment or system components prior to receipt of reviewed shop drawings.

E. Reviewed with notations on the submittal shall not prohibit the Contractor from purchasing equipment. If the Contractor does not comply with the notations, the submittal shall be deemed rejected.

1.6 EQUIPMENT DIMENSIONS AND WEIGHTS

A. The contract documents may indicate specific equipment dimensions. The Contractor is responsible for verification of the dimensions for the equipment submitted prior to submitting shop drawings. Equipment larger than the equipment indicated on the contract documents may not be acceptable by the Engineer's.

B. The contract documents may indicate specific equipment weights. The Contractor is responsible for verification of the weight of the equipment submitted prior to submitting shop drawings. Equipment weighing more than the equipment indicated on the contract documents may not be acceptable to the Engineer.

C. Equipment shall not exceed maximum weight indicated on the schedules. If the equipment weight exceeds that indicated on the schedule, even where the manufacturer is an approved manufacturer, that equipment cannot be bid on for this project.

D. If equipment is not acceptable to the Engineer due to dimensions or weights exceeding those indicated on contract documents, the Contractor shall accept all responsibility and costs for providing equipment that meets the dimension and weight requirements of the contract documents.

1.7 ELECTRICAL CHARACTERISTICS

A. Electrical characteristics for mechanical equipment are generally indicated on the mechanical documents. The electrical documents generally indicate power and wiring requirements to each piece of mechanical equipment.

B. It shall be the mechanical installer's responsibility to verify prior to submitting shop drawings that the equipment submitted meets the electrical requirements of both the mechanical and electrical documents. If there is a discrepancy, the contractor shall bring the discrepancy to the Engineer's attention prior to submitting shop drawings.

C. If the discrepancy is brought to the Engineer's attention prior to ordering the mechanical equipment or electrical materials associated with that equipment, the Engineer will issue additional instructions to the Contractor.

D. If the discrepancy is not brought to the Engineer's attention prior to ordering the mechanical equipment and electrical materials (i.e., Contractor does not verify electrical requirements), the Contractor shall be responsible for all costs except those that would have been incurred if the discrepancy was determined prior to ordering the mechanical equipment and electrical materials.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRODUCT SUBMITTALS

A. The following list may be used as a checklist for the contractor and Engineer. All products may not be listed.

PRODUCT SUBMITTALS

BGA NO.	PRODUCT						
		Date In	Date Out	Reviewed	Reviewed as Noted	Revise and Resubmit	Rejected
	Particulate Air Filtration						
	Instrumentation & Controls						
	Roof Curbs & Support Rails						
	Manual Balancing Dampers						
	Control Dampers						
	Fire Dampers						
	Dielectric Fittings						
	Dehumidification Units						
	Diffusers, Registers and Grilles						
	Duct Access Doors						
	Duct Flexible Connectors						
	Ductless Split System Air Conditioners						
	Variable Refrigerant Flow (VRF) System						
	Electric Unit Heaters						
	Intake Hoods & Relief Hoods						
	Equipment Identification						
	Suspended Exhaust Fans						
	Duct Insulation						
	Piping Insulation						
	Ductwork Materials						

	Piping Materials						
	Test & Balance Agency Pre-Qualifications						
	Single Package Heat Pumps						
	Airflow Measuring Stations						
	Pipe Hangers, Shields, and Supports						
	Vibration Isolation Products						
	Seismic & Wind Load Restraint Analyses						

3.2 TEST AND REPORT SUBMITTALS

A. The following list may be used as a checklist for the Contractor and Engineer. All tests may not be listed.

1. Duct air loss test
2. System start-up

3.3 CONTROL SUBMITTAL

A. Control submittals shall include the following:

1. All information necessary for a clear representative of the system to be provided.
2. All control components.
3. Graphical representative of all systems to be controlled.
4. I/O summary sheets.
5. Floor plan indicating panels.
6. Sequence of operation. All devices referenced in the sequence shall be indicated on graphic representation.
7. Large scale (75% reduction maximum) of all control panel faces.
8. Wiring diagrams including interface with equipment (terminal strip, contactor, etc.).

B. Submit a floor plan locating all thermostats, humidistats, sensors, and control panels. Contractor must receive approval in writing before roughing in controls.

3.4 SHOP DRAWING SUBMITTAL COVER SHEET

A. A separate cover sheet shall be submitted with each product type.

3.5 SHOP DRAWING SUBMITTAL COVER SHEET
(Provide one page for each group of shop drawings.)

PROJECT NAME: **Clarendo County 911 EOC** **BGA FILE NO.** **24004-03-33**

PRODUCT: _____ **BGA SHOP DWG. NO.** _____

NOTE TO CONTRACTOR

1. All shop drawing comments by Buford Goff & Associates shall be complied with or the shop drawings shall be declared rejected.
2. If this form is not completed and signed by the Contractor and items 1 to 8 below are not answered YES or N/A, the shop drawings shall be declared rejected.
3. Dampers, grilles, valves, etc., are reviewed for characteristics but not for size and quantity. It is the Contractor's responsibility to verify sizes and quantity.

SHOP DRAWING SUBMITTAL (Contractor to complete this section)

1. Does the submittal comply with the contract documents? ☐ Yes ☐ No

   If no, list all deviations on an attached page.

2. Have the electrical characteristics (i.e., volt/phase/amps, MOP, MCA, and connection location) been reviewed with the electrical schedules and the electrical circuit sizing meet the requirements of that equipment? ☐ Yes ☐ No ☐ N/A
3. Is product an approved manufacturer listed in the specifications or addendum? ☐ Yes ☐ No ☐ N/A
4. Does the product submitted meet the manufacturer's recommended service clearance for the space in which it is to be installed? ☐ Yes ☐ No ☐ N/A
5. Have the control components of the product been reviewed and do they meet with the requirements of the controls contractor? ☐ Yes ☐ No ☐ N/A
6. Have the equipment connections been reviewed (size and locations) and has the Contractor included all provisions to make the required connections? ☐ Yes ☐ No ☐ N/A
7. Has the seismic engineer reviewed and approved the method of connecting seismic restraints to equipment? ☐ Yes ☐ No ☐ N/A
8. Is the equipment within the weight limitations specified, if any? ☐ Yes ☐ No ☐ N/A

BGA'S SHOP DRAWING STAMP (Engineer to complete this section)

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Contractor is responsible for specific compliance with the information given in the Contract Documents; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades, and the safe and satisfactory performance of his work.

☐ Reviewed ☐ Reviewed as Noted ☐ Revise and Resubmit ☐ Revise and Resubmit Items Listed
☐ See attached for additional comments ☐ Reject

Comments: _____

_____

_____

_____ Reviewer: _____ Date: _____

END OF SECTION

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of supports and anchors on all piping and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0548 – Sound, Vibration, and Seismic Control for HVAC
2. Section 23 0719 - HVAC Piping Insulation
3. Section 23 2113 - HVAC Piping (General)

1.3 QUALITY ASSURANCE

A. Products not otherwise specified in these documents shall be furnished by the listed manufacturers and installed in accordance with the manufacturer’s recommendation.

B. Products used shall be consistent with industry practice for use in commercial or industrial installation.

C. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. ANSI B31.3 - Pressure Piping
b. Factory Mutual
c. International Building Codes
d. Manufacturer's Standardization Society Documents, MSS-SP-58, MSS-SP-69
e. Pipe Fabrication Institute, Standard ES-26
f. AISC Specification for the Design, Fabrication, and Erection of Structural Steel Buildings

D. Manufacturers:

1. The following pipe hanger and support manufacturers are acceptable:

a. B-Line
b. Pipe Hangers and Devices Mfg. Inc.
c. Anvil International
d. Empire Industries

2. The following refrigerant pipe clamp manufacturers are acceptable:

a. IRP
b. Hydro-Zorb
c. Armafix

3. The following surface mounted pipe support manufacturers are acceptable:

a. Mifab
b. MIRO
c. Roost Systems

4. The following channel support manufacturers are acceptable:

a. Erico Eristrut
b. Unistrut

PART 2 - PRODUCTS

2.1 GENERAL

A. It shall be the Contractor's responsibility to provide an adequate pipe support system in accordance with recognized engineering practices using, where possible, standard, commercially available hangers, support, guides, anchors and accessories.

B. Model numbers are indicated for products not exposed to ambient conditions. The products exposed to ambient conditions shall be a similar product but with the material or finish specified for products exposed to ambient conditions.

C. Materials shall be selected to prevent electrolysis and minimize corrosion for the environment in which the product is to be installed.

D. Hanger shall be sized for insulation to run through hanger, support, clamp, or guide.

2.2 SAFETY FACTOR

A. All attachments, rods, and accessories selected based on weight load shall be selected for a two times safety factor minimum.

2.3 SEISMIC RESTRAINTS

A. Where seismic restraints of components is required, attachments shall be per the requirements of the Vibration and Seismic Controls specifications.

2.4 PIPE HANGERS, SUPPORTS AND ACCESSORIES – GENERAL (EXPOSED TO AMBIENT CONDITIONS)

A. Materials:

1. The material for all accessories including, but not limited to, rods, bolts, fasteners, inserts, supports, anchors, clamps, auxiliary steel, and accessories shall be stainless steel or hot dipped galvanized unless specifically noted otherwise.

B. Hangers:

1. Clevis hanger shall be stainless steel or hot dipped galvanized finish.
2. Swivel loop hangers shall be zinc electroplate finish.

C. Shields:

1. Shields shall be stainless steel.

2.5 PIPE HANGERS, SUPPORTS, AND ACCESSORIES - GENERAL (INDOOR)

A. General:

1. Other finishes may be specified for specific applications.

B. Hangers:

1. Swivel loop hangers for insulated pipe shall be carbon steel with zinc electroplate finish.
2. Clevis hangers for insulated pipe shall be carbon steel or carbon steel with zinc electroplate finish.

C. Shields:

1. Shields shall be carbon steel with zinc electroplate finish.

2.6 PIPE HANGERS - INSULATED PIPING

A. Basis of design manufacturer - Swivel loop hanger with shield:

1. Anvil Model No. 69 with 167 shield
2. At contractor's option, clevis hanger may be used.

2.7 PIPE HANGERS - NON INSULATED PIPE (STEEL)

A. Basis of design manufacturer for all pipe sizes - clevis hanger:

1. Anvil Model No. 260

2.8 PIPE HANGERS - NON INSULATED PIPE (COPPER)

A. Basis of design manufacturer for all pipe sizes - Swivel loop hanger:

1. Anvil Model No. 69 (with PVC coating)

2.9 SUPPORT SPACING

A. General:

1. The maximum spacing for pipe hangers and supports shall not exceed those stated in these specifications or the hanger manufacturer's recommendations, whichever is less.
2. Where concentrated loads of valves, fittings, etc. occur, closer spacing will be necessary and shall be based on the weight to be supported and the maximum recommended loads for the hanger components.
3. Supports shall be provided within 12" of each change of direction, at each valve, and at equipment connections.
4. Pipe not listed shall meet the spacing requirements of the manufacturer.

B. Copper Pipe and Tubing:

Size	Max. Span Ft.
Less than 1-1/2"	5
1-1/2" and greater	8

C. Steel (Std. Weight):

Size	Max. Span Ft.
All sizes	10

2.10 HANGER RODS

A. Threaded rods, if not indicated otherwise, shall be carbon steel with zinc electroplate finish.

B. Where seismic restraints of components are required, rod sizes shall be per the requirements of the Mechanical Sound, Vibration, and Controls specifications.

C. Rods shall be selected at 2x safety factor.

D. Rod capacity based upon ASTM A107 at 650 degrees F is as follows:

Rod Dia	Max. Load	Max. Load (@ 2 x SF)
3/8	610	305
1/2	130	565

2.11 AUXILIARY SUPPORTS, FASTENERS, AND ACCESSORIES

A. Provide all auxiliary supports, anchors, and fasteners necessary for the installation of piping, equipment, and accessories.

B. Supports shall include angles, channels, flat steel, rods, bolts and appurtenances.

C. Special supports shall be provided where standard hanger, supports, or attachments cannot be used. This includes, but is not limited to, use of trapeze supports, suspending supports from other supports (where acceptable to manufacturers, etc.).

2.12 CHANNEL SUPPORTS

A. General:

1. Channel supports shall be utilized wherever practical and whenever a channel support provides a cleaner installation than individual attachments to the structure.

B. Construction:

1. Channel supports shall be 12 gauge minimum and dimensions as necessary to meet project conditions.
2. Channels in conditioned spaces or in plenums above conditioned spaces shall be pregalvanized or powder coated carbon steel.
3. Channels exposed to ambient conditions shall be hot dipped galvanized after fabrication, aluminum, stainless steel, PVC coated, or epoxy coated.
4. Channels shall have holes, slots, knockouts, etc. as required by the Contractor.

C. Clamps and Accessories:

1. Clamps, accessories, fasteners, etc. shall generally be the same materials as the channel supports unless indicated otherwise.
2. Pipe clamps for indoor pipe shall have a pipe cushion.
3. See refrigerant pipe clamps for refrigerant pipe.

2.13 SURFACE MOUNTED PIPE SUPPORTS

A. General:

1. Support shall be designed to support outdoor piping.
2. The support height shall be adjustable.

3. The support shall be suitable for a minimum load of 150 lbs.
4. Spacing of supports shall be no greater than specified for piping supports or as indicated on plans, whichever is less.

B. Rubber Support:

1. Support shall be constructed of UV resistant rubber.
2. Attached to the base are two threaded rods with a 14 gauge channel support (or self-lubricating rollers as required by the installation. If rollers are required, a pipe guide shall be provided.)
3. The channel support shall be galvanized.
4. The threaded rod shall be zinc plated.

C. Polycarbonate Support:

1. Support shall be constructed of UV resistant polycarbonate.
2. Attached to the base are two threaded rods with self-lubricating rollers with a pipe guide.
3. A UV resistant rubber support pad shall be provided.

D. Accessories:

1. Provide all accessories and hardware to support piping.
2. All hardware and metal components shall be HDG or stainless steel unless noted otherwise.

E. Basis of design rubber support manufacturers shall be:

1. Mifab CE

F. Basis of design polycarbonate support manufacturers shall be:

1. MIRO

2.14 BEAM CLAMPS

A. Clamps shall be designed to attach hanger rods to a beam or bar joist.

B. Clamps shall be provided with locknut.

2.15 REFRIGERANT PIPE CLAMPS

A. General:

1. Horizontal refrigerant pipe may be supported by either of the following methods:

a. Provide a pipe insert at the point of support. See pipe insulation.
b. Provide refrigerant pipe clamp specified in this section.

B. Pipe Clamp:

1. Metal pipe clamp shall have an inner rubber cushioning.
2. Clamp shall be sized to allow refrigerant pipe with insulation to pass through the inner rubber cushioning.

C. Basis of design manufacturer shall be:

1. IRP Hydra-Zorb Klo-Shure Cushion Clamp

2.16 PIPE SHIELDS

A. Provide at all supports and hangers on insulated piping systems.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide all steel and concrete required for support and anchoring of pipes other than shown on structural or architectural drawings.

B. Contractor shall bear all responsibility for materials and workmanship as described in this section and shall make sure that all hangers and supports are properly and permanently connected to building structure.

C. All pipe supports shall be designed to avoid interferences with other piping, hangers, electrical conduits and supports, building structures and equipment.

D. Provide hanger rod nuts on both sides of clevis and trapeze hangers.

3.2 SUBMITTAL

A. Manufacturer shall be responsible for reviewing all plans, specifications, and existing conditions to determine the types, quantities, and accessories required to provide a complete system of pipe support.

B. Submit shop drawings for each product to be used and indicate where the product is to be installed.

C. Submit detail of attachment method to the following structures:

1. Bar joists
2. Beams
3. Other structural building elements

3.3 AUXILIARY SUPPORTS, ANCHORS, AND FASTENERS

A. Supports attaching to steel structure shall be by bolting or clamping without penetrating structural member. Welding is not permitted without written permission.

B. All fasteners shall be provided which resist loosening from vibration.

3.4 SURFACE MOUNTED PIPE SUPPORT

A. Adjust pipe support for gravity flow of condensate drain lines.

END OF SECTION

SECTION 230548 – SOUND, VIBRATION, AND SEISMIC CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of mechanical sound, vibration, and seismic control required on all mechanical equipment, systems, and appurtenances where shown on the drawings and specified hereinafter.

B. All foundations and supports of Division 23 equipment shall be furnished and installed by Division 23 installer except where specifically noted otherwise.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All seismic equipment and design shall comply with all local codes and ordinances and meet or exceed the standards and procedures (latest editions) of the following:

a. International Building Codes
b. SMACNA Seismic Restraint Manual
c. ASHRAE
d. ASTM E 488 (Anchor locations)

B. Mechanical sound, vibration and seismic control equipment shall be sized and provided by the approved manufacturer only. Seismic bracing shall be a factory manufactured item listed in the manufacturers catalog for the intended use.

C. Manufacturer:

1. The following sound, vibration, and seismic control (except flexible pipe connectors) manufacturers are acceptable:

a. Mason Industries
b. Korfund Dynamics Company
c. Vibro-Acoustics Corporation

d. Kinetics

2. The following acoustical barrier manufacturers are acceptable:

a. Kinetics
b. Acoustiblok
c. Aerosonics
d. Sound Seal

PART 2 - PRODUCTS

2.1 GENERAL

A. All equipment and piping shall be mounted on or suspended from approved foundations and supports as specified herein and as shown on the drawings.

B. The vibration isolation systems shall be guaranteed to have the deflection recommended by the manufacturer for the specific application but no less than shown on the schedule. Mounting sizes shall be determined by the mounting manufacturer and mountings shall be installed in accordance with the manufacturer's instructions.

C. Components not exposed to ambient:

1. Steel components shall be powder coated. All nuts, bolts, and washers shall be zinc-electroplated. Structural steel bases shall be thoroughly cleaned of welding slag and primed with zinc-chromate or metal etching primer.

D. Components exposed to ambient:

1. All components shall be PVC coated steel, hot-dip galvanized, stainless steel, or heresite coated.

2.2 VIBRATION ISOLATORS

A. General:

1. Each spring isolator shall be designed and installed so that the ends of the spring remain parallel during and after the specified minimum deflection to solid height.
2. All spring-flex mountings shall be completely stable beyond rated load and have an additional 30% capacity (minimum), and horizontal and vertical spring constants shall be equal (kx/ky=1).
3. Vibration isolation equipment submittal drawings shall include the following information:

a. Isolation mounting deflections.
b. Spring diameters, compressed spring heights at rated load; solid spring heights, where spring isolation mountings are used.
c. Equipment operating speed.
d. Clearly outlined procedures for installing and adjusting isolators.

4. Neoprene shall be bridge bearing type.
5. Mounts shall have holes in baseplate for anchoring to structure.
6. All baseplates shall be sized to meet manufacturer's maximum published seismic restraint rating.

B. Specification type "E" (Precompressed Hangers):

1. Vibration hanger shall contain a steel spring and 0.3" deflection neoprene element in series. They shall be precompressed to the rated deflection so as to keep the piping or equipment at a fixed elevation during installation. Deflection shall be clearly indicated by means of a scale. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing thru a 30 degree arc before contacting the hole and short circuiting the spring.
2. Basis of design manufacturer shall be:

    a. Mason Industries, Inc. type PC30N.

C. Specification type "Y" (Rooftop Curbs):

1. Curb mounted rooftop equipment shall be mounted on spring isolation curbs as indicated.
2. The lower member shall consist of a sheet metal or structural steel sections containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. All directional neoprene snubber bushings shall be a minimum of ¼” thick. Steel springs shall be laterally stable and rest on ¼” thick neoprene acoustical pads. The roof curbs shall be built to seismically contain the rooftop unit.
3. The hardware and the springs shall be provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing nailed over the lower curbs waterproofing. All spring locations shall have access ports with removable waterproof covers.
4. Lower curbs shall have 2” of internal rigid insulation.
5. The rooftop unit shall be fastened to the top floating rail and the lower section shall be anchored to the roof structure per the seismic engineer’s recommendations.
6. Curb shall be 24 inches high min.
7. Curb shall have a solid bottom suitable to hold the sound barrier material.
8. See Section 23 0502 – Common HVAC Materials for additional curb construction requirements for the lower curb.
9. Basis of design manufacturer shall be:

    a. Mason Industries, Inc. type SRSC.

D. Specification type “Q” (Waffle Pads):

1. One layer of 3/4" thick neoprene pad consisting of 2" square modules.
2. Pads shall have a minimum load deflection of 10%.
3. Pads up to 36 sq. inches shall have a 1/4" thick bearing plate. Larger pads shall have a 3/8" thick bearing plate.

4. Bearing plates shall be stainless steel and shall have an appropriately sized hole for mounting.
5. Basis of design manufacturer shall be:

    a. Mason Industries, Inc. Model Super WMH.

2.3 VIBRATION ISOLATOR SCHEDULE

A. General:

1. Deflection shown is a minimum value. Higher values may be required by seismic design.

B. Suspended Air Handling Equipment:

1. Type E hangers, deflection 1.25”
2. Includes air handlers and fan coil units

C. Rooftop Equipment:

1. Type Y roof curb, deflection 2.0”.

D. Rooftop Condensers:

1. Type Q waffle pads.

2.4 ACOUSTICAL BARRIERS

A. Type 2 – Curb Acoustical Barrier:

1. Barrier is suitable for below rooftop equipment curb.
2. Acoustical barrier shall be a 2.0 lb. per square foot, reinforced material. Tensile strength shall be 510 lbs. per in. Material shall be waterproof.
3. Sound transmission loss shall be STC 32.
4. Basis of design Type 2 manufacturer shall be:

    a. Acoustiblok Blok 32

B. Acoustical Batt Noise Absorption Material

1. Acoustical batt shall be a non-fiberglass, hydrophobic noise absorption material made from 4 pcf nominal density faced mineral wool.
2. Material shall not support mold or mildew growth.
3. ASTM C 423 – NRC of 1.0.
4. Basis of design acoustical batt manufacturer shall be:

    a. Acoustiblok QuietFiber.

2.5 ACOUSTICAL BARRIER ASSEMBLIES

A. Type A – Acoustical Barrier Assembly

1. Assembly shall consist of:

a. top layer of 3” acoustical batts
b. a layer of type 2 curb acoustical barrier
c. a later of 5” acoustical batts
d. a final layer of type 2 curb acoustical barrier.

2. All seams in the type 2 curb acoustical barrier shall be tapped and caulked per the manufacturer’s recommendations. Voids around the duct penetrations through the curb shall be packed tight with acoustical batt.
3. Assembly STC rating shall be 57 or greater.

B. Systems requiring Type A acoustical barrier assembly:

1. SPHP units – apply Type A acoustical barrier to entire curb.

2.6 SEISMIC DESIGN

A. General:

1. Specifications and plans shall indicate minimum requirements and general intent. The actual requirements shall be determined by the contractor’s seismic system engineer but those requirements shall not be less than indicated on the plans and in these specifications.
2. The seismic engineer shall be a professional engineer registered in the state in which the facility is to be constructed and whose principal area of practice is in seismic engineering and related fields. The engineer shall be in the full time employment of the company submitting the product. The seismic engineer shall be responsible for:

a. Submittals (drawings and calculations)
b. Seismic Quality Assurance Plan
c. Certificates of Compliance

3. The following mechanical components, except ceiling mounted mechanical components, shall be exempt from seismic design:

a. All components in seismic design category A and B.
b. All components in seismic design category C where Ip = 1.0.
c. All components in seismic design category D, E, or F:

1) 20# or less
2) For distribution systems 5#/LF or less
3) Flexible connections between component and duct, piping, and conduit
4) Components mounted 4 ft. or less above floor weighing 400# or less, and Ip = 1.0

B. Duct Systems:

1. Seismic restraints are required for all ducts unless specifically indicated otherwise.
2. The following duct shall be exempt from seismic design:

    a. Duct with an Ip = 1.0 and with a cross-sectional area of less than 6.0 SF.
    b. Duct with an Ip = 1.0 and installed 12 inches or less from the point of connection to the supporting structure above to top of duct (excluding insulation or any other coverings) for full length of duct run (duct run is up to change of direction of more than 2 times duct width in degrees).

C. Components in Duct Systems:

1. Components and equipment installed in the duct system having no flexible duct connection and weighing 75 pounds or less may be considered part of the duct system.
2. Connections to components and equipment in the duct system shall accommodate differential movement utilizing type of flexible connection indicated on drawings or elsewhere in the specifications. If none indicated, flexible connection may be:

    a. Flexible connector
    b. Swing joints
    c. Multiple elbows

3. All components and equipment greater than 20 pounds with flexible duct connectors or greater than 75 pounds shall be independently supported and seismically restrained independently of the duct system.

D. Piping Systems:

1. Seismic restraints are required for all pipes unless specifically indicated otherwise.
2. Seismic restraints are not required for the following pipe installations provided the pipe is installed where it is protected from impact or will avoid the impact of larger pipe or equipment:

    a. Where pipes are supported by a trapeze, the weight of the piping cannot exceed 10 lb./ft.
    b. The distance from the point the hanger attached to the structure to the top of the pipe must be 12 in. or less.
    c. When piping is supported on a trapeze, the distance from the point the support rods attaches to the structure to the point the support rods connect to the trapeze must be 12 in. or less.
    d. The seismic coefficient Rp must be 4.5 or greater and meet one of the following:

        1) Piping in Seismic Design Category C where Ip > 1.0 and a nominal pipe size of 2 inches or less.

3. Other piping systems shall meet or exceed the requirements of the IBC and the listed standard (whichever is greater):

a. Refrigeration Piping - ASME B31.5

E. Importance Factor (Ip):

1. Importance factor for all mechanical components in Risk Category IV shall be Ip = 1.5.

2.7 WIND LOAD DESIGN

A. General:

1. Specifications and plans shall indicate minimum requirements and general intent. The actual requirements shall be determined by the contractor's structural engineer but those requirements shall not be less than indicated on the plans and in these specifications.
2. The structural engineer shall be a professional engineer registered in the state in which the facility is to be constructed. The structural engineer shall be responsible for:

a. Submittals (drawings and calculations)

3. All equipment located outdoors shall be designed to meet or exceed the requirements of the current IBC wind load requirements.
4. Calculations shall be based on the ASCE determined design pressure, exposure class, building height, and building type.

B. All rooftop curbs shall be anchored sufficiently to the roofing members to withstand the IBC wind load requirements.

C. Where additional bracing or tie downs are required, they shall be provided at no additional cost to the Owner.

D. Coordinate the restraints required for wind loading with the seismic and vibration requirements indicated on the drawings and specifications.

2.8 ANCHORAGE TO BUILDING STRUCTURE

A. General:

1. Anchorage to the building structure shall meet the requirements of the latest edition of:

a. International Building Code (Chapter 19)
b. ASCE Standard 7 (Chapter 13)
c. American Concrete Institute (ACI) 318

2. Requirements of this section of specifications are minimum requirements. When other requirements are indicated, the greater requirement shall be met or exceeded.

B. Anchorage in Concrete or Masonry:

1. Calculation of anchorage forces shall be provided by the seismic engineer for all installations in Seismic Design Category C.
2. The following anchorage and attachments are not permitted:

a. Friction clips.

C. Post Installed Anchors:

1. Post installed anchors for Seismic Design Category C shall meet the requirements of ACI 318.

D. Threaded Rod Supports:

1. Rod supports shall be designed to resist bending moments.
2. Threaded rod supporting duct, piping, equipment, or other components shall connect to structure by use of a swivel, eyebolt, vibration isolation hanger or other connection

2.9 VIBRATION AND SEISMIC ACCESSORIES

A. Provide all necessary brackets, bolts, fasteners, predrilled bases, oversized bases, accessory components and materials to install systems in accordance with manufacturer's requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. If the equipment to be mounted or restrained is not furnished with integral structural frames and external mounting lugs (both of suitable strength and rigidity), approved members shall be installed in the field which shall provide means of attaching required vibration and seismic devices.

B. The members include, but not limited to the following: gussets, rails, brackets, angles, channels and similar components. These members should be sized by the vibration and seismic vendor to provide an acceptable installation.

C. All field installed components shall be neatly installed and be of materials and/or finish suitable for the installation.

3.2 SUBMITTALS (VIBRATION ISOLATION)

A. The manufacturer shall submit drawings indicating location and type of all vibration isolation components provided.

B. A schedule shall show capacity and load of each component at each location.

C. Design shall be based upon actual installation and not contract drawing schematics.

3.3 SUBMITTALS (SEISMIC LOAD)

A. Seismic Restraints:

1. Submit drawings showing seismic loading, location of bracing, and types and sizes of bracing assemblies. The level of detail and information provided shall be similar to those included in the "SMACNA Seismic Restraint Manual."
2. Submit seismic protection ratings in three principle axes certified by an independent laboratory.
3. Submit calculations for shear, pull-up, primary overturning, and secondary overturning.
4. Submit drawings indicating auxiliary supports and method of attachment.
5. Submit drawings indicating size and type of attachment (i.e., welding, bolting, etc.) to:

    a. Attachment of equipment to housekeeping pads or slab.

6. Submittals for seismic snubbers shall also include detailed drawings of steel sole plates and all anchorage to building structure including welding, bolting, and other methods of attachment. Submittal shall clearly indicate location of attachment and structural members.

B. Attachments and Connections:

1. Submit drawing indicating type of connection (i.e., clamp, eye bolt, swivel, etc.) to:

    a. Beams
    b. Joists
    c. Structure members

2. Submit drawings indicating type of attachment (welding, bolting, etc.) to:

    a. Structural members
    b. Components or equipment

C. Calculations shall be submitted and signed by a licensed professional engineer in the state where the project is located.

3.4 ACOUSTICAL BARRIERS INSTALLATION

B. Below rooftop curb:

1. Seal to inside of roof curb and to all penetrations to completely isolate rooftop equipment.

3.5 SUBMITTALS (WIND LOAD)

A. Submit drawings and calculations showing wind loading, location of anchors, ties and bracing, and types and sizes of restraints.

B. Submit drawings showing auxiliary supports and method of attachment.

3.6 SUPERVISION

A. The manufacturer, or his qualified representative, shall be responsible for providing such supervision as may be necessary to assure correct installation and adjustment of the isolators. Upon completion of the installation and after the system is put into operation, the manufacturer, or his representative, shall make a final inspection and submit his report to the Engineer in writing certifying the correctness of installation and compliance with approved submittal data.

3.7 INSTALLATION

A. Where field conditions, construction schedule, or construction progress require that isolators be installed after the equipment or systems are installed, provide temporary supports until that time when isolators can properly be installed.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of mechanical identification on all mechanical equipment, systems, and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work furnished and installed shall comply with all local codes and ordinances and shall meet or exceed the standards and procedures (latest editions) of the following:

a. ANSI A13.1 for the identification of piping systems.
b. ANSI/NEMA Standard Z535.1.

B. Manufacturer:

1. The following band, tag, nameplate, and identification marker manufacturers are acceptable:

a. Seton Name Plate Corporation
b. T&B/Westline Products
c. Brady
d. MSI
e. Brimar

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. General:

1. Nameplates shall be black plastic with white engraved lettering.
2. All information shall be provided on a single nameplate per device if practical.
3. Nameplates shall have screw holes and screws for mounting unless screws would damage the intended use of the product to which it is attached.
4. Nameplates shall be 1/16" thick.

B. Size:

1. 3/4" high nameplate when located on a lay-in ceiling grid.
2. 2" high nameplate when located on HVAC equipment.
3. 3/4" high nameplate when located on control devices such as panels, etc.
4. 3/4" high nameplate when located on duct access doors.

2.2 THERMOSTATS, HUMIDISTATS, SWITCHES, AND OTHER SIMILAR DEVICES

A. Devices to be identified include:

1. Fan switches
2. Control panels
3. Flat plate sensors
4. Similar devices

2.3 MECHANICAL EQUIPMENT

A. Devices to be identified include all mechanical equipment.

B. Where equipment is located above a lay-in ceiling, a nameplate shall also be provided on the metal grid in close proximity to the equipment.

2.4 CEILING LOCATION MARKERS

A. Provide nameplates to indicate location of equipment and devices located above the ceiling.

B. Equipment shall include:

1. Concealed HVAC equipment
2. Concealed fire dampers
3. Concealed isolation valves

2.5 ACCESS DOORS

A. Access doors shall have a nameplate attached to identify device to be accessed as follows:

1. Fire dampers

B. Nameplate shall include:

1. Device description: FD, etc.

PART 3 - EXECUTION

3.1 PIPE CODING SUBMITTAL

A. Submit a chart indicating each system and colors available for background and lettering.

3.2 CEILING LOCATION MARKERS

A. After Engineer approval, attach nameplate to ceiling grid as close to device as practical.

3.3 NAMEPLATES

A. Submit listing of all nameplates with associated information to the Engineer for approval before fabrication.

B. Coordinate method of attachment and location of nameplate with contractor who is responsible for the installation of the device.

END OF SECTION

SECTION 230592 - SYSTEM START-UP

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the start-up of all building mechanical systems where shown on the drawings and specified hereinafter.

B. Description:

1. These systems shall include:

a. Air systems
b. Refrigeration systems

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following (latest edition):

a. AABC National Standards
b. SMACNA

B. Start-up of equipment shall be by manufacturer's representative unless noted otherwise.

C. Tests, in addition to those specified herein, required to prove code compliance, to meet insurance requirements, and to verify proper installation by the Engineer, owner, or authorities having jurisdiction shall be provided by the Contractor.

D. All tests, instruments, and procedures shall be in accordance with the AABC National Standards and system test and balance specifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. All concealed work must remain uncovered until required tests have been completed. Sections of the system may be tested prior to concealing as outlined hereinafter.

B. The Owner and the Engineer shall be notified in writing a minimum of three working days prior to any tests being performed.

C. Local, state and federal authorities having jurisdiction shall be notified in writing with sufficient time to schedule inspection as required by the authority.

D. In no case shall a system be started or operated in such a manner that the system or component pressure or temperature ratings, or the pressure or temperature to which a system or component has been tested, be exceeded.

2.2 START-UP

A. Systems shall be started up by the Contractor except as required in specific portions of the mechanical specifications.

B. The following systems shall be started up by a factory certified technician:

1. Single Package Heat Pumps
2. Split System Air Conditioners
3. Split System Heat Pumps

2.3 AIR DISTRIBUTION SYSTEMS

A. General:

1. Cleaning and leakage testing are not required for existing duct systems unless indicated otherwise.

B. Cleaning of Duct System:

1. Upon completion of duct and before installation of any outlets, the contractor shall clean entire duct system of all rubbish, plaster, dirt, etc.

C. Leakage Tests for systems 2 inch w.g. and less:

1. Verify, by use of air monitoring devices and pitot tube traverse, that the total air quantities measured at all outlets and the air quantity handled by the fan differ by no more than $\pm$5%.
2. Where leakage is determined to exceed 5% in accordance with the above testing procedure, the Contractor shall locate and repair the duct to reduce the leakage to acceptable levels.

3. Where excessive leakage is noted at any location, whether the entire system meets the 5% leakage rate or not, the Contractor shall repair the duct to minimize the leakage at the location identified.
4. Leakage includes all connected components of the system.
5. Leakage tests shall be repeated until the duct is proven to be within the limits of leakage specified herein.

2.4 STARTING THE PIPING SYSTEMS

A. Prior to putting any piping system in service, it shall be tested and thoroughly cleaned according to the procedures as specified below and as required by the equipment manufacturer, whichever requirement is more stringent.

B. Dehydration of Refrigerant Piping Systems:

1. Dehydrate refrigerant piping systems using a vacuum pump with check valve.
2. The systems shall be evacuated to 300 microns or to whatever level required by equipment or system manufacturer, whichever is most stringent, and held there for three hours.
3. The vacuum shall be broken with dry refrigerant.
4. After approved by the third party inspector, fill the system with its operating charge of refrigerant.

2.5 PIPING SYSTEM TESTS

A. General:

1. Upon completion of each system of work under this Division and at a designated time, all piping shall be pressure tested for leaks.
2. Sections of the system shall be tested prior to concealing the piping in walls, chases, false ceilings, etc.
3. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests repeated at no additional cost to Owner. Make tight any leaks. Repeat tests until system is proven tight. Caulking of leaks is not permitted.
4. All equipment not capable of withstanding the test pressure shall be valved off during test.
5. Provide all gauges, valves, caps and accessories to properly test system.
6. At no time shall a system be tested at a pressure greater than the piping system or component is rated.

B. Refrigerant Piping:

1. Refrigerant piping shall be tested in accordance with the equipment manufacturer’s recommended pressure.
2. All joints and equipment shall be leak tested using a halide or electronic leak detector.
3. The test shall be for the length of time recommended by the manufacturer or thirty minutes, whichever is greater, without leakage.

2.6 SYSTEM START-UP

A. General:

1. System shall be started and checked to ensure safe and proper operation.
2. Minimum requirements are listed for each system and are in addition to manufacturer start-up requirements and the requirements stated in the specific sections of the specifications.
3. Control systems installed complete and operable.
4. Proper thermal overload protection in place for electrical equipment.

B. Air Systems:

1. Verify proper fan rotation.
2. Verify full load amps are below nameplate amps.
3. Verify control dampers operating.
4. Verify balance dampers and fire dampers are open.
5. Remove all duct restrictions.
6. Verify clean filters are installed.
7. Verify access doors are closed and duct end caps are in place.
8. All outlets shall be installed and connected.

C. Vibration Isolation System:

1. Verify that all systems are free floating. Check for short circuits.
2. Check that hanger rods are not hitting hanger.
3. Determine if isolators are properly adjusted.
4. Check alignment of flexible connections.
5. Check free length of duct connectors.

2.7 SYSTEM PRESSURES

A. Observe the start-up of systems to verify that no dangerous conditions exist as the result of high (supply) or low (return / exhaust) pressure. If excessive pressures are observed, report the observed condition and shut down or modify system operation to avoid damage.

PART 3- EXECUTION

3.1 SUBMITTALS

A. Submit to the Engineer all test results including a minimum of the following information:

1. System tested
2. Location of test
3. Date, time, and ambient temperature at test startup and completion
4. Persons present for test
5. Duration of test
6. Test equipment
7. Test results

B. Reports shall include but not be limited to:

1. Manufacturer's factory test reports

2. Equipment start-up reports

3.2 ENGINEER REVIEW

A. The Engineer shall, at his discretion, recheck any or all of the test work. Provide ample number of technicians and test equipment to perform the tests required.

B. All systems not accepted shall be retested.

C. Systems shall be retested and rechecked until accepted by all parties.

3.3 DUCT LEAKAGE

A. Where leakage is determined to exceed the allowable rate, locate and repair the duct to reduce the leakage to acceptable levels.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the testing and balancing of all mechanical systems where shown on the drawings and specified hereinafter.

B. Description:

1. Systems shall include all equipment, operators, controls, accessories, and appurtenances.
2. These systems shall include:

   a. Air systems (heating, ventilating, air conditioning, exhaust and recirculation distribution systems)

3. Air inlets and outlets shall include:

   a. Exhaust
   b. Outside Air
   c. Supply
   d. Return

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 05 92 - System Start-Up

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following (latest editions):

   a. AABC National Standards
   b. NEBB Standards

c. NBC Standards

2. Testing and balancing shall be performed by an agency certified by the AABC, NEBB, or the National Balancing Council.
3. All technicians shall have a minimum of three years testing and balancing. Each test and adjustment shall be under the direct supervision of a qualified technician.
4. Testing and balancing shall be performed by one agency.

PART 2 - PRODUCTS

2.1 GENERAL BALANCING PROCEDURES

A. All recorded data shall represent a true, actually measured, or observed condition.

B. Any abnormal conditions in the mechanical systems or conditions which prevent total system balance, as observed by the Test and Balance Agency, shall be reported as soon as possible to the Engineer.

C. If, for any reason, a system cannot be properly balanced, it shall be reported to the Engineer by the Test and Balance Agency as soon as observed.

D. Should additional balancing devices be required, the Test and Balance Agency shall bring it to the attention of the Contractor as quickly as possible.

E. The Test and Balance Agency shall leave all system components in proper working order including:

1. Close access doors.
2. Close doors to electrical switch boxes.
3. Restore thermostats to specified settings.

F. The Test and Balance Agency shall permanently mark the settings of all valves, dampers, and other adjustment devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop, it shall be set and locked.

G. Systems shall be tested in each specified mode of operation. See equipment Sequence of Operation.

2.2 INSTRUMENTS

A. All Test and Balance work shall be performed using the required instrumentation to obtain proper measurements.

B. Instruments shall be properly maintained and transported in such a manner as to provide protection against damage due to vibration, impact, moisture or any other condition that may render them inaccurate.

C. Instruments shall have been calibrated within a period of six months prior to starting the project.

D. Proof of calibration shall be maintained with the instruments.

E. Instruments shall be calibrated upon completion of the work when required by the client to prove reliability.

2.3 AIR SYSTEMS

A. General Requirements:

1. Total system balance shall not begin until the Test and Balance Agency has verified that start-up procedures have been performed and filters have been changed.
2. The Test and Balance Agency shall measure the amperes of all fan motors before total system balance is started and shall take proper steps to correct and report any overloads.
3. The Test and Balance Agency shall not continue total system balance if any conditions are observed that are hazardous to the air system. This shall be reported and corrected before proceeding further.
4. The Test and Balance Agency shall verify all outlets for compliance with design requirements and shall report any variations before starting total system balance.
5. If during total system balance, the Test and Balance agency detects any inlet or outlet conditions that will not allow proper balancing to be performed, the Engineer shall be notified immediately.
6. Reports shall indicate airflow measured at unit and inlet and outlet totals.

B. Air Outlets:

1. The systems shall be balanced so that the total supply air quantity to each space shall be within -5% to +5% of the design amount.
2. The pattern for all adjustable outlets shall be adjusted for proper distribution to minimize drafts.
3. Outlet dampers shall not be used to provide proper branch airflow to space.

C. Air Inlets:

1. Inlets on systems shall be adjusted to the required quantities with a tolerance of $\pm$5%.
2. At completion of total system balance, at least one inlet of every branch shall be fully open and at least one branch balancing damper in the system shall be fully open.
3. Return air inlets installed in ceilings where the space above the ceiling is used as a return air plenum are to be fully opened and are not to be measured or adjusted except where a specific airflow is indicated

D. Filters:

1. Under final balanced conditions, the Test and Balance Agency shall measure and record static pressure entering and leaving each filter bank.

E. Fans:

1. The Test and Balance Agency shall set the fan RPM to provide design total CFM and the required static pressure to operate the system.

2. Fan speed shall not exceed the maximum allowable RPM as established by the fan manufacturer.
3. The final setting of fan RPM shall not result in overloading the fan motor in any mode of operation. Dampers shall be modulated, and the amperes of the supply fan motor shall be measured to ensure that no motor overload can occur. The amperes shall be measured in the full cooling, heating, dehumidification, and neutral modes to determine the maximum brake horsepower.
4. After total system balancing, the following values shall be recorded:

    a. Fan RPM
    b. Motor voltage and amperes
    c. Entering static pressure
    d. Leaving static pressure

5. When applicable, final supply fan settings shall be based on rated wet cooling coil resistance.

F. Coils:

1. Under final balanced conditions, the Test and Balance Agency shall measure and record static pressure entering and leaving each coil bank.

G. Static Pressure Readings:

1. Static pressure leaving the fan shall be taken as far downstream from the fan as is practical but shall be upstream of any restrictions in the duct (such as duct turns).
2. No reading shall be taken directly at the fan outlet or through the flexible connection.
3. Static pressure entering a fan shall be measured in the inlet duct upstream of any flexible connection and downstream of any duct restrictions.

2.4 TEMPERATURE CONTROL SYSTEM:

A. In the process of Total System Balance, the Test and Balance Agency shall:

1. Work with the temperature control contractor to ensure the most effective total system operation within the design limitations, and to obtain mutual understanding to intended control performance.
2. Verify that all control devices are properly connected.
3. Verify that all dampers, valves, and other controlled devices are operated by the intended controller.
4. Verify that all dampers and valves are in the position indicated by the controller (open, closed, or modulating).
5. Verify the integrity of valves and dampers in terms of tightness of close-off and of full-open position.
6. Check that all valves are properly installed in the piping system in relation to direction of flow and location.
7. Check the calibration of all controllers.
8. Verify the proper application of all normally open and normally closed valves.
9. Check the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.

10. Check the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media.
11. Check that the sequence of operation for any control mode is in accordance with approved shop drawings. Verify that no simultaneous heating and cooling occurs except where specified.
12. Verify that all controller set points meet the design intent.
13. Check all dampers for free travel.
14. Verify the operation of all interlocked systems.
15. Perform all system verification to assure the safety of the system and its components.

2.5 TEMPERATURE MEASUREMENT

A. General:

1. Where outside air temperature is a variable affecting other readings (such as a mixed air temperature), the outside air reading shall be given at the time of the mixed air reading.

B. Air Temperatures:

1. Provide entering and leaving air temperatures for each cooling coil and heating coil.
2. Temperatures shall be measured in heating, cooling, dehumidification, and neutral modes of operation.

2.6 Residential HOOD

A. Exhaust air flow to this equipment shall be tested and balanced to the following air flow readings.

1. Maximum exhaust airflow – design CFM
2. Minimum exhaust airflow – 150 CFM/LF

PART 3 - EXECUTION

3.1 SUBMITTALS

A. The Contractor shall submit to the Engineer the following information within thirty days after the award of the contract:

1. The name of the Test and Balance Agency.
2. Name and registration number of the certified testing technician.
3. Detailed testing procedures including list of instruments, task performed, model and serial number and date last calibrated.
4. Agenda including schedule of work with approximate duration of each phase, approximate date of field inspections, and required start date to meet scheduled completion date.
5. Sample report forms.

B. An approved copy of each submittal must be received by the Test and Balance Agency before work is begun.

C. If complete submittals are not received by the Engineer within the specified times, the Engineer reserves the right to select the Test and Balance Agency with any additional costs incurred by the Contractor.

3.2 REPORT SUBMITTALS

A. Provide a preliminary typed report for the Engineer’s review.

B. After receiving Engineer’s review comments and addressing issues, resubmit the Test and Balance report. Report shall have systems, subsystems, and individual readings in a sequential format.

C. Reports shall be submitted after all modifications required by these specifications to balance system (e.g., replace dampers) have been made. Reports will not be accepted with comments such as damper missing, etc.

3.3 DRAWING SUBMITTALS

A. Test and Balance Agency shall submit plans indicating:

1. All traverse locations referencing values shown in reports.

3.4 COORDINATION OF WORK:

A. Test and Balance Agency shall not begin work on a system until system is started as required in SYSTEM START-UP specifications.

3.5 DAMPERS

A. If it is determined by the Test and Balance Agency that additional balance dampers are required, the Contractor shall install additional dampers.

B. The Test and Balance Agency shall rebalance system after changes have been made.

3.6 ENGINEER REVIEW

A. The Engineer shall, at their discretion, recheck any or all of the test and balance work within 120 days of receipt of report. The Test and Balance Agency shall provide ample number of technicians and test equipment to perform the tests required.

B. Upon completion of the Engineer's recheck, the testing and balancing report, or portions thereof, shall be accepted or rejected. All parts not accepted shall be retested and rebalanced.

C. Systems shall be tested, rebalanced and rechecked until accepted by all parties.

3.7 MOTOR CAPACITY

A. At no time shall the motor exceed full load amps. Motor shall load into service factor only if written permission is received from the engineer.

END OF SECTION

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all piping, ductwork, and appurtenances where shown on the drawings and specified hereinafter under applicable sections of this specification.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0713 - Duct Insulation
2. Section 23 0719 - HVAC Piping Insulation

1.3 QUALITY ASSURANCE

A. Flame and Smoke Spread Ratings:

1. All insulation materials must have a maximum 25/50 flame/smoke rating as tested by ASTM E-84, NFPA 255 and UL 723 except where specifically noted otherwise.

B. Insulation thickness shall equal those recommended by ASHRAE 90.1 or as scheduled, whichever is greater. Surface temperatures shall be below 140 degrees F.

C. Accessories such as adhesives, mastics, cements, and tapes for fittings shall have the same component rating as listed above.

D. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed requirements. Treatment of jackets or facing to impart flame and smoke safety shall be permanent. The use of water soluble treatments is prohibited.

E. Installation and materials shall meet the requirements of the International Building Codes.

F. All insulation work shall be applied by mechanics normally employed in the trade. All insulation shall be installed in accordance with the manufacturer's recommendations.

G. All insulation furnished under this Division of the specifications shall be the product of one manufacturer except for special applications.

H. Manufacturers:

1. The following manufacturers of sealants, adhesives, and mastics shall be:

a. Foster
b. Childers
c. Mon-Eco

PART 2 – PRODUCTS

2.1 MASTICS, SEALANTS, AND ADHESIVES

A. General:

1. Materials shall be as recommended by the insulation manufacturer.
2. Products shall be applied as recommended by the manufacturer for that specific application.
3. The number of coats and thicknesses shall meet or exceed the manufacturer’s recommendation or as indicated in these specifications or on the plans, whichever is greatest (coats and thickness).
4. Materials shall meet LEED requirements for low emitting products.

PART 3 - EXECUTION

3.1 GENERAL

A. All insulation materials shall be delivered and stored in manufacturer's container and kept free from dirt, water, chemical and mechanical damage.

B. Insulation shall be applied by experienced workmen in a workmanlike manner.

C. Insulation shall not be applied until all pressure testing has been completed, inspected and released for insulation application.

D. Surfaces to be insulated shall be clean and dry.

E. All insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.

F. Insulation shall be run continuously through all building assemblies except where the listed fire rated assembly does not allow insulation to be used.

G. Items that are factory insulated shall not receive additional insulation where not otherwise specified.

3.2 INSTALLATION

A. Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal.

B. Insulation on equipment that must be opened periodically for inspection, cleaning, and repair must be constructed so insulation can be removed and replaced without damage.

END OF SECTION

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all sheet metal duct and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0700 - HVAC Insulation

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. Federal Specification HH-I-558C Mineral Fiber Blankets
2. ASTM C553 Standard Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications
3. ASTM C1136 Barrier Material, Vapor (Jacket Only)
4. ASTM C916 Liner Adhesive
5. ASTM G21, G22 Fungi and Bacteria Resistant Tests
6. ASTM C1071, Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
7. UL 723 Duct Tape

B. Duct wrap shall not exceed 25% compression.

C. Manufacturers:

1. The following fiberglass duct insulation manufacturers are acceptable.

a. Owens/Corning
b. Certainteed
c. Knauf
d. Johns Manville

PART 2 - PRODUCTS

2.1 GENERAL

A. Duct insulation shall comply with the requirements of International Energy Conservation Code or these specifications, whichever is greater.

B. If no other specific direction is provided, the spaces for duct insulation are defined as follows:

1. Concealed:

   a. Above ceiling.
   b. In mechanical rooms.
   c. Other spaces not generally considered regularly occupied spaces.

2. Exposed:

   a. Indoor locations generally considered regularly occupied spaces and where duct can be visible to occupants.

3. Return air plenum:

   a. A space is only considered a return air plenum if the unducted air returning from a space or above the ceiling of the space is from the same air handler supplying that space.

2.2 TYPES OF FIBERGLASS INSULATION

A. Fiberglass Duct Wrap:

1. Blanket type insulation composed of glass fibers bonded with a thermosetting resin and faced with an FSK vapor retarder. The facing shall be a glass scrim reinforced laminate of aluminum foil and kraft paper bonded with a fire retardant adhesive.
2. Insulation shall be 1.0 lb./CF density, .28K @ 75 degrees F and a facing vapor transmission of .02 perms max.
3. Basis of design insulation shall be:

   a. Owens Corning Type 100

B. Fiberglass Duct Liner:

1. Liner is composed of a mat of glass fibers bonded with a thermosetting resin. The airstream side shall have a glass mat reinforcement with a durable fire rated coating. The liner is edge coated.
2. Liner shall be 1.5 lb. (min.)/CF density .24K @ 75 degrees F.
3. Liner shall be rated for a minimum air velocity of 6000 FPM.
4. Liner shall not support microbial growth.
5. Water repelling shall be >4 (INDA IST 80.6).

6. Liner coefficients shall be tested in accordance with ASTM C423 and ASTM E795. Liner sound absorption coefficients shall be:

THICKNESS IN	125	250	500	1000	2000	4000	NRC
½	0.07	0.20	0.44	0.66	0.84	0.93	0.55
1	0.08	0.31	0.64	0.84	0.97	1.03	0.70
1½	0.10	0.47	0.85	1.01	1.02	0.99	0.85
2	0.25	0.66	1.00	1.05	1.02	1.01	0.95

The manufacturer’s values must be within 10 percent of the values in the above chart for each octave band but shall not exceed the NRC level listed.

7. Basis of design liner shall be:

   a. Owens Corning Quiet R

2.3 MINIMUM THERMAL VALUES REQUIRED FOR INSULATION (UP TO 9000 CDD50 AND UP TO 9000 HDD 65, CLIMATE ZONE 3)

A. General:

1. This section is intended to indicate minimum as installed "R" values.
2. Where specific duct insulation thicknesses are indicated elsewhere in this specification or on the plans, the greater thickness or insulating value shall be provided.
3. If no other requirements are indicated, no insulation is required.

B. Supply Duct:

1. R-6 as installed

C. Return Duct:

1. R-6 as installed
2. Return Air Plenum: R-0

A. Outside Air Duct:

1. R-6 as installed

1.2 APPLICATION OF FIBERGLASS DUCT WRAP

A. Fiberglass duct wrap shall be provided for all ducts required to be insulated in the following locations except where dual wall duct specified:

1. Concealed ducts

1.3 APPLICATION OF DUCT LINER (GENERAL)

A. Liner is in lieu of all other lesser thickness insulation specified for that duct or portions of duct in which that liner is installed.

B. Duct liner shall overlap external duct insulation by 12 inches minimum.

1.4 APPLICATION OF FIBERGLASS DUCT LINER (RECTANGULAR DUCTS)

A. One inch (1") duct liner is required in the following locations:

1. Return air transfer ducts

B. Two-inch (2") duct liner is required in the following locations:

1. SPHP’s return air ductwork.

1.5 TAPE FOR FIBERGLASS DUCT INSULATION

A. Tape shall be pressure sensitive joint sealing tape specifically made for the specific application in which it is used.

B. Tape shall be 3" wide minimum and shall match the insulation finish.

1.6 DUAL WALL DUCT

A. No additional insulation is required.

1.7 EXHAUST DUCT

A. Provide 2" duct wrap on concealed exhaust ducts from the backdraft damper to the roof.

PART 2 - EXECUTION

2.1 INSTALLATION OF FIBERGLASS INSULATION

A. Fiberglass Duct Wrap Insulation:

1. Duct wrap insulation seams shall be stapled 6" on center with outward clinching staples. All seams are to be sealed with pressure sensitive tape matching the facing.
2. Where rectangular ducts are 24" in width or greater, duct wrap insulation shall be additionally secured to the bottom of the duct with mechanical fasteners such as pins and speed clip washers, spaced 18" on center (max.) to prevent sagging of insulation.

B. Fiberglass Duct Liner

1. The duct liner shall be adhered to the sheet metal with 90% minimum coverage of adhesive.
2. All exposed leading edges and all transverse joints shall be coated with adhesive.
3. All exposed leading edges shall be installed with metal nosing.
4. The duct liner shall be additionally secured with mechanical fasteners in accordance with the manufacturer's recommendations.

C. Tape and Mastic Installation:

1. After the pressure sensitive tape is applied, a coat of mastic shall be applied to the tape overlapping the insulation by 2" minimum.
2. Tape and mastic shall also be applied to all tears, rips, punctures, penetrations, mechanical fasteners, access doors, and all other locations as necessary to ensure a continuous vapor tight system.
3. Mastic must also be applied to any factory applied tape such as on factory insulated supply grilles, etc.

END OF SECTION

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of insulation required for thermal and acoustical installation on all piping including fittings and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0700 - HVAC Insulation

1.3 QUALITY ASSURANCE

A. Manufacturers:

1. The following elastomeric pipe insulation manufacturers are acceptable:

a. Armacell
b. K-Flex
c. Aeroflex
d. Nomaco

2. The following pipe insert (for elastomeric pipe insulation) manufacturers are acceptable:

a. Aeroflex
b. Armafix
c. Armacell

3. The following aluminum jacket manufacturers are acceptable:

a. Childers
b. RPR Products
c. GLT Products

PART 2 - PRODUCTS

2.1 GENERAL

A. Pipe insulation shall comply with the International Energy Conservation Code or these specifications, whichever is greater.

2.2 TYPES OF INSULATION

A. Elastomeric Insulation:

1. General:

a. The insulation shall have a factory applied adhesive closure system.

2. Physical properties:

a. Thermal conductivity (k) is .27 at 75 degrees F.
b. Water transmission is .08 perms – inch.
c. Will not significantly contribute to fire.

3. Basis of design insulation shall be:

a. Armacell type AP Armaflex or type AP/SS

2.3 PIPE INSULATION APPLICATION

A. General:

1. All fittings and accessories in the piping system shall be insulated similar to the piping system.

B. Elastomeric Pipe Insulation:

1. Elastomeric pipe insulation shall be provided on all refrigerant and condensate piping requiring insulation.
2. Elastomeric pipe insulation not permitted on the following:

a. Where not UL approved for fire rated assemblies.
b. Where details or notes specifically require another insulation type.

2.4 FITTINGS

A. General:

1. Fittings shall be factory molded except where indicated otherwise.
2. Fittings shall have a factory installed vapor barrier or have a field installed vapor barrier equal to the pipe vapor barrier.

B. Elastomeric Pipe Insulation:

1. Piping:

a. Fittings may be mitered at contractor's option.

2.5 JACKETING

A. Aluminum Jacketing:

1. General:

a. Jacketing shall be manufactured from Type 1100, 3003, 3105 and 5005 alloys.
b. Jacketing on piping shall be smooth, embossed, or corrugated.

2. Thickness:

a. Pipe jacket shall be 0.020 inches.

3. Vapor Barrier:

a. Continuous lamination to jacket.
b. Three (3) mil polyethylene film with 40 lb. virgin kraft paper.

2.6 FINISH

A. Outdoor Refrigerant Piping:

1. Aluminum jacketing.

B. Fittings:

1. Fittings adjacent to jacketing shall be finished similar to piping.

2.7 ADDITIONAL INSULATION REQUIREMENTS

A. Liquid Refrigerant Lines:

1. Insulate liquid refrigerant lines similar to suction refrigerant lines in the following systems:

a. Ductless split systems
b. Variable refrigerant systems
c. Where required by equipment manufacturers

2.8 PIPE INSERT (FOR ELASTOMERIC INSULATION)

A. General:

1. Insert shall be a closed cell, high compressive strength, foam insulating pipe support.
2. The insert shall be lined with a closed cell EPDM foam rubber and encased in a zero-perm weatherproof membrane.

B. Properties:

Compressive Strength (at yield)	314 PSI
Thermal Conductivity	.312K
Water Absorption (by weight)	<7%
Water Vapor Permeability	0.0 Perm

C. Insert shall be sized for the pipe on which it is installed and the thickness of the adjacent insulation.

D. Basis of design manufacturer shall be:

1. Aerofix-U

PART 3 - INSULATION THICKNESS SCHEDULES

3.1 GENERAL

A. Specific insulation requirements may be indicated elsewhere in these specifications or on the contract drawings.

B. Insulation for piping exposed to ambient conditions based upon 90 degrees F, 90% RH, and 7 MPH wind speed.

3.2 ELASTOMERIC INSULATION SCHEDULE

A. Refrigerant Suction Lines and Liquid Lines:

1. All pipe - 1" thk.

B. Condensate Drain Lines:

1. All pipe – 1” thk.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Apply adhesives, sealants, coatings, and other materials as recommended by the manufacturer.

B. All penetrations through vapor barrier shall be sealed with vapor barrier sealer. Where metallic jacketing is used, all penetrations through jacket and at termination of jacket shall be sealed.

C. Butt joints and seams of elastomeric insulation shall be sealed with contact adhesive as recommended by the insulation manufacturer. Where possible, insulation shall be used without slitting and slipped over tubing. All fittings shall be covered and sealed with fabricated pieces of the same insulation and adhesive.

4.2 ANCHORS AND SUPPORTS

A. Anchors and supports that are secured directly to cold surfaces shall be adequately insulated and vapor sealed to prevent condensation.

B. Jacketing shall be carried through hanger on inside of 16-gauge sheet metal shields and sealed to maintain continuous vapor barrier.

4.3 FITTINGS

A. General:

1. Apply vapor barrier to insulation and all seams.

4.4 METALLIC JACKETING

A. Jacketing shall be held in place with a friction type, Z lock, or 2" overlap joint. Joints shall be completely sealed along the longitudinal seam and shall be installed to shed water. Circumferential joints shall be sealed by use of 2" wide butt strips. ½" bands shall secure jacketing. Space as recommended by the manufacturer.

B. Straps shall secure jacket. Straps shall be the same material as jacket. Provide 1/2" straps.

4.5 FIRERATED ASSEMBLIES

A. Insulation shall run through all building assemblies except where the listed fire rated assembly does not allow insulation to be used.

4.6 MULTI-LAYER INSTALLATION

A. Joints shall be staggered.

4.7 ELASTOMERIC INSULATION

A. Inserts:

1. Center insert on hanger or pipe support.
2. Insert shall be installed using the insert manufacturer’s adhesive to seal the insert to the adjacent pipe insulation.
3. The insert and adjacent insulation shall be wrapped with the insert manufacturer’s tape to seal and finish the installation. The tape shall wrap the insulation/insert two complete times.

B. Tape:

1. 3/4" longitudinal tape specifically listed for use on elastomeric insulation shall be installed along every longitudinal seam/joint.

END OF SECTION

SECTION 230900 - INSTRUMENTATION AND CONTROLS FOR HVAC (GENERAL)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the building environmental controls shown on the drawings and specified hereinafter.

B. Description:

1. Control and instrumentation work shall include:

a. Temperature control
b. Humidity control
c. Airflow control
d. Equipment interlock and controls
e. Wiring for automatic controls

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 09 00.01 - Controls for HVAC (Dampers)
2. Section 23 09 00.02 - Controls for HVAC (Flow Measurement)
3. Section 23 09 05 - Smoke Devices and Systems

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All environmental controls shall comply with all local codes and ordinances, and meet or exceed the following standards:

a. Underwriters Laboratories
b. NEMA Standards
c. National Electrical Code
d. Scientific Apparatus Makers Associates Standard PMC 20.1 for Process Measurement and Control Terminology

e. Scientific Apparatus Makers Associates Standard PMC 20.2 for Process Control Performance
f. NFPA 90A
g. NFPA 72E Standard for Automatic Fire Detectors

B. Control circuit wiring shall meet NFPA Standard 70, Article 725, for remote control, low energy power, low voltage power and signal circuits.

C. All control equipment shall be the product of one manufacturer whenever practical.

D. Manufacturers:

1. The following needlepoint bipolar ionization manufacturers are acceptable:

a. GPS Air

PART 2 - PRODUCTS

2.1 SYSTEM

A. Provide all thermostats, humidistats, sensors, transmitters, controllers, actuators, control panels, conduit, wiring, accessories and appurtenances for a complete building environmental control system.

B. Provide switches, fuses, disconnects and all other devices necessary for protection and convenient operation of system.

C. The contractor shall be responsible for providing power wiring, conduit, breakers and final connections for all control devices, panels, components, and the following equipment unless specifically shown on electrical plans:

1. Control devices
2. Motorized dampers

D. The control system shall be on normal power.

2.2 CONDUIT

A. General:

1. All control conduit shall be furnished and installed under this division except where specifically indicated otherwise.
2. All line voltage and control wiring shall be run in conduit.
3. Conduit shall be provided in accordance with the Electrical Division of this specification unless noted otherwise in these specifications.
4. Outdoor conduit shall be GRC.
5. Indoor conduit shall be EMT.
6. Conduit shall be 3/4".

2.3 CONTROLS WIRING

A. Wiring for low voltage circuits generally shall be No. 18B and S gauge or larger RSH-2 heat resistant.

B. Cables of two or more conductors, not smaller than 22 B and S gauge if shielded or No. 18 B and S gauge if not shielded, may be used for low voltage d-c and electronic circuits carrying less than 1.50 amperes, in lieu of individual wires.

C. Cables carrying a-c circuits sensitive to external fields shall be shielded.

D. Cables having fewer than 12 conductors shall have thermoplastic or rubber insulation for 300 volts or more and a heavy outer braid or thermoplastic sheath. Shields shall be grounded to building's grounding system, using wire not smaller than No. 14 B and S gage. Shields shall not be grounded to conduit systems or building piping.

E. Cables shall terminate in solder or screw type terminal strips. All terminal strips shall be numbered.

F. Cables shall not be tapped at intermediate points.

G. All wires, whether individual or in cables, shall be color coded and numbered for identification in accordance with the National Electrical Code.

H. Wire, where specifically permitted to be installed without conduit, shall be plenum rated.

2.4 TRANSFORMERS

A. Transformers shall be furnished and installed for supplying current to control equipment as required.

B. Transformers shall conform to NEMA standards, shall be capable of supplying 125 percent the connected load, shall be enclosed in U.L. listed cabinets, ventilated, with conduit connections, and provided with fused disconnect switches on primary side and on secondary side.

2.5 CONTROL VOLTAGE

A. Voltage shall not exceed 24V.

2.6 SPEED SWITCHES

A. Speed switches, rheostats, and other fan speed control devices may be furnished by either the equipment manufacturer or the controls contractor.

2.7 LINE VOLTAGE THERMOSTATS

A. Thermostats:

1. Thermostats shall have minimum adjustable operating range of 20 degrees F above and below design setpoint.

2. Thermostats shall be without thermometer and with setpoint indicator.
3. Thermostat shall have external adjustments with internal stops for minimum and maximum settings.

2.8 DDC THERMOSTATS

A. General:

1. The electronic thermostat shall allow the following functions:

   a. Temperature setpoint adjustment.
   b. Override switch (from unoccupied to occupied).

2. The electronic thermostat shall allow the following to be programmed from the building control system:

   a. Space occupied and unoccupied temperatures.
   b. Space occupied and unoccupied times.
   c. Allowable space setpoint adjustment.
   d. Length of override duration.

3. The electronic thermostat shall have the following features:

   a. Digital display.

4. Thermostats shall connect to unit controller via communication cable with a standard jack. The thermostat shall also have a connection available for field monitoring.

B. Construction:

1. Device shall be polymer construction.
2. Circuit boards shall be coated.

C. Technical Specifications:

1. Ambient Operating Conditions: 32 deg F to 140 deg F, 0 to 100% RH
2. Accuracy: ± .34 deg F @ 70 deg F (thru film nickel)

2.9 DDC HUMIDISTAT

A. General:

1. Provide electronic humidistat without setpoint adjustment.
2. Humidistat shall connect to unit controller via communication cable with a standard jack. The humidistat shall also have a connection available for field monitoring.
3. Where humidistat and thermostat are located adjacent to each other and both are providing input for the same piece of equipment, a combination humidity transmitter and temperature sensor shall be provided in lieu of separate devices.

B. Construction:

1. Devices shall be polymer construction.

2. Circuit boards shall be coated.

C. Technical Specification (@ 77 deg F):

1. Ambient operating conditions: 32 deg F to 140 deg F, 0 to 100% RH
2. Accuracy: ± 3% RH for 20-80% RH
   ± 5% RH for 5-20% and 80-95% RH
3. Temperature Coefficient: .12% RH/deg F
4. Response: less than 120 sec between 50-90% RH
5. Offset Adjustment: ± 5

2.10 SENSORS, TRANSMITTERS, AND OTHER CONTROL DEVICES

A. General:

1. Provide the type device specified for the specific application. Where the device is not specifically indicated, provide the device best suited to provide the control specified.

B. Location of device:

1. Device shall be located as indicated on the drawings or as stated in the specifications.
2. Where no device location is indicated or specified, the device shall be located as recommended by the manufacturers to provide the best practical results.
3. Where the location indicated on the drawings or stated in the specifications does not provide the best practical results, the manufacturers shall provide recommendations for relocating the device.
4. It shall be the responsibility of the contractor to identify all conflicts between indicated device locations and manufacturers recommended locations prior to installation of any related components (i.e., sensor wells, conduit, etc.).

2.11 SAFETY DEVICES

A. General:

1. Safety devices including, but not limited to, the following shall be hard wired to perform their required function:

   a. Condensate overflow switch
   b. Duct high (and low) pressure switch(es)
   c. Smoke alarm, via unit duct detector, where shutdown sequence is specified to be by mechanical.

2. Status, where specified, shall be monitored by the building automation controls system and initiate other sequences where required.

2.12 CONTROL PANELS

A. General:

1. All controllers, relays, switches, etc., for equipment shall be mounted in enclosed control panels with key lockable, piano hinged door.
2. Location of each panel shall be where indicated on plans, approved by Engineer, and convenient for adjustment and service.
3. Label each panel properly identifying function or service of panel and all surface mounted devices.
4. Control panels shall be extruded or formed, cold-rolled steel, enamel surfaced, with full length mounting brackets, drilled wall mounting holes.
5. The control panel shall be key lockable.
6. Provide a 24V control transformer.

2.13 FLOAT SWITCH

A. General:

1. Float switch shall include a sealed, waterproof reed/magnet float switch with no exposed electrical contacts.
2. Float shall be prewired with 6 ft. long, 18 ga. lead cables.
3. Switch shall be tested to UL 508 and UL listed for 24V AC.
4. Float shall attach to drain pan with stainless steel clips.

B. Locations:

1. All drain pans.

C. Basis of design manufacturers shall be:

1. SMD Research Safe-T-Switch Model SS3.

2.14 EQUIPMENT STATUS

A. Equipment status shall be provided by solid state current sensors.

B. Sensor shall have non-polarity sensitive outputs, trip point adjustment, trip LED, and power LED.

2.15 BIPOLAR IONIZATION

A. General:

1. The electrodes shall be needlepoint type. Needlepoints shall not protrude into the airstream.
2. The bipolar ionization system shall be capable of:

a. Effectively killing microorganisms downstream of the bipolar ionization equipment (mold, bacteria, virus, etc.).
b. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.
c. Reducing space static charges.
d. Reducing space particle counts.

3. The bipolar ionization system shall produce equal amounts of positive and negative ions.
4. Relative humidity from 0 – 100%, condensing, shall not cause damage, deterioration, or dangerous conditions to the air purification system.
5. Bipolar ionization units shall be tested and listed by either UL or ETL according to UL Standard 2998.
6. The operation of the electrodes or bipolar ionization units shall conform to UL 2998 with respect to ozone generation.

B. Electrodes:

1. Each plasma generator shall include the required number of electrodes and power generators sized to the air handling equipment capacity.
2. Ionization output from each electrode shall be a minimum of 5 million ions/cc when tested at 2" from the ion generator.

C. Duct Mounted Units:

1. Ion generators shall be furnished with a factory-equipped gasketed mounting flange to prevent air leakage.
2. Ion generators shall contain a built-in power supply and operate on 24V AC.

D. Equipment Mounted Units:

1. The entire cooling coil shall have equal and adequate ionization distribution across the face of the coil.
2. Ion generators shall be mounted in a linear configuration to minimize space required. The ion generators and mounting bar shall be 4" deep or less.
3. The power supply shall accept the following voltages: 12V DC; 24V AC; 120V AC; or 230V AC. Power from the power supply to the ionization generators shall be 12V DC.

E. Electrical:

1. Generators shall include internal short circuit protection, overload protection, and automatic fault reset.
2. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating.
3. The power supply shall have an On/Off switch and power indicator LED.

F. Control:

1. Generators shall include an external control interface to monitor generator status and alarm.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. The Contractor shall be responsible for a complete operational system.
2. The installation shall include:

    a. Drawings
    b. Supervision
    c. Interlocks
    d. Adjustments
    e. Verification

3. Location of sensing elements shall be the responsibility of the installer.

B. Wiring splices shall not be permitted in electrical panelboards, junction boxes and switchgear.

3.2 THERMOSTATS, HUMIDISTATS, SWITCHES, AND SIMILAR CONTROL DEVICES

A. General:

1. Install all devices as recommended by manufacturer.
2. When device is provided by the control contractor, the control contractor shall be totally responsible for all coordination with the equipment supplier to ensure compatibility of components to meet the requirements of the equipment manufacturer and the control sequence.

B. Installation:

1. Mount thermostats, humidistats, sensors, and switches 4'-0" above finished floor to the top of the device’s control mechanism unless noted otherwise.
2. Thermostats mounted on exterior walls shall be mounted on a thermally insulated sub-base.
3. When location is not shown, Contractor shall assume the most remote location served by unit. Coordinate exact location with Engineer.
4. Contractor shall coordinate location of thermostat, humidistats, and switches with final architectural plans and actual field conditions to avoid locating them inside cabinets, bookcases, casework, chalkboards, tackboards and behind door swings and similar obstructions that would limit access or limit the ability to properly sense space conditions.

3.3 WIRING

A. All control wiring shall be installed in a workmanlike manner and neatly laced.

3.4 CONDUIT

A. Conduit sleeves thru non-waterproofed walls shall be grouted and caulked on both sides of the wall.

3.5 DEVICES ON EXTERNALLY INSULATED DUCTS

A. Devices mounted on externally insulated ducts shall be mounted on standoff brackets to allow proper installation of duct. If device must be mounted directly to duct for proper operation, standoff bracket may be deleted.

3.6 SPEED SWITCHES

A. If switch is not factory installed on the unit, the control contractor shall field install the switch.

3.7 FLOAT SWITCH

A. Secure bracket to drain pan with screw.
B. Verify float is properly positioned.

3.8 BIPOLAR IONIZATION

A. Submittals:

1. Bipolar ionization generator submittals shall include dimensional drawings showing the units in which the generators are to be installed. The submittal shall include documentation stating that the installation requirements have been coordinated with the equipment manufacturer.

B. Installation:

1. Bipolar ionization generators shall be factory or field installed. If field installed, installation shall be in strict accordance with manufacturer’s written recommendations.
2. The ionization generators shall be wired to the remote mounted power supply.

END OF SECTION

SECTION 230900.01 - CONTROLS FOR HVAC (DAMPERS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the damper and valve controls shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0900 – Instrumentation and Controls for HVAC (General)

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All environmental controls shall comply with all local codes and ordinances, and meet or exceed the following standards:

a. Underwriters Laboratories
b. NEMA Standards
c. National Electrical Code
d. Scientific Apparatus Makers Associates Standard PMC 20.1 for Process Measurement and Control Terminology
e. Scientific Apparatus Makers Associates Standard PMC 20.2 for Process Control Performance
f. NFPA 90A

B. All control equipment shall be the product of one manufacturer whenever practical.

C. Manufacturers:

1. The following damper actuator manufacturers are acceptable:

a. Belimo
b. Honeywell
c. Bray

PART 2 - PRODUCTS

2.1 DAMPER ACTUATORS

A. Provide damper actuators for control of motorized dampers where shown on plans, schedules, or specified.

B. Damper actuators shall be selected by the control contractor and shall be sized to fully open and close against the rated duct static pressure.

C. The operator linkage arrangement shall permit travel of the actuator from full open to full close without any binding.

D. Loss of power:

1. Dampers shall fail as required by sequence of operation.
2. For all dampers not indicated otherwise, the dampers shall fail as follows:

    a. Outside air dampers: closed

E. Two position actuators shall be provided for:

1. 100 percent supply air and exhaust air applications
2. Where required to be two position by the system Sequence of Operation

F. Proportional actuators shall be provided for:

1. Outside air dampers specified for a specific CFM
2. Where required to be proportional by the system Sequence of Operation

G. Electronic actuators shall be provided for all control dampers.

PART 3 - EXECUTION

3.1 DAMPER ACTUATORS

A. Submittals shall indicate force on damper and actuator capacity.

END OF SECTION

SECTION 230900.02 - CONTROLS FOR HVAC (FLOW MEASUREMENT)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of flow measurement devices shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 09 00 – Instrumentation and Controls for HVAC (General)

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All environmental controls shall comply with all local codes and ordinances, and meet or exceed the following standards:

a. Underwriters Laboratories
b. NEMA Standards
c. National Electrical Code

B. All flow measurement equipment shall be the product of one manufacturer whenever practical.

C. Manufacturers:

1. The following thermistor airflow measurement manufacturers are acceptable:

a. Ebtron

PART 2 - PRODUCTS

2.1 THERMISTOR AIRFLOW MEASUREMENT

A. General:

1. Device shall be thermistor type capable of continuously monitoring airflow volume and temperature. Each sensor point shall be independently reported to the transmitter.
2. Device shall be suitable for insertion in mounting, standoff mounting, or internal mounting to meet specific application.
3. All components shall be provided by the sensor manufacturer.
4. The entire sensor and transmitter assembly shall be UL listed.

B. Sensor Probe:

1. Probe shall be gold and anodized 6063 aluminum alloy.
2. Probe shall have a UL plenum rated connecting cable.
3. Probes shall be "plug and play" and not have to be matched to a specific transmitter.
4. All hardware shall be stainless steel.

C. Sensor:

1. Sensor shall use thermal dispersion technology with two hermetically sealed industrial grade thermistor probes at each measurement location.
2. Sensor calibration shall be stored in the sensor probe and be calibrated in the factory to NIST traceable airflow and temperature standards.
3. The sensor shall not require field calibration when installed in accordance with manufacturer's requirements.
4. Sensor shall be sealed in a glass filled polypropylene housing.
5. Performance:

a.	Sensor accuracy	-	± 2% of Reading
b.	Temperature accuracy	-	± .15 degrees F
c.	Operating temperature range	-	-20 to 160 degrees F
d.	Operating humidity range	-	0 to 99% RH
e.	Calibration range	-	0 to 5000 FPM
f.	Duct airflow accuracy	-	± 3% of Reading
g.	OA intake airflow accuracy		± 5% of Reading

6. Sensors shall be provided (min.) as follows:

a.	Area less than 1 sq. ft.	-	2 sensors
b.	>1 to 2 sq. ft.	-	4 sensors
c.	>2 to 4 sq. ft.	-	6 sensors
d.	>4 to 8 sq. ft.	-	8 sensors
e.	>8 to 12 sq. ft.	-	12 sensors
f.	>12 to 14 sq. ft.	-	14 sensors
g.	Area greater than 14 sq. ft.	-	16 sensors

D. Transmitter:

1. Transmitter shall utilize industrial grade components.
2. Transmitter shall include:

    a. Inputs and outputs shall be fused, protected, and internally isolated form the power supply.
    b. Serial RS-485 interface with field selectable protocol.
    c. Output signal offset/gain with digital adjustment.
    d. Adjustable digital filter.
    e. 4-20 ma or 0-10 VDC, field selectable, scalable and isolated analog signals.

3. Transmitter shall be capable of performing sensor and transmitter diagnostics and shall perform a full system checkout on power up.
4. Transmitter shall have a sensor detection system to ignore malfunctioning sensors and provide a visual alarm.
5. Transmitter shall be capable of displaying individual sensor airflow and temperature readings.
6. Display shall be 16 character alpha numerical.
7. The operating temperature range for the transmitter shall be -20 to 120 degrees F.
8. 24V AC power connection internally fused.
9. If exposed to ambient conditions, enclosure shall be NEMA 4.
10. Basis of design transmitter shall be:

    a. Ebtron model GTx116

PART 3 - EXECUTION

3.1 AIRFLOW MEASUREMENT

A. Manufacturers shall submit detailed drawings of the system component in which the airflow measurement device is to be installed.

B. Submittal shall include test data to verify compliance with accuracy at all required airflows in the configuration the assembly to be installed.

C. If the test and balance airflow measurements and the sensor airflow measurements disagree by an amount determined to be unacceptable by the Engineer, the sensor manufacturer shall visit the jobsite to review the installation of each location of airflow measurement in question. The manufacturer shall re-calibrate the sensors in the field if necessary to provide accurate readings.

END OF SECTION

SECTION 230904.1 – VRF CONTROL SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of the VRF control system.

B. Description:

1. The work shall include, but not be limited to, the following:

a. Field programmable digital system controller(s).
b. Digital transmission system.
c. Field programming to perform monitoring and control functions specified herein and on point schedule.

2. All sensors, actuators, transducers, solenoids, transformers, wiring and appurtenances shall be provided for a complete VRF control system.
3. Digital controller shall include the distributed microprocessors.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0900 - Instrumentation and Control for HVAC (General)

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All equipment and components shall comply with all local codes and ordinances, and meet or exceed the following standards:

a. American Society for Testing and Materials ASTM
b. Institute of Electrical and Electronic Engineers IEEE
c. National Electrical Manufacturers Association NEMA
d. Underwriters Laboratory, UL (UL 916)
e. FCC Regulation, Part 15, Section 156
f. National Fire Protection Association NFPA

B. All the equipment shall have the UL label.

C. Manufacturers shall be:

1. Daikin
2. Trane
3. Approved Equal

PART 2 - PRODUCTS

2.1 GENERAL

A. The VRF control system shall be capable of controlling 64 indoor unit groups and 128 indoor units connected to 10 outdoor units.

B. The control system shall support operations superseding that of the local remote controller, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring.

C. The controller can be used in conjunction with a BACnet interface, BACnet MSTP adaptor, Lonworks interface, and Modbus adapter to control the indoor units.

D. The VRF control system shall be equipped with two RF-45 Ethernet ports for 100 Mbps network communication to support interconnection with a network PC via the internet, Local Area Network (LAN), or connection with a non-networked PC after completed installation.

E. Web access functions shall be available so that the Owner can securely log into each VRF control system via the PC's web browser to support monitoring, scheduling, error recognition, downloading of system operation data (trend log) and general user functions. Error emails can be sent to designated email addresses.

F. The VRF control network is made up of local remote controllers, multi-zone controllers, advanced multi-zone controllers, and open protocol network devices that transmit information via the communication bus.

G. The VRF control system shall control all VRF systems in this project as well as control all other systems per their Sequences of Operation.

2.2 CONTROLLER DISPLAY

A. The controller shall display On/Off, Operation Mode, Setpoint, Space Temperature, and Fan Speed,

B. The controller shall display Date and day of the week along with the time of day.

C. The controller shall display the temperature setpoint in one degree increments.

D. Display shall reflect room temperature in one-tenth degree increments.

E. Capable of displaying site floor plan or graphical user interface (GUI) as the background for visual navigation.

F. Up to 4 status points can be assigned to the indoor unit (room name, room temperature, setpoint, and mode).

G. Up to 60 floor layout sections can be created.

2.3 CONTROLLERS

A. The controllers can be adjusted to maintain the optimal operation of 64 connected indoor groups and 128 indoor units.

B. Set temperatures can be adjusted in increments of 1°F.

C. In the cases where a system or unit error may occur, the VRF controllers will display an error code and the unit address.

D. The controller shall control system functions including.

1. On/Off
2. Operation Mode (Cool, Heat, Fan, Dry, and Auto)
3. Cool and Heat Setpoints
4. Controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating.
5. Independent Setup (Cooling) and Setback (Heating) setpoints in the unoccupied mode.
6. Fan speed for units specified with multiple speeds.

E. The controller shall support daily schedules.

F. The controller shall support auto-changeover.

2.4 WEB/EMAIL FUNCTION

A. Each VRF control system shall be capable of monitoring, operating, and scheduling a maximum of 64 indoor unit groups from a networked PC's web browser.

PART 3 – EXECUTION

3.1 SHOP DRAWINGS

A. Submit control shop drawings. Shop drawings to include sequences of operation, control schematic, and graphic pages.

3.2 INSTALLATION

A. All wiring shall be in conduit.

B. Conduit and wiring shall not be run exposed in any areas except utility spaces (mechanical room, mechanical closets, or rooms with exposed mechanical equipment).

3.3 TRAINING

A. Provide training for the Owner.

B. Provide training manuals for up to four (4) persons.

C. Provisions shall be made to provide communications via the Owner's PC to allow remote access at some future date when the Owner provides a PC for this purpose.

END OF SECTION

SECTION 230993 - SEQUENCE OF OPERATION (HVAC CONTROLS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 09 00 - Instrumentation and Control for HVAC (General)
2. Section 23 09 93.1 - Sequence of Operation (Single Package Heat Pumps)
3. Section 23 09 93.2 - Sequence of Operation (General Fans)
4. Section 23 09 93.4 - Sequence of Operation (Electric Heaters)
5. Section 23 09 93.9 - Sequence of Operation (Various Systems)

PART 2 - SEQUENCE OF OPERATION

2.1 GENERAL

A. These sequence descriptions and definitions shall apply to all sequences unless sequence specifically indicates otherwise.

2.2 SETPOINTS

A. In general, the specification indicates setpoints or range of setpoints for most devices.

B. Temperatures shall be field settable to any temperature.

C. Time of day operations shall be field settable to any time.

D. Time delays shall generally be field settable as follows:

1. 0-60 second delay: settable from 0-300 seconds.
2. 0-5 minute delay: settable from 0-60 minutes.

E. The contractor shall adjust setpoints in the following manner:

1. As required to start-up, test, debug and otherwise ensure equipment and system is operating as intended.
2. Dampers, actuators, and similar devices should be left in their optimum operating position.
3. Thermostats, humidistats, and similar devices should be left as indicated on drawings or in specifications. If no value is indicated, contractor should set at a reasonable value.
4. Equipment and system schedules should be reviewed with the Owner and Engineer prior to initiating the schedule.

2.3 MORNING COOL-DOWN

A. This mode is the mode between night setback and normally occupied mode and is used to bring area served from unoccupied conditions to conditions required for occupancy.

B. This mode typically will operate with outside air systems closed or de-energized.

C. The start time of this mode shall be determined by the building automation system based upon space temperatures, building characteristics, outside temperature, and historical ability of each system to cool down the building.

2.4 MORNING WARM-UP

A. This mode is the mode between night setback and normally occupied mode and is used to bring area served from unoccupied conditions to conditions required for occupancy.

B. This mode typically will operate with outside air systems closed or de-energized.

C. The start time of this mode shall be determined by the building automation system based upon space temperatures, building characteristics, outside temperature, and historical ability of each system to warm up the building.

2.5 NIGHT SETBACK

A. This mode is the unoccupied mode.

B. This mode is a timed function of adjustable duration.

C. This mode typically will operate with outside air systems closed or de-energized and is used primarily to maintain unoccupied space temperature (adjustable) or space humidity level (adjustable).

2.6 OVERRIDE

A. When override is activated, the system shall operate with that zone, equipment, or system in the occupied mode.

B. At the end of the override time period, the zone equipment or system shall return to the mode scheduled at that time.

2.7 OUTSIDE AIR CONTROL

A. Where airflow measuring stations are provided in the outside air intake, the outside air damper shall modulate to maintain the outside air setpoint as measured by the airflow measuring station setpoint.

2.8 FAILURE MODES

A. General:

1. Initiating devices shall each be hard wired.
2. Manual reset of temperature alarm and pressure alarm shall be required. Other alarms shall automatically reset unless manual reset indicated.

B. Smoke and Fire Alarm:

1. The fan shall de-energize as fast as practical.

C. Low Temperature (Recirculating System):

1. A low temperature condition may be caused by mixed air low limit or leaving air low limit.
2. Unless sequences specifically identify alternative modes of operation, the following shall be provided:

    a. The system shall operate in occupied mode.
    b. Outside air dampers shall be closed or outside air supply fans shall be de-energized.
    c. Heating system shall energize.
    d. Loop water system shall energize.

3. Alarm shall be indicated at building automation system.

D. High Condensate Level:

1. Upon a rise in condensate level in the condensate pan, the float switch shall de-energize the unit.

2.9 SPACE HEATING DEVICES

A. Unless stated otherwise, all general space heaters shall be scheduled off by any of the following means:

1. Night setback thermostat
2. Timed schedule
3. Outside air temperature setpoint

2.10 SYSTEM OPTIMUM START

A. The building automation control system shall provide an optimum start sequence for the HVAC system.

B. Optimization shall be determined by a comparison of indoor and outdoor environmental conditions and system capacities.

C. At the completion of optimum start, the building shall be at design temperatures. This is not necessary, and in most cases will not be, the same time as the start of the occupied period. For example, the completion of optimum start could be set at 7 am and the occupied mode set at 9 am. The occupied mode is typically when ventilation air would be energized.

2.11 ALARMS

A. In addition to the alarms indicated, all temperatures and other monitored or sensed conditions that fall above or below the normal range shall be alarmed.

B. Alarms shall be assigned a level of alarm (minimum three levels - low (maintenance), high (important), and critical).

2.12 REMOTE NOTIFICATION

A. Critical alarms shall be sent via text and/or email to up to six (6) Owner identified recipients.

2.13 TWO SPEED MOTORS

A. Sequence shall include a time delay on two speed motors when changing from high speed to low speed.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 230993.1 - SEQUENCE OF OPERATION (SINGLE PACKAGE HEAT PUMPS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 09 93 - Sequence of Operation (HVAC Controls)

PART 2 - SEQUENCE OF OPERATION

2.1 SINGLE PACKAGE HEAT PUMPS

A. Supply Fan Operation:

1. The supply fan shall be controlled by a variable frequency drive and a direct digital controller. When the system is enabled, the fan shall energize unless restricted by:

    a. Smoke alarm.
    b. Night setback.
    c. Fan failure or timed safety.
    d. Damper endswitches

2. Upon a start signal, the associated motorized damper in the supply duct shall be opened and the fan shall soft start. The direct digital controller shall provide a signal to the variable frequency drive to control supply fan speed.
3. Minimum design airflow shall be as scheduled.

B. Cooling Mode (Varying Airflow):

1. Electric heat shall be off.
2. When fan speed is at minimum setpoint, the compressor(s) shall proportionally energize to maintain space temperature.

3. If additional cooling is required and the compressor(s) are fully loaded, then the supply fan speed shall modulate to maintain space temperature.

C. Heating Mode (Constant Airflow):

1. The compressor(s) and reversing valve shall proportionally energize to maintain space temperature.
2. Supply fan speed shall be at maximum design airflow.
3. If the compressors(s) fail or additional heating is required, then the auxiliary electric heat shall proportionally energize to maintain space temperature.

D. Morning Warm-Up:

1. During morning warm-up, the outside air damper shall remain closed and the unit shall provide 90 deg F (adj.) supply air.

E. Morning Cooling-Up:

1. During morning cool-down, the outside air damper shall remain closed and the unit shall provide 55 deg F (adj.) supply air.

F. Outside Air:

1. Upon beginning of occupancy (plus time delay of x minutes), the outside air damper shall open and shall modulate to maintain the design outside air as measured by the airflow measuring station.

G. Override:

1. The system shall operate in occupied mode.

H. Unoccupied Mode:

1. During unoccupied mode, the system shall start if space temperature drops below unoccupied heating setpoint or rises above unoccupied cooling setpoint.
2. Outside air dampers shall be closed.
3. The system shall operate in cooling, heating, or dehumidification mode as required.

I. Dehumidification Mode:

1. If space humidity exceeds sensor setpoint, and the system is not currently in cooling mode, the fan speed shall be reset to the minimum setpoint.
2. The compressor(s) shall fully energize.
3. The hot gas reheat shall proportionally energize to maintain space temperature setpoint.
4. Once humidity drops below setpoint by “X” percent RH, then the unit shall return to standard mode.

END OF SECTION

SECTION 230993.2 - SEQUENCE OF OPERATION (GENERAL FANS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 230993 - Sequence of Operation (HVAC Controls)

PART 2 - SEQUENCE OF OPERATION

2.1 GENERAL FANS

A. Fans shall be controlled as shown on the schedule.

B. Fans under building automation control system timed control shall be on during occupied mode and off during unoccupied mode.

C. Provide auxiliary contacts for start/stop for all fans, not temperature controlled.

END OF SECTION

SECTION 230993.4 - SEQUENCE OF OPERATION (ELECTRIC HEATERS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 230993 - Sequence of Operation (HVAC Controls)

PART 2 - SEQUENCE OF OPERATION

2.1 SPACE HEATING DEVICES (GENERAL)

A. General space heating devices shall be energized or de-energized by the building automation control system based upon ambient temperatures.

B. Heaters shall be de-energized when the ambient temperature exceeds 65 degrees F (adj.) in occupied mode.

C. The digital controllers shall allow the heaters to operate when the ambient temperature is below 65 degrees F (adj.) in occupied mode.

D. Heaters shall be de-energized when the ambient temperature exceeds 50 degrees F (adj.) in unoccupied mode.

2.2 ELECTRIC UNIT HEATERS

A. Heater shall be controlled by an integral factory thermostat and direct digital controller.

END OF SECTION

SECTION 230993.6 - SEQUENCE OF OPERATION (SPLIT SYSTEM DX EQUIPMENT)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 09 93 - Sequence of Operation (HVAC Controls)

PART 2 - SEQUENCE OF OPERATION

2.1 GENERAL

A. Unit Operation:

1. The evaporator fan, condenser fan, and compressor shall be controlled independently of each other by the direct digital controller.
2. When system is in occupied or override modes, the system shall operate in occupied mode.

B. Heating Control (Heat Pump):

1. Upon a demand for heating, the reverse cycle unit shall load the compressor.
2. When space temperature drops below the night low limit setpoint (unoccupied mode), the unit shall energize in heating.

C. Cooling Control:

1. Upon a demand for cooling, the unit cooling sequence shall energize.
2. The compressor shall load to maintain sensor setpoint.
3. When space temperature rises above the night high limit setpoint (unoccupied mode), the unit shall energize in cooling.

D. Evaporator Fan Operation:

1. The fan shall run continuously when the unit is energized.

E. Failure Mode:

1. High condensate level

2.2 SPLIT SYSTEM DX EQUIPMENT

A. Unit Operation:

1. The unit shall be controlled by a space thermostat and direct digital controller.

END OF SECTION

SECTION 230993.9 - SEQUENCE OF OPERATION (VARIOUS SYSTEMS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of controls system shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 09 93 - Sequence of Operation (HVAC Controls)

PART 2 - SEQUENCE OF OPERATION

2.1 FLOAT SWITCHES

A. When float switch rises to preset water depth, the system shall be de-energized.

B. When float switch drops to below preset water depth, the system shall automatically restart.

2.2 BIPOLAR IONIZATION

A. The bipolar ionization unit shall be energized when the unit is energized and shall be off when the unit is off.

END OF SECTION

SECTION 232113 - HVAC PIPING (GENERAL)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of pipe, pipe fittings, accessories and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1. Section 23 05 48 – Sound, Vibration, and Seismic Control for HVAC

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All pipe and pipe fittings shall comply with American National Standards Institute Code, all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:

a. Non-Ferrous Metallic Pipe and Fittings:

1) Copper Tube, Water, Seamless, Types K, L, and M. ASTM B88
2) Pipe Fittings, Brass or Bronze, 125 and 250 lbs., Cast or Wrought. ANSI B16.15
3) Solder Joint Fittings, Pressure, Copper Alloy. ANSI B16.22
4) Refrigerant Piping. ANSI B31.5, ANSI B36.40, ASTM A333
5) Copper tube (drain, vent) DWV. ASTM B306
6) Copper tube (refrigeration), ACR. ASTM B280

b. Pipe Joining Materials, Gaskets, Methods, and Accessories:

1) Soldering and brazing ANSI B9.1

B. Material shall be new domestic materials (made in the USA) of standard manufacture suitable for specified use.

C. Manufacturer shall certify materials conform to reference specifications, or specification number shall be cast into or marked on each piece.

D. Manufacturers:

1. The following solder manufacturers are acceptable:

a. United Wire
b. Engelhard
c. Elkhart

PART 2 - PRODUCTS

2.1 GENERAL

A. No materials shall be co-mingled within the same system except those which are specifically approved in these specifications.

2.2 PIPE SCHEDULE

A. Cooling Coil Condensate Drain Piping:

1. Piping shall be seamless hard drawn, Type L, copper pipe.

2. Outdoor piping shall be schedule 40 PVC.

B. Refrigerant Piping:

1. Piping shall be seamless hard drawn, Type L, ACR, copper pipe.
2. In a variable flow refrigerant system, the piping between the branch selector and indoor unit up to 5/8" may be seamless soft drawn, Type L, ACR, copper pipe, ASTM BS280, where permitted by the equipment manufacturer.
3. Piping shall be dehydrated, charged with nitrogen, and capped.

2.3 FITTINGS AND CONNECTIONS

A. Fittings shall be the same material and weight as the pipes joined by the fitting unless noted otherwise. Fittings shall comply with all applicable standards.

B. Prohibited Fittings:

1. The following are prohibited fittings:

a. Bullhead tees
b. Street ells
c. Bushings
d. Close nipples
e. "T" drill fittings

C. Copper Pipe Fittings - Refrigerant Service:

1. Fittings shall be wrought copper.
2. All joints shall be brazed.
3. Brazing material may be an alloy of silver, copper and/or phosphorus with a minimum melting point above 1100 degrees F.

PART 3 - EXECUTION

3.1 GENERAL

A. Pipe shall be installed in strict accordance with manufacturer's recommendations.

B. Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing piping in place, properly clearing all window, doors, and other openings or obstructions.

C. Excessive cutting or other weakening of building to facilitate piping installation will not be permitted.

D. Piping shall line up flanges and fittings freely and shall have adequate unions and flanges so that all equipment can be disassembled for repairs.

E. Each length of pipe, as erected, shall be upended and rapped. Dirt and all foreign matter shall be cleaned from pipe and fittings before installation.

F. All turns and connections shall be made with long radius fittings as specified hereinafter.

G. Provide proper provision for expansion and contraction in all portions of pipework, to prevent undue strains on piping or apparatus connected therewith. Provide double swings at coil connections, riser transfers, and other offsets wherever necessary to take up expansion.

H. Piping shall be installed straight and level except where required to be sloped.

3.2 ISOLATION VALVES

A. Provide shutoff valves at all major branches.

3.3 PIPING TO EQUIPMENT

A. Where items in piping such as control valves, coils, and equipment connections are different sizes than the piping, reducers and increasers shall be installed adjacent to such items so there is a minimum of reduced size pipe.

B. All piping connections to coils, equipment, valves and other system components shall be made with offsets with flanges or unions so arranged that the equipment can be serviced or removed without dismantling the piping.

C. Provide all final pipe connections to systems and equipment.

3.4 REFRIGERANT PIPE

A. Cut refrigerant pipe with wheel cutter only. Do not saw or ream.

3.5 CONCEALED PIPE

A. Test all pipe prior to concealing or insulating.

3.6 PIPE INSPECTION

A. The Owner and the Engineer reserve the right to inspect, sample, and test any pipe after delivery and to reject all pipe represented by any sample which fails to comply with the specified requirements. Inspection of pipe shall be for pits, blisters, rough spots, breakage, or other imperfections. Any pipe which has been rejected because of the above shall be conspicuously identified and immediately removed from the construction site.

3.7 DRAINAGE PIPING

A. Provide cleanouts at all changes of direction totaling 90 degrees or more.

END OF SECTION

SECTION 233112 - MECHANICAL DUCT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the installation of mechanical duct, accessories, and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 23 Specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. Mechanical duct systems shall be fabricated and installed in accordance with the manufacturer's recommendations and meet or exceed the standards and procedures (latest editions) of the following:

   a. SMACNA, Balancing and Adjustment of Air Distribution
   b. SMACNA, Low Pressure Duct Construction Standards
   c. SMACNA, Fire Damper and Heat Stop Guide
   d. SMACNA, Duct Cleanliness for New Construction Guidelines
   e. SMACNA, HVAC Duct Construction Standards
   f. NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems
   g. ASHRAE Handbook of Fundamentals and ASHRAE Systems and Equipment Handbook
   h. International Building Codes

2. The duct shall be Class 0 in accordance with UL Standard 181. Where permitted by Code, Class 1 duct shall be allowed.
3. All duct system components including insulations, adhesives, mastics, cements, tapes, coverings, connectors and appurtenances shall have a maximum UL flame spread of 25 and a smoke development rating of 50 as tested by ASTM E-84.
4. Duct sealants shall meet UL 181A and UL 181B.

B. Manufacturers:

1. The following duct sealant manufacturers are acceptable:

a. AirSeal McGill
b. Ductmate
c. Hardcast

PART 2 - PRODUCTS

2.1 GENERAL

A. Dimensions shown on the plan are finished inside dimensions. The sizes of internally lined ducts shall be increased accordingly. The size of dampers and accessories shall also be increased in size.

B. Ducts shall be smooth on the inside.

C. The general location of ducts shall be as shown on the contract drawings. Exact location of ductwork shall be determined by the Contractor.

2.2 SEALING DUCTS

A. General:

1. Sealants shall be water based. Solvent based sealants are not acceptable.
2. Sealants shall be UV, water and mildew resistant.
3. Sealants shall be suitable for low, medium and high-pressure applications up to 15" WG.
4. Sealants shall have a mild odor, no flashpoint, and not require a respirator for application.

B. All ducts shall be sealed in accordance with Seal Class A. Seal all joints (longitudinal and traverse) and all penetrations. The following shall not require sealant:

1. Spiral lockseams
2. Gasketed connections

C. Basis of design sealant shall be:

1. McGill AirSeal United Duct Sealer (Water Based).

2.3 DUCT SHIPMENT

A. Intermediate Level (SMACNA):

1. Ducts leaving the place of fabrication shall be kept clean and dry.

PART 3 - EXECUTION

3.1 GENERAL

A. The contractor shall provide additional bends and offsets as may be required to bring ductwork into proper relation with other equipment and features of the building.

B. Where changes are made in shape of ducts, full area shall be maintained, and changes shall be gradual to minimize pressure drop.

C. Ducts terminating at grilles and registers shall be provided with suitable means of attachment.

D. All ductwork shall operate without chatter and vibration and shall be free from pulsation.

E. The following work shall be performed under the direction of the System Test and Balance Contractor.

1. Install all automatic dampers.
2. Provide necessary blank-off plates (safing) required to install dampers that are smaller than duct size.
3. Assemble multiple section dampers with required number of shafts through duct for external mounting of damper motors.
4. Provide necessary sheet metal baffle plates to eliminate stratification and provide air volumes specified. Locate baffles by experimentation and affix and seal permanently in place after stratification problem has been eliminated.
5. Provide access doors to adjust, maintain, or service equipment sensors, controllers and all other devices.

3.2 DUCT STORAGE

A. Duct shall be protected by storing on elevated supports.

B. All ducts shall have ends capped during storage.

C. The area used for storage shall be kept dry and clean.

3.3 PROTECTION AND CLEANING DURING INSTALLATION

A. During construction, all open ends of duct installed shall be capped.

B. Prior to capping, all interior duct surfaces shall be wiped clean.

3.4 HANGING

A. Hanging and support systems shall be in accordance with SMACNA Duct Construction Standards and drawing details.

B. Where duct is supported by threaded rods, see Mechanical Sound, Vibration, and Seismic Control specifications for threaded rod requirements and attachment requirements.

C. Where duct is supported by sheet metal straps, the strap shall attach to the duct with two #10 sheet metal screws located within 2 inches of the top of the duct.

3.5 ACCESSORIES

A. Doors, coils, dampers, registers, grilles, diffusers, air turning vanes, and other accessory items shall be installed as detailed in the SMACNA Duct Construction Standard with adequate reinforcement and support to accommodate additional weight without damage to the duct.

3.6 COMPLETION AND DEMONSTRATION

A. Upon completion of the duct system installation, and before the Engineer has inspected the system operation, open all system dampers and turn on fans to blow all scraps and other loose material out of the duct system. Allow for a means of removal of such material.

B. Check the duct system to ensure there are no excessive air leaks through joints, at reinforcement locations, seams, points of connection with fire dampers, coils, or other duct accessories. Where there are unacceptable leaks, the leakage shall be repaired and shall be done so in the manner of a newly installed system. Excessive air leaks shall be leaks that exceed industry standards, cause higher than acceptable noise, or where leakage exceeds reasonable expectations.

END OF SECTION

SECTION 233113.1 - METAL DUCT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of all metal duct where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 3112 - Mechanical Duct

1.3 QUALITY ASSURANCE

A. Codes and Standards: All work shall meet or exceed the standards and procedures (latest editions) of the following:

1. ASTM A527 Galvanized Steel Spiral Lock Seam Duct
2. Underwriter Laboratories, UL 103
3. ANSI Z223.1

B. Material shall be free from blisters or other mechanical defects. Material shall be galvanized prime sheet steel unless noted otherwise.

C. Sheet metal thickness, cross joints, seams, slip-connections, cross-breaking, bracings, duct supports and reinforcing shall be in accordance with the more stringent requirements of ASHRAE Guide and SMACNA Duct Construction Manual for system pressure classifications. Minimum gauge thickness is 26 unless thicker gauges are indicated.

D. Manufacturers:

1. The following round duct manufacturers are acceptable:

a. United McGill
b. Semco
c. Turnkey Duct Systems
d. Eastern Sheet Metal

e. Lindab
f. Hamlin
g. BHV Sheet Metal Fabricators
h. Spiral Pipe of Texas
i. Patton Industries

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials:

1. Duct shall be galvanized or as indicated elsewhere on the plans or in these specifications.

B. Closure:

1. Transverse joints and seams in sheet metal duct shall be of the types and sizes recommended by SMACNA and the ASHRAE Handbook for the specific duct pressure classification.

2.2 ROUND DUCT (SINGLE WALL SUPPLY)

A. Duct:

1. Duct shall be constructed with spiral lockseams or spiral lock seam/standing rib.

B. Fittings:

1. All fittings are to have continuous welds along all seams. All divided flow fittings are to be manufactured as separate fittings, not as saddle taps, tap collars, or similar duct components.
2. All 90 degree tees and 45 degree laterals (wyes) up to and including 12 inch diameter size shall have a conical entrance into the fitting, produced by machine or press forming. The entrance shall be free of weld build-up, burrs, or irregularities.
3. Elbows in diameters 3 inches through 12 inches shall be two section stamped elbows. All other elbows shall be gored construction with all seams continuous welded. Elbows shall be fabricated to a center-line radius of 1.5 times the cross-section diameter.
4. Pipe to pipe joints in diameters to 50 inches are by the use of sleeve couplings, reinforced by rolled beads.
5. Pipe-to-fitting joints in diameters to 50 inches are by slip fit of projecting collar of the fitting into the pipe. Insertion length of sleeve coupling and fitting collar is 2 inches for diameters through 9 inches and 4 inches for diameters 10 inches and up.

2.3 LOW PRESSURE RUNOUTS

A. Where concealed, single wall, low pressure runout ducts are indicated, they may be snap lock duct provided all of the following conditions are met:

1. Ducts 12" round or 12" x 12" and smaller.
2. Runout to a single air distribution device.
3. Less than 10 feet in length.
4. No other specific type of duct is specified.
5. Duct shall be 26 gauge minimum.
6. Snap lock duct free area is equal to or greater than duct specified.
7. Duct does not run through a wall or partition.
8. Duct is not exposed.

PART 3 - EXECUTION

3.1 ROUND DUCT

A. Submittals shall include:

1. Duct gauges and general construction
2. Fitting gauges and general construction
3. Liner gauges and general construction
4. Friction loss
5. Sound attenuation of straight duct sections
6. Thermal conductivity factors defining the insulation characteristics

3.2 EXPOSED DUCT

A. Prepare exposed duct as recommended by the paint manufacturer for field painting.

3.3 PLENUMS

A. Fabricate plenums connecting to equipment only after review of acceptable equipment shop drawings.

3.4 SUBMITTALS

A. Provide a list of all duct materials and systems in which they are to be installed for the entire project.

3.5 CUTTING DUCTS

A. Ducts shall be cut with a handheld plasma cutter whenever practical. This shall include, but not be limited to, cutting openings for access doors, taps, and similar applications.

3.6 ROUND DUCT FITTINGS (FOR EXPOSED DUCT)

A. Secure fittings per SMACNA requirements or #10 TEK screw minimum.

END OF SECTION

SECTION 233300 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor and materials and perform all installation of duct accessories and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 31 12 - Mechanical Duct

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. Duct accessories shall be fabricated and installed in accordance with the manufacturer's recommendations and meet or exceed the standards and procedures (latest editions) of the following:

a. UL Standard 214 for Fire Retardancy
b. NFPA 90A and 90B
c. SMACNA
d. ASTM E84
e. AMCA Standard 500

2. Duct accessories shall have AMCA Certified Rating Seal when specified.

B. Manufacturers:

1. The following low pressure access door manufacturers are acceptable:

a. Ruskin
b. Air Balance
c. KEES
d. National Controlled Air

2. The following flexible duct connector manufacturers are acceptable:

    a. Ventfabrics
    b. Ductmate

3. The following concealed damper regulator mechanism manufacturers are acceptable:

    a. Young
    b. Dura Dyne
    c. Potteroff

PART 2 - PRODUCTS

2.1 FLEXIBLE DUCT CONNECTORS

A. General:

1. Flexible connectors shall consist of two strips of 24-gauge metal and a coated fabric.
2. Fabric used in indoor applications shall meet NFPA 90A and 90B.
3. Fabrics shall meet NFPA 701.
4. Connectors shall be unaffected by mildew, resistant to weather and have a fire-retardant coating on a noncombustible fabric.
5. The connector shall be suitable for -40-degree F to 180-degree F.
6. Where duct has roll formed mating flange, metal strips shall be roll formed.

B. Indoor Applications:

1. Characteristics:

    a. Fabric: glass cloth
    b. Weight: 30 ± 2 oz/sq. yd.
    c. Tongue Tear: 40/30 lbs.
    d. Tensile Strength: 395/255 lbs.

2. Metal strips shall be galvanized or aluminum.
3. Metal strips shall be 3" minimum, and fabric shall be 5" minimum.
4. Basis of design manufacturer shall be:

    a. DuctMate Proflex Neoprene

C. Locations:

1. Inlet and outlet of each single package heat pump.
2. Inlet and outlet of each dehumidification unit.
3. Inlet and outlet of each suspended exhaust fan.
4. Inlet and outlet of each suspended supply fan.

2.2 DUCT ACCESS DOOR SIZES

A. Access doors shall be the following minimum sizes unless noted otherwise:

Duct Maximum Dimensions	Access Door
6"	6" x 6"
14"	10" x 14"
18"	14" x 14"
Larger than 18"	16" x 16"

B. The minimum access door size for a fire damper shall be 12" x 12".

2.3 LOW PRESSURE DUCT ACCESS DOORS

A. Low pressure access doors shall be provided in duct systems with static pressures up to 2 inches W.G. and for velocities up to 2400 FPM.

B. Frame and door shall be 20-gauge galvanized steel in galvanized duct. The door shall be dual wall with 1/2" insulation minimum.

C. Door shall be removable cam type with two cams for doors less than 16" and four cams for door 16" and larger.

D. Polyurethane foam seals shall be provided between frame and duct and between door and frame.

2.4 CONCEALED DAMPER REGULATOR MECHANISMS

A. Concealed regulators shall include regulator box, control cable, gears, and accessories.

B. Regulator box shall be depth and type suitable for ceiling type. Cover shall be stainless steel.

C. Regulators shall be provided for all manual balancing dampers located above the following ceiling types:

1. Gypsum board ceilings
2. As indicated on plans.

D. Standard regulator cover shall have standard screws. Basis of design manufacturer shall be:

1. Young Regulator No. 270-301

PART 3 - EXECUTION

3.1 LOW PRESSURE DUCT ACCESS DOOR

A. A duct access door shall be provided for access to all devices and appurtenances requiring periodic maintenance or inspections, including but not limited to:

1. Fire dampers
2. Smoke detector sampling tube.

B. Access door shall be within 24" of device serving. There shall not be turning vanes or any other devices prohibiting access to damper and replacement of linkages.

C. Access door shall be attached to housing with sheet metal screws. Frame shall be sealed to duct with high pressure duct sealant.

D. Where necessary the duct size shall be increased to accommodate the minimum size specified access door. If this is not practical, a section of duct shall be designed and installed to be easily removable to access damper or device.

3.2 FLEXIBLE DUCT CONNECTORS

A. Installed length of material shall be 50% flat length.

3.3 CONCEALED DAMPER REGULATOR MECHANISMS

A. Provide coordination drawing to ceiling installer indicating location of regulators. Drawing shall include detailed framing requirement for each type ceiling.

END OF SECTION

SECTION 233313 - DAMPERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, and perform all operations in connection with the installation of dampers and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

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

B. All sections of Division 23 Specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 31 12 - Mechanical Duct

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. Dampers and appurtenances shall be fabricated and installed in accordance with the manufacturer's recommendations and meet or exceed the standards and procedures (latest editions) of the following:

a. UL Standard 555
b. NFPA 90A
c. AMCA Standard 500
d. SMACNA Standards

B. Manufacturers:

1. The following control damper manufacturers are acceptable:

a. Ruskin
b. Air Balance, Inc.
c. Nailor-Hart
d. Louvers and Dampers, Inc.
e. NCA
f. Airline Products
g. Titus
h. Arrow
i. Leader Industries
j. Pottorff
k. United Enertech

2. The following manual balancing damper manufacturers are acceptable:

    a. Ruskin
    b. Air Balance, Inc.
    c. Nailor-Hart
    d. Louvers and Dampers, Inc.
    e. NCA
    f. Airline Products
    g. Arrow
    h. Leader Industries
    i. Pottorff
    j. United Enertech

3. The following positive locking damper mechanism manufacturers are acceptable:

    a. Rossi

PART 2 - PRODUCTS

2.1 CONTROL AND MANUAL BALANCING DAMPERS

A. General:

1. Bolts, screws or rivets shall not be used in construction of damper assembly.
2. Damper shall be opposed blade for dampers 14 inches and higher.
3. Bearings shall be non-corrosive, non-stick type and shall be molded synthetic Cycoloy 800, stainless steel, or Zytel.
4. Damper manufacturer shall provide a complete damper assembly.
5. All dampers with shafts extending through the ducts with exterior insulation shall have 2-inch standoff brackets or shaft extensions.

B. Materials:

1. Dampers material shall match the duct material in which it is installed unless noted or specified otherwise.

C. Positive Locking Damper Mechanism:

1. The damper mechanism for all manual balancing dampers shall positively lock the damper in position.
2. The locking mechanism shall not release the damper position due to vibration. Devices that utilize wings nuts will not be accepted.
3. Basis of design:

    a. Rossi Everlock
    b. Rossi Megalock

D. Control Dampers:

1. General:

a. Provide at all locations where control dampers are required except where insulated outside air dampers are required.

b. All control dampers shall have coated polyester fabric blade seals unless noted otherwise.

2. Low Leakage (Rectangular):

a. Frame shall be 5" x 1" x .125" aluminum channel for dampers 14 inches and higher. Blades shall be 6" wide extruded aluminum air foil construction.

b. Blade seals shall be vinyl locked in extruded blade slots. Seals shall be field replaceable.

c. Dampers shall be AMCA certified for a maximum leakage at 1" WG per sq. ft. damper area of 3 CFM.

d. Maximum pressure shall be 13 inches W.G. and maximum temperature shall be 250 degrees Fahrenheit.

e. Basis of design low leakage control dampers (rectangular) manufacturer:

1) Ruskin CD50

E. Manual Balancing Dampers:

1. Low Pressure (Rectangular):

a. The frame shall be 5" x 1" x 16 gage galvanized steel channel. Blades shall be 8" wide, maximum, 16 gage galvanized steel.
b. Dampers 36" W x 12" H and smaller shall have a frame 3" x 22 gauge and 22-gauge blades.
c. Basis of design manual balance dampers manufacturer:

1) Ruskin MD15

2. Low Pressure (Round):

a. The frame shall be 20 gage galvanized steel, 7 inches in length, minimum. Blades shall be 20 gage.
b. The maximum velocity shall be 1500 FPM.
c. Basis of design low pressure manual balancing damper (round) manufacturer:

1) Ruskin MDRS25

F. Dampers with concealed regulators:

1. Provide dampers compatible with concealed regulator control. See Duct Accessories specification.

2.2 FIRE DAMPERS

A. General:

1. Provide fire dampers where indicated on drawings, where specified, and where required by the National Fire Protection Associates, International Building Codes, Underwriters' Laboratory Standard 555 and Local Codes and ordinances having jurisdiction.
2. Fire dampers shall have a label affixed to the assembly stating that it is rated as a dynamic damper.
3. Dampers shall bear a UL label certifying qualifications for use in fire assemblies.
4. UL ratings shall apply to the entire assembly including dampers.
5. Fire dampers shall be type with a blade and frame installed out of air stream.
6. Frame enclosure and blades shall be galvanized unless noted otherwise.
7. All dampers shall be provided with closure springs and latches.
8. Provide a sleeve with all fire dampers.

B. Dynamic Fire Dampers, 1-1/2 Hour (Rectangular):

1. Fusible links shall be 165 degrees Fahrenheit.
2. UL label shall indicate 1-1/2 fire damper per UL Standard 555 for use in less than 3-hour fire resistant rated assemblies.
3. Damper shall be suitable for duct velocities up to 3000 FPM.
4. Basis of design dynamic fire dampers, 1-1/2-hour (rectangular) manufacturer:

    a. Ruskin DIB22 (Style C)

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Fire Dampers:

1. Indicate system static pressure and damper dynamic rating (static pressure and airflow) for airflow direction required.

3.2 FIRE DAMPERS

A. General:

1. Opening shall be 1/4" per foot larger than the sleeve but not less than 1/4" and not more than 1" plus 1/8" per foot.
2. Sleeve gage shall be equal to or heavier than duct gage.
3. Duct connection shall be plain s-slip, hemmed s-slip, stainless s-slip, reinforced standing s-slip, inside slip joint and double s-slip.
4. Mounting angles for fire dampers shall be 1-1/2" x 1-1/2" x 16-gauge angles, minimum, fastened with a minimum of two connections each side. Mounting angles shall overlap partitions a minimum of 1".
5. Damper shall be installed squarely and free from racking.

6. Multiple damper sections shall be braced at every horizontal mullion and braced 8' o.c. maximum vertically.
7. Join multiple damper assemblies or fasten damper to sleeve or duct with number 10 screws or 1/2" long welds, staggered on both sides, 6" on center, and maximum of 2" from damper corner or end of joining sections. Screws shall not impede performance of damper.
8. Provide mullion plates as required on multiple damper sections. Sections shall be sealed with 1/8" bead of sealant applied on all mullion joint.

B. Fire Damper:

1. Sleeve shall not extend more than 6" beyond fire partition on both sides.
2. Damper shall be installed in partition.

3.3 CONTROL AND MANUAL BALANCING DAMPERS

A. General:

1. Dampers shall be installed with blades horizontal unless shown otherwise on drawings. Manufacturer shall provide proper damper for installation in non-horizontal ducts.
2. Dampers shall be installed square and without racking. Damper installations shall not allow twisting, torquing or distortion. Provide proper clearances for operation of damper blades.

B. Installation:

1. Multiple damper sections shall be braced at every horizontal mullion and braced 8 feet O.C., maximum, vertically.
2. Join multiple damper assemblies or fasten damper to duct with Number 10 screws, or 1/2" long welds staggered on both sides 8" on center and maximum of 2" from damper corner or end of joining section. Screws shall not impede performance of the blade seals.
3. Damper actuator shall be installed on duct or fixed structure. Mounting on gypsum walls or similar structures is not permitted.

C. Sealants:

1. Low leakage dampers shall have an 1/8" bead of sealant between duct and damper.

2. Multiple low leakage damper sections shall be sealed with 1/8" bead of sealant applied on all mullion joints and between damper sections.

3. Sealants shall be:

   a. Dow-Corning 100% Silicon Rubber
   b. Dow-Corning Silastic 732
   c. GE RTV 108

3.4 FIRE DAMPER TESTING

A. The project's Chapter 1 inspector will be testing each fire damper. The contractor shall assist the Chapter 1 inspector with the following:

1. Turn off system while testing dampers.
2. Open up ceiling for special inspector.
3. Open up duct access door.
4. Reset damper after testing by the inspector and provide new linkage.
5. Close duct access door.
6. Close up ceiling.
7. Reset the system after all testing is completed.

3.5 POWER TO DAMPERS:

A. Unless power to a damper is specifically shown on the electrical design documents, the installing contractor shall provide power to the damper.

END OF SECTION

SECTION 233346 - FLEXIBLE DUCT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of all flexible duct where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 31 12 - Mechanical Duct

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All flexible duct shall comply with all local codes and ordinances, and meet or exceed the standards and procedures (latest editions) of the following:

a. NFPA 90A and 90B
b. Air Diffusion Council test code FD72-R1
c. Underwriters Laboratories, Class 1, Air Duct Standard 181
d. SMACNA

2. Duct shall be suitable for temperatures up to 180 degrees F.

B. Manufacturers:

1. The following flexible air duct manufacturers are acceptable:

a. Flex Master
b. Thermaflex
c. ATCO
d. Approved equal

PART 2 - PRODUCTS

2.1 GENERAL

A. Outer jacket shall be fiberglass scrim reinforced metallized film laminate.

B. Insulation R value shall not be less than the duct insulation in the duct to which the flex duct is connected to, but in no case shall the R value be less than 6.0 BTU/hr. sq. ft/degrees F at 70°F.

C. Vapor barrier permanence shall be .1 perm per ASTM Method E96.

D. Inner liner shall be an encapsulated steel spring helix or mechanically fastened to the steel spring helix.

2.2 FLEXIBLE AIR DUCT

A. Inner liner shall be chlorinated polyethylene (CPE) or polyester.

B. Duct shall be suitable for temperatures up to 250 degrees F (continuous), 4000 FPM, +6" W.G. for up to 16" duct and -1/2" W.G. for up to 16" duct.

C. Basis of design duct shall be (metallic jacket):

1. Thermaflex M-KE

2.3 SUPPORTS

A. Hanger or support saddle shall be provided by the duct manufacturer.

B. Support shall prevent any restriction of the internal diameter of the duct when the weight of the supported section rests on the hanger or saddle material.

C. Minimum width of support shall be 1½" or as required by SMACNA or ADC, whichever is greater.

D. Factory installed suspension systems integral to the flexible duct are an acceptable alternative hanging method when manufacturers' recommended procedures are followed.

2.4 DUCT LENGTHS

A. The runout length to air distribution units shall be 8 feet maximum unless noted otherwise.

2.5 CONNECTIONS

A. Tapes shall be listed and labeled in accordance with UL 181B and shall be marked 181B-FX or 181B-M.

B. Non-metallic clamps shall be listed and labeled in accordance with UL 181B and shall be marked UL181B-C.

C. Straps shall be metal for all systems where the duct is required to meet or exceed 2" WC or where located above gypsum or other inaccessible ceilings.

D. Metal straps shall be used when connected to a device in a rated assembly.

2.6 ACOUSTICAL PERFORMANCE

A. All standard grade flexible ducts shall have acoustical properties for ducts as follows:

1. The minimum insertion loss (dB) of a 10-foot length of straight duct at 2500 FPM:

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
8 inch	10	21	26	30	35	22
12 inch	10	26	26	34	27	14

2. Other size ducts shall have construction equal to and acoustical properties similar to that shown for 8" and 12" duct.

PART 3 - EXECUTION

3.1 GENERAL:

A. Flexible duct shall be supported at manufacturer's recommended intervals but at no greater distance than five (5) feet. Maximum permissible sag is 1/2 inch per foot of spacing between supports.

B. Hangers shall be adequately attached to the building structure.

C. Take every precaution to avoid tearing of vapor barrier. Damage to vapor barrier may be repaired with approved tape. If internal core is penetrated, replace flexible duct.

D. No splicing of flexible duct shall be permitted. All runs must be continuous.

E. Bends shall not be made with centerline radius less than one duct diameter.

F. Do not install flexible duct adjacent to any equipment, piping, etc. which operates above the recommended flexible duct use temperature.

G. Flexible duct shall not be installed through any partition.

3.2 ATTACHING FLEXIBLE DUCT

A. Collars to which flexible duct is attached shall be a minimum of 2 inches in length.

B. Peel the vapor barrier back 3 or 4 inches. Fold the insulation back over the vapor barrier.

C. Trim duct ends squarely.

D. Tape duct to sleeve or collar and seal with mastic.

E. Replace insulation and vapor barrier. Tape to provide vapor seal and seal with mastic. Connect with locking strap.

F. Slide inner core of each flexible duct section over sheet metal sleeve one-half the length of sleeve.

G. Protect flexible duct at connections to sleeves or collars by allowing duct to extend straight for a few inches beyond the end of the sheet metal connector before making a bend.

3.3 INSTALLATION INSPECTION

A. The contractor shall review all flex duct installed when the system is operating at maximum airflow to verify no significant duct leakage at any flexible duct connection.

B. If any leakage is found, the connection shall be repaired.

END OF SECTION

SECTION 233400 - HVAC FANS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of fans and air handling equipment and appurtenances where shown on the drawing and specified hereinafter.

B. Description:

1. Fans include low pressure equipment designed to handle relatively small amounts of air.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 05 02 - Common HVAC Materials

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. AMCA 300 - Certified Ratings for Sound and Airflow
b. AMCA 210 - Test Code for Air Moving Devices
c. Insulation - NFPA 90A and UL 181
d. UL705 (Single width backward inclined fans).

B. Manufacturers:

1. The following fan manufacturers are acceptable:

a. Greenheck
b. Cook
c. Penn Ventilator
d. Twin City Fans

PART 2 - PRODUCTS

2.1 MOTORS

A. All motors are premium efficiency.

B. Motors controlled by variable frequency drives shall be inverter duty rated.

C. Electronically commutated fan motors shall be controlled by a 0-10 VDC input (or any other input signal coordinated with the control contractor).

2.2 FANS

A. General:

1. All units shall be licensed to bear the AMCA Certified Ratings Seal for sound and air flow.
2. Fan wheel and shaft shall be statically and dynamically balanced by the fan manufacturer.
3. Fan RPM, tip speed, and motor horsepower shall not exceed that specified or shown on the drawings.
4. Exhaust fans shall be furnished with automatic backdraft dampers.
5. Conduit chase thru curb cap shall be provided on roof mounted equipment.
6. Fan shall not be selected at more than 85% of maximum pressure obtainable with that fan at the specified CFM.

B. Bearings:

1. Equip all fans with antifriction ball or spherical roller, self-aligning, pillow block bearings.
2. Bearings shall be in a cast iron housing and shall be regreaseable.
3. Bearings shall have a minimum life (AFBMA-L50) of 200,000 hours operation at maximum cataloged operating conditions.

C. In-Line Fans:

1. The fan housing shall be constructed of heavy gauge formed steel, with removable panels for access to the entire drive assembly and wheel for cleaning, inspection, and service without dismantling the unit.
2. The motor shall be isolated from the air stream by a motor enclosure and shall draw cooling air from outside the fan housing.
3. The fan inlet shall be a spun venturi throat overlapped by a backward curved centrifugal wheel with spun cone.
4. The fan housing shall be internally lined with a fiberglass duct liner for noise reduction and condensation control.
5. Ceiling mounted fans shall have a metal ceiling grille factory painted off white.

PART 1 `- EXECUTION

1.1 FANS

A. Fans shall be controlled as shown on schedules and in the Sequence of Operation specifications.

END OF SECTION

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of air distribution equipment and appurtenances where shown on the drawing and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. AMCA 300 - Certified Ratings for Sound and Airflow
b. AMCA 210 - Test Code for Air Moving Devices
c. Insulation - NFPA 90A and UL 181
d. NAAMM Metal Finishes Manual

B. Manufacturers:

1. The following air distribution manufacturers are acceptable:

a. Krueger
b. Metal Aire
c. J and J Register
d. Titus
e. Carnes
f. Tuttle and Bailey
g. E.H. Price
h. Nailor

PART 2 - PRODUCTS

2.1 AIR DISTRIBUTION UNITS (GENERAL)

A. General:

1. Furnish and install where shown on the plans, air distribution units in accordance with the air distribution schedules on the drawings and as specified hereinafter.
2. All supply, return, and exhaust air units shall be provided with opposed blade volume damper in the neck of the unit. Where return grilles are not ducted, the damper may be omitted.
3. Provide a round to square adapter for flex duct connecting to square neck.
4. All supply air distribution units shall have factory installed insulation with FSK vapor barrier on all surfaces above conditioned space. Insulation shall be 1-1/2", R-6 minimum and all edges taped to grilles and sealed with mastic.

B. Material:

1. General purpose use – steel or aluminum.
2. Group toilets and private toilets – aluminum.
3. Fire rated assemblies: steel.

C. Finish:

1. All air distribution units shall be furnished with the manufacturer’s standard off-white baked enamel finish unless specifically noted otherwise on plans or in specifications.

D. Frame Style:

1. Frame style shall be suitable for the surface in which air distribution unit is to be installed. Manufacturers or contractor shall provide all accessories such as plaster rings, etc., as necessary for a complete, finished installation.
2. Air distribution units shall typically be supplied with frame style as follows:

    a. Units installed in sheetrock or other hard finish shall have surface mounted frame style or plaster rings.
    b. Units installed in acoustical ceilings shall have frame style to match ceiling system type.

2.2 ACOUSTICAL CEILING UNITS (PLAQUE DIFFUSERS)

A. Acoustical ceiling air distribution units shall be plaque diffusers with 360-degree radial diffusion and removable face panel.

B. Face panel shall have smooth edges and rounded corners.

C. The back cone shall be one piece without corner joints.

D. Frame style shall be compatible with ceiling type.

E. Units shall be 24" x 24" or 12” x 12” as indicated on plans.

2.3 HARD OR MONOLITH CEILING UNITS (PLAQUE DIFFUSERS)

A. Hard or monolithic ceiling air distribution units shall be plaque diffusers with 360-degree radial diffusion and removable face panel.

B. Face panel shall have smooth edges and rounded corners.

C. The back cone shall be one piece without corner joints.

D. Frame style shall be compatible with ceiling type.

E. Units shall be 24" x 24" or 12” x 12” for 8” round or 8”x8” neck sizes and smaller.

PART 3 - EXECUTION

3.1 AIR DISTRIBUTION UNIT

A. Adjust operable deflection vanes to 30 degrees.

B. All plenums and duct visible thru face of air distribution units and bar grilles shall be painted flat black.

C. Add mastic to duct tape on insulated grilles.

END OF SECTION

SECTION 233723 - HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of air distribution equipment and appurtenances where shown on the drawing and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 05 02 - Common HVAC Materials

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. AMCA 300 - Certified Ratings for Sound and Airflow.
b. AMCA 210 - Test Code for Air Moving Devices.
c. Insulation - NFPA 90A and UL 181.
d. NAAMM Metal Finishes Manual.

B. Manufacturers:

1. The following air intake hood and relief hood manufacturers are acceptable:

a. Greenheck
b. Cook
c. CaptiveAire
d. Acme
e. Penn Ventilator
f. Jenn Aire
g. Carnes
h. Ammerman, Co.

PART 2 - PRODUCTS

2.1 INTAKE HOODS AND RELIEF HOODS

A. Hoods shall be constructed of heavy gauge aluminum.

B. Access to dampers shall be provided by a hinged hood or access through the shroud.

C. The following accessories shall be furnished with hoods:

1. Roof curb
2. Bird screen of heavy gauge PVC coated steel or aluminum

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 234100 - PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of air distribution equipment and appurtenances where shown on the drawing and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. AMCA 300 - Certified Ratings for Sound and Airflow
b. AMCA 210 - Test Code for Air Moving Devices
c. Insulation - NFPA 90A and UL 181
d. ASHRAE 52 Test Standard for filter efficiencies
e. UL Standard 900 for filter flame and smoke rating
f. Institute of Environmental Services Standard IES-RP-CC-DDI-86 for HEPA filters

B. Manufacturers:

1. The following filter manufacturers are acceptable:

a. Camfil Farr
b. American Air Filter
c. Airguard
d. Flanders Precisionaire
e. Glasfloss
f. Airflow, Inc.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment with 2” filters require the following filters:

1. The first set shall be installed before initial start-up.
2. A second set shall be installed for testing and balancing.
3. The third set shall be turned over to the Owner at final inspection.

2.2 2” PLEATED PANEL FILTERS

A. MERV 13 Filters:

1. Panel filters shall be flat throwaway type constructed of high strength moisture resistant board forming a double wall around the filter media.
2. A metal support grid is bonded to the leaving air side of the pleated media.
3. The filters shall be UL Class 2 approved and listed.
4. Filter shall have a maximum initial pressure drop of 0.41 inches WG at 500 FPM and 15 pleats per linear foot for 2-inch filters.
5. Filter shall not have an electrostatically enhanced media.
6. Filter media and frame shall be from 100% recyclable material.

2.3 TEMPORARY FILTERS:

A. During start-up, preliminary testing of system, operation of system prior to system being ready for testing and balancing, or operation of a system prior to final building cleaning, the contractor shall protect all equipment, coils, and the entire duct system with filters.

B. Filters shall be MERV 8 minimum and contain an antimicrobial biocide to control the growth of mold, mildew, algae, and fungi on the filters (i.e., fibers shall not support microbial growth). Biocide shall not offgas, migrate, or leach into the airstream.

C. Basis of design filter shall be:

1. Fiberbond Dustlok

2.4 EQUIPMENT REQUIREMENTS

A. Filters shall be provided on all equipment to protect heat transfer components from outside air, building exhaust air or other airstreams that would foul heat transfer surfaces.

B. Where no other filtration is indicated or scheduled, air handling equipment shall have a 2" pleated panel filter. The 2" filter shall be MERV 13.

PART 3 - EXECUTION

3.1 TEMPORARY FILTERS

A. The contractor shall install temporary filter media on all negative pressure openings if the system is to be operated prior to the final cleaning of all spaces served by the system. These openings include open return ducts, exhaust ducts, and grilles. All filters shall be replaced as often as necessary.

B. All temporary filters shall be held securely in place and with minimum bypass. Filters shall be changed as needed.

C. Systems shall not be operated without filters equaled to specified filters in place to protect coils and other heat exchanger devices.

3.2 SPARE FILTERS

A. The spare set of filters shall be stored at the project site at the location designated by the Owner.

END OF SECTION

SECTION 238123 - COMPUTER ROOM AIR CONDITIONING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of computer room air conditioning equipment and appurtenances where shown on the drawings and specified hereinafter.

B. Description:

1. Computer room equipment shall be air cooled, water cooled glycol or chilled water units designed specifically to control temperature and humidity in spaces with electronic equipment. Units can be split or self-contained.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as reference (latest edition):

a. Underwriters Laboratory
b. NFPA 90A
c. AMCA 210 Test Code for Air Moving Devices
d. National Electrical Code

B. All motors and equipment shall be U.L. labeled.

C. All insulation and materials shall have a flame spread rating of less than 25 and smoke developed of less than 50.

D. All heating and cooling equipment shall bear the ARI seal.

E. All refrigerant coils shall be ARI certified.

F. Manufacturers:

1. The following computer room air conditioning manufacturers are acceptable:

a. Liebert
b. Data Aire

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment shall meet or exceed the scheduled efficiencies or ASHRAE 90.1, whichever is greater.

B. All motors shall be premium efficiency.

2.2 LARGE SYSTEMS (8 TONS AND LARGER)

A. Refrigerant:

1. Refrigerant is R410A

B. Construction:

1. The frame shall be constructed of heliarc welded tubular steel.
2. The exterior panels shall be 20 gauge (min) and powder coated.
3. The exterior panels shall be insulated with a minimum 1 inch, 1-1/2 lbs. density fiber insulation. All panels shall have 1/4 turn fasteners.
4. All components shall be serviceable from the front and right side of the unit.

C. Fan and Motor:

1. The fan shall be a direct drive plug fan.
2. The motor shall be an ECM motor. The speed shall be varied as required.

D. Humidifier (Infrared Type):

1. The humidifier shall be of the infrared type utilizing infrared quartz lamps.
2. The evaporator pan shall be stainless steel.
3. The system shall monitor and control water level and have an adjustable water-overfeed to prevent mineral precipitation.
4. The auto flush system shall automatically flush deposits from the humidifier pan. The system shall be filled adjustable to change cycle times to suit local weather conditions.

E. Humidifier (Steam Generator Type):

1. The humidifier shall be of the steam generator type with disposable canister.
2. The evaporator pan shall be stainless steel.
3. The system shall monitor and control water level and have an adjustable water-overfeed to prevent mineral precipitation.

F. Reheat:

1. Electric reheat coils shall be stainless steel, low watt density, fin tubular construction, protected by thermal safety switches.
2. Reheat shall be (a minimum of 3 stages) (SCR).

G. Electrical:

1. Unit shall have a single point power connection.
2. Provide a unit mounted, non-locking, disconnect switch.
3. The electrical panel shall provide an SCCR of 65,000A (min.).

H. Cooling System:

1. Refrigerant System:

a. The refrigerant system shall include a liquid line filter drier, refrigerant site glass, expansion valve, safety switches and liquid line solenoid.
b. The compressor shall be a digital scroll compressor.
c. The compressor shall have a gas cooled motor, vibration isolators, thermal overloads, auto reset high pressure switch, service valves, discharge check valve, and crankcase heater.
d. Provide a manually adjustable thermal expansion valve (TXV). The TXV shall maintain consistent superheat over the unit's operating range and prevent refrigerant from returning to the compressor.

I. Condensate:

1. Provide an insulated stainless steel condensate pan.
2. Provide a condensate pump with primary and secondary float switches.
3. The secondary float, when activated will alarm and shut the unit down.

J. Safety Controls:

1. General:

a. Programmable auto restart sequencing loads.

2. Refrigerant system:

a. Short cycle limiter
b. Compressor lead/lag sequencer

K. Controls:

1. Provide BACnet communications to provide information to the building automation control system.
2. The controls shall be microprocessor based and programmable. Information shall be shown on a graphic display.
3. The control system shall delay heating or cooling in response to very low rates of change and shall advance heating or cooling in response to rapid temperature changes.

4. The microprocessor shall calculate the moisture content in the room and prevent unnecessary humidification and dehumidification cycles by responding to changes in dewpoint temperature.
5. The following shall be programmable:

    a. Temperature setpoint (65 degrees F to 85 degrees F)
    b. Temperature sensitivity (1 degree F. to 10 degrees F.)
    c. Humidity setpoint (20% RH to 80% RH)
    d. Humidity sensitivity (1% RH to 30% RH)

6. The following alarms shall be provided.

    a. High temperature
    b. Low temperature
    c. High humidity
    d. Low humidity
    e. Humidifier problem
    f. Loss of air flow
    g. Change air filters
    h. High head pressure
    i. Low suction pressure
    j. Short cycle
    k. Compressor overload
    l. High condensate level
    m. Custom alarms (up to 4)

L. Filters:

1. Filters shall be 4", MERV 11.

M. Provide the following accessories:

1. Floor stand
2. Condensate pump
3. Smoke detector
4. Liquid detectors (x)
5. Turning vanes
6. Shutoff valves
7. Supply plenum to 2" above the ceiling. Plenum finish to match the cabinet.

PART 3 - EXECUTION

3.1 LEAK DETECTION

A. Wire underfloor leak detection devices to unit controls.

3.2 FACTORY TESTS

A. Each unit shall be factory assembled, wired, and load tested including air flow, water flow, refrigeration operation electrical systems and control systems.

B. Five copies of the factory tests shall be furnished to the Engineer.

END OF SECTION

SECTION 239005 - HEAT TRANSFER (ELECTRIC COOLING)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of heat transfer equipment and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 05 02 - Common HVAC Materials

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. ARI Standards 210/240, 340, and 360
b. ANSI Z21.47/UL - Unitary Air Conditioning Standard for Safety Requirements
c. Underwriter's Laboratory
d. NFPA 90A
e. AMCA 210 Test Code For Air Moving Devices
f. National Electrical Code
g. ASHRAE 15 - Safety Code for Mechanical Refrigeration

B. All motors and equipment shall be U.L. labeled.

C. All insulation and materials shall have a flame spread rating of less than 25 and smoke developed of less than 50.

D. All heating and cooling equipment shall bear the AHRI seal.

E. All coils shall be AHRI certified.

F. All electric heaters shall have impedance protection per UL519.

G. All outdoor cabinets shall meet or exceed the 500 hour salt spray test unless more stringent tests are specified.

H. Manufacturers:

1. The following wall mounted ductless split system air conditioner manufacturers are acceptable:

a. Trane
b. Daikin
c. York

2. The following single zone VAV packaged heating and cooling unit manufacturers (with hot gas reheat) are acceptable:

a. Trane
b. Daikin
c. JCI
d. AAON
e. Valent
f. Addison

PART 2 - PRODUCTS

2.1 GENERAL

A. General:

1. Equipment shall meet or exceed the scheduled efficiencies or ASHRAE 90.1, whichever is greater.
2. Furnish and install heating and cooling units in accordance with the drawings and as specified hereinafter.
3. Units shall be air conditioning or heat pump as shown on equipment schedules.
4. Unit shall be factory assembled and tested.
5. Provide all controls and accessories for a complete operating system including but not limited to:

a. Crank case heater
b. Start capacitor kit (single phase condensers)

2. Refrigerant shall be R-410A or R454B as noted.
3. Motors shall be premium efficiency.

B. Outdoor Cabinets:

1. Unit shall be designed for outdoor installation.
2. Cabinet shall be insulated and constructed of heavy duty galvanized steel. Frame and panels shall be 18 gauge minimum. They shall be zinc coated or epoxy coated with a baked-on finish.
3. Prewired control panel.

4. Hinged access doors with quick release handles.
5. Dual wall cabinets shall be finished with a baked acrylic finish.

C. Refrigerant Circuits:

1. All units shall have factory installed liquid line filter dryer, liquid line sight glass, pressure tap ports, check valves, and suction and liquid service valves.
2. Heat pump units shall also have reversing valve, suction line accumulator, and discharge muffler.
3. Where low ambient control is required, electronic head pressure control shall be provided.

D. Compressors (up to 7 tons):

1. Compressor shall have centrifugal oil pump.
2. Motor shall have internal temperature and current sensing motor.
3. Compressor shall have totally dipped hermetic motor windings.
4. Compressor shall be resiliently mounted and seismically isolated.

E. Compressors (7-1/2 tons to 30 tons):

1. Compressors shall have centrifugal oil pumps.
2. Motor shall be suction gas-cooled with internal temperature and current sensing motor overloads.
3. External high and low pressure cutout devices shall be provided.
4. Compressor shall be resiliently mounted and seismically isolated.
5. Minimum of two compressors for units larger than 120 MBH (nominal capacity).

F. Outdoor Coil:

1. The outdoor coil shall be constructed of aluminum spine fin mechanical bonded to seamless aluminum or copper tubing with all joints brazed.
2. Surface shall be engineered to facilitate defrost water runoff.
3. Louvered panels.

G. Indoor Coil:

1. The indoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.
2. Coil shall include factory installed refrigerant metering device and refrigerant line fittings.

H. Outdoor Fans:

1. Fan motors shall be permanently lubricated, weatherproof motors suitable for outdoor use.
2. Motor shall have built-in current and thermal overload protection.
3. Fans shall be resiliently mounted and seismically isolated.
4. Fans shall be statically and dynamically balanced.
5. Provide PVC coated fan guard.

I. Indoor Fan:

1. Indoor fan shall be direct drive plenum fan with electronically commutated motor or inverter duty motor with a variable frequency drive.
2. Fan shall be seismically isolated.

J. Safeties:

1. Heat pumps shall have a solid state defrost control. Defrost shall occur only when coil saturated suction temperature indicates freezing temperatures. Defrosting shall be limited to a maximum of 10 minutes over a 90 minute period.
2. Provide a time-guard device to prevent compressor recycling by requiring a 5-minute delay before restarting.
3. Three phase protection.
4. Drain pan float switch.

K. Electrical (Outdoor Unit):

1. Provide control voltage transformer.
2. Provide a unit-powered GFCI service receptacle. Receptacles shall have metal covers.
3. Provide transformer for motor or heaters as required.
4. Transformers shall be factory mounted and wired.
5. Power to the packaged unit shall be through the interior of the unit curb.

L. Electric Heaters:

1. Heaters shall have a total output as scheduled on drawings.
2. Each heater assembly shall include power supply fusing if over 48 amps, automatic resetting limit switches and heat limiters for thermal protection.
3. Heaters shall be provided with polarized plug for quick connection to unit low voltage wiring.
4. Electric heaters factory furnished and installed capacity not to exceed scheduled capacity at rated voltage.
5. If larger heaters are supplied, they shall not be large enough to require larger supply wiring or disconnects.
6. Heaters shall have SCR control except where staged heaters are scheduled.

M. Refrigerant Circuit (Units with Hot Gas Reheat):

1. Provide full modulating control of hot gas reheat.
2. Reheat control shall maintain space setpoint to ± 2 degrees F.
3. Discharge air temperature shall be adjustable from the building automation control system.

N. Drain Pan:

1. Provide dual slope insulated noncorrosive drain pan.

O. Filters:

1. Provide flat filter rack for 2 inch pre filter.

P. Outside Air Intake:

1. Provide outside air intake hoods with birdscreen.
2. Settable low leak, motorized, outside air dampers.
3. See Instrumentation and Control for HVAC specification for airflow measuring requirements.

Q. Provide BACnet communication card on all equipment.

R. Controls:

1. The unit shall be provided with digital controls to provide the specified sequence of operation. See the Sequence of Operations specification.
2. Space temperature and humidity sensors shall be capable of controlling the unit in cooling, heating, and dehumidification modes.

1.2 DUCTLESS SPLIT SYSTEM UNITS

A. Controls:

1. Provide a control wiring terminal board in the outdoor unit to match the indoor unit terminal board and thermostat terminals.
2. Airflow switch interlocked with condenser operation.
3. Hard wired thermostat (with 24 hour time clock control.)

B. Indoor Wall Mounted Unit:

1. Unit shall be compact, lightweight design suitable for wall mounting.

C. Filters:

1. Washable filter

D. Accessories:

1. Condensate pump

1.3 CONDENSATE PUMPS FOR DUCTLESS SPLIT SYSTEMS

A. General:

1. This pump shall replace any factory supplied pump.
2. The pump shall be powered from the indoor unit.

B. Pump:

1. Piston pump
2. Electronic water sensing
3. High water cutout and anti-siphon fitting
4. Condensate filter

5. 22 db A @ 3.3 ft.
6. 208/1 power
7. 2.0 GPH @ 20 ft. lift at 0 ft. suction.

C. Wall Mounted Unit:

1. The pump shall be designed to fit in or directly beneath the wall mounted unit.
2. If external to the wall mounted unit, the pump shall be in a casing similar to the wall mounted unit.

D. Basis of design manufacturer shall be:

1. Sauermann

PART 2 - EXECUTION

2.1 CONDENSATE DRAIN LINES

A. Provide a weather seal grommet where drain penetrates casing and wall sleeve.

2.2 WARRANTY

A. Compressors shall have five (5) year parts and labor warranty:

B. Compressor Failure:

1. When a compressor fails within the warranty period, the compressor shall be replaced.
2. If the system has multiple compressors on a single refrigerant circuit, and one compressor fails, all compressors shall be replaced during the warranty period.

END OF SECTION

SECTION 239005.2 - HEAT TRANSFER (ELECTRIC COOLING, VRF SYSTEMS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of heat transfer equipment (VRF, variable refrigerant flow) and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section. In addition, refer to these specification sections:

1. Section 23 0502 - Common HVAC Materials
2. Section 23 9005 – Heat Transfer (Electric Cooling)

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. ARI Standards 210/240, 340, and 360
b. ANSI UL – 1995 Heating and Cooling Equipment
c. Underwriter's Laboratory
d. NFPA 90A
e. AMCA 210 Test Code For Air Moving Devices
f. National Electrical Code
g. ASHRAE 15 - Safety Code for Mechanical Refrigeration

B. All motors and equipment shall be U.L. labeled.

C. All insulation and materials shall have a flame spread rating of less than 25 and smoke developed of less than 50.

D. All heating and cooling equipment shall bear the ARI seal.

E. All coils shall be ARI certified.

F. All electric heaters shall have impedance protection per UL519.

G. All outdoor cabinets shall meet or exceed the 500 hour salt spray test unless more stringent tests are specified.

H. Manufacturers:

1. The following variable refrigerant flow manufacturers are acceptable:

a. Mitsubishi
b. Daikin
c. LG

2. The following variable refrigerant flow indoor unit condensate pumps are acceptable:

a. Sauermann
b. Approved Equal

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment shall meet or exceed the scheduled efficiencies or ASHRAE 90.1, whichever is greater.

B. System shall be:

1. Heat recovery (each unit can operate in heat pump mode, heating or cooling, as commanded).

C. Refrigerant Circuits:

1. All units shall have factory installed high pressure sensor and switch, low pressure sensor, liquid line filter dryer, liquid line sight glass, pressure tap ports, check valves, and suction and liquid service valves.
2. Units shall have reversing valve, suction line accumulator, and discharge muffler.
3. Where low ambient control is required, electronic head pressure control shall be provided.
4. Subcooling feature.
5. Refrigerant circuits shall be charged with dehydrated air prior to shipping.

D. Safeties:

1. Units shall have a solid state defrost control. Defrost shall occur only when coil saturated suction temperature indicates freezing temperatures. Defrosting shall be limited to a maximum of 10 minutes over a 90 minute period.
2. Provide a time-guard device to prevent compressor recycling by requiring a 5-minute delay before restarting.

E. Unit shall be factory assembled and tested.

F. Standard operating range for cooling shall be 23°F to 122°F outdoor ambient except where low ambient controls are required. Heating operating range shall be to 0°F dry bulb outdoor ambient without additional low ambient controls or an auxiliary heat source.

G. Standard operating range for indoor units shall be -14 degrees F to 122 degrees F.

H. System shall continue to provide heat to the indoor units in heating operation while in the defrost mode. Reverse cycle (cooling mode) defrost during heating operation shall not be permitted due to the potential reduction in space temperature.

I. Refrigerant shall be R410A.

J. All motors shall be premium efficiency.

K. Condensate Pumps:

1. All indoor units shall be provided with condensate pumps.
2. Condensate pumps shall be by the equipment manufacturer except for fan coil units, vertical units, and wall mounted units.

2.2 CONDENSER

A. Outdoor Cabinets:

1. Unit shall be designed for outdoor installation.
2. Cabinet shall be constructed of heavy duty galvanized steel. Frame and panels shall be 18 gauge minimum. They shall be zinc coated or epoxy coated with a baked-on finish.
3. Prewired control panel.

B. Compressor:

1. The inverter scroll compressors shall be variable speed capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure measured in the condensing unit. Evaporator and condenser temperatures shall be read every 20 seconds and pressures calculated. With each reading, the compressor capacity shall be controlled to eliminate deviation from target value.
2. The inverter driven compressor in each condensing unit shall be of highly efficient, digitally commutating, hermetically sealed scroll type with a maximum speed of 7,980 rpm.
3. The capacity control range shall be as low as 4% to 100%.
4. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
6. An oil separator with an intelligent oil management system shall be provided.
7. The compressor shall be spring mounted to minimize the transmission of vibration.
8. Minimum number of compressors shall be:

    a. 6-12 ton – 2 compressors
    b. 14 ton – 3 compressors
    c. 16-20 ton – 4 compressors
    d. 22-24 ton – 5 compressors
    e. 26-28 ton – 6 compressors

9. In the event of compressor failure, the remaining compressors shall continue to operate and provide heating or cooling as required.
10. Compressors shall be started in a sequence to equalize run time of each compressor.

C. Outdoor Coil:

1. The outdoor coil shall be constructed of aluminum spine fin mechanical bonded to seamless copper tubing with all joints brazed.
2. Fins shall be covered with a permanent anti-corrosion coating.
3. Pipe plates shall be treated with powdered polyester resin for corrosion prevention.

D. Outdoor Fans:

1. Fan motors shall be permanently lubricated, weatherproof motors suitable for outdoor use.
2. Motors shall be multiple speed operation via digital commutating inverter.
3. Motor shall have built-in current and thermal overload protection.
4. Fans shall be resiliently mounted and seismically isolated.
5. Fans shall be statically and dynamically balanced.
6. Provide PVC coated fan guard.

E. Electrical (Outdoor Unit):

1. Provide control circuit fuses, crank case heater, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
2. Provide transformer for motor or heaters as required.
3. Transformers shall be factory mounted and wired.
4. Provide a start capacitor for single phase units.

2.3 INDOOR UNIT (GENERAL)

A. General:

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. The cabinet shall be constructed with a galvanized steel casing and sound absorbing foamed polystyrene and polyethylene insulation.
3. Provide needlepoint bipolar ionization.

B. Fan:

1. The fan shall be direct-drive fan with statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall be equipped with adjustable external static pressure settings.
3. The fan motor shall be thermally protected.

C. Coil:

1. The indoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be completely factory tested.
4. A condensate pump with a minimum 21 inch lift shall be located below the coil in ceiling mounted units in the condensate pan. The pump shall have a built-in safety alarm.
5. A thermistor will be located on the liquid and gas line.

D. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.

E. Control:

1. The unit shall be equipped with a program drying mechanism that dehumidifies while limiting changes in room temperature.
2. Computerized PID control shall control superheat.
3. Thermistor mounted in the return air.
4. The unit shall be compatible with interfacing with the building automation system via LonWorks or BACnet gateways.

2.4 BRANCH SELECTOR BOX (HEAT RECOVERY SYSTEM)

A. General:

1. Selector boxes shall be factory assembled, wired, piped, and tested.
2. When the system is simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. Unit Cabinet:

1. Units shall have a galvanized steel plate casing.
2. Each cabinet shall house the expansion valves.
3. The cabinet shall contain one subcooling heat exchanger per branch.
4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.

C. Refrigerant Valves:

1. The unit shall be furnished with 5 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable.

D. Condensate Removal:

1. The unit shall not require provisions for condensate removal.

E. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.
3. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

2.5 4-WAY CEILING CASSETTE UNIT

A. General:

1. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations. The supply is distributed via motorized louvers which can be adjusted from 0 degrees (horizontal) to 90 degrees (vertical).
2. Return air shall be through the concentric panel.

B. Filter:

1. The return air shall be filtered by a washable long-life filter with mildew resistant resin.

C. Sound Levels:

1. The indoor units sound pressure shall be 33 dB(A) maximum at low speed measured at 5 feet below the unit.

D. Accessories:

1. Fresh air intake kit
2. Supply air branch duct connections
3. Hard wired wall mounted sensor
4. Mounting brackets

2.6 CONCEALED CEILING DUCTED UNIT (STANDARD MODEL)

A. General:

1. The cabinet shall have supply and return air openings.

B. Filter:

1. The return air shall be filtered by a washable long-life filter with mildew resistant resin.

C. Sound Levels:

1. The indoor units sound pressure shall be 48 dB(A) maximum at low speed measured at 5 feet below the unit.

D. Accessories:

1. Hard wired wall mounted sensor.
2. Mounting brackets.

2.7 CONCEALED CEILING MOUNTED DUCTED UNIT (SLIM MODEL)

A. General:

1. The cabinet shall have supply and return air openings.
2. The casing shall be 8" maximum height.

B. Filter:

1. The return air shall be filtered by a washable long-life filter with mildew resistant resin.

C. Sound Levels:

1. The indoor units sound pressure shall be 32 dB(A) maximum at low speed measured at 5 feet below the unit.

D. Accessories:

1. Hard wired wall mounted sensor
2. Mounting brackets

2.8 CEILING SUSPENDED CASSETTE UNIT

A. General:

1. The unit shall have a louver that can be set to automatically and continuously change the direction of the airflow.

B. Filter:

1. The return air shall be filtered by a washable long-life filter with mildew resistant resin.

C. Sound Levels:

1. The indoor units sound pressure shall be 38 dB(A) maximum at low speed measured at 3.3 feet below the unit.

D. Control:

1. The discharge louver can be set from the room controller to five (5) different positions.

E. Accessories:

1. Hard wired wall mounted sensor
2. Mounting brackets

2.9 WALL-MOUNTED UNITS

A. General:

1. Unit shall be a recessed wall mounted unit.

2. The unit shall have a louver that can be set to automatically and continuously change the direction of airflow.

B. Filter:

1. The return air shall be filtered by a washable long-life filter with mildew resistant resin.

C. Sound Levels:

1. The indoor sound pressure shall be 40 dB(A) maximum at low speed measured at 3.3 feet below the unit.

D. Control:

1. The discharge louver can be set from the room controller to five (5) different positions.

E. Accessories:

1. Hard wired wall mounted sensor
2. Wall mounting template

2.10 REFRIGERANT PIPING AND SPECIALTIES

A. If the manufacturer includes in their literature the option of utilizing specialty refrigerant pipe fittings for controlling or distributing refrigerant flow, these fittings must be furnished and installed at all locations recommended by the manufacturer.

B. All piping and fittings shall meet the requirements of the manufacturer.

2.11 SYSTEM CONTROLS

A. The system shall be controlled by a central control panel.

B. The panel shall control or monitor the following for each unit:

1. Cooling and heating setpoints
2. Setpoint ranges
3. Cooling and heating setback temperatures
4. Alarms
5. Fan speed
6. Filter
7. Scheduling

C. The system shall allow remote monitoring and control by the District’s building automation system through web based software.

D. The variable refrigerant system shall have a gateway controller that allows the variable refrigerant controls to interface with the building control system via BACnet.

2.12 CONDENSATE PUMPS (FAN COIL AND WALL MOUNTED UNITS)

A. General:

1. This pump shall replace any factory supplied pump.
2. The pump shall be powered from the indoor unit.

B. Pump:

1. Piston pump
2. Electronic water sensing
3. High water cutout and anti-siphon fitting
4. Condensate filter
5. 25 dB(A) @ 3.3 ft.
6. 120V/1ph power
7. 2.5 GPH @ 20 ft. lift at 0 ft. suction

C. Wall Mounted Unit:

1. The pump shall be designed to fit in or directly beneath the wall mounted unit.
2. If external to the wall mounted unit, the pump shall be in a casing similar to the wall mounted unit.

D. Accessories:

1. Covers for the refrigerant and drain lines. Covers shall match the unit construction.

E. The basis of design manufacturer shall be:

1. Sauermann Si-20

PART 3 - EXECUTION

3.1 WARRANTY

A. Compressor shall have five (5) year parts and labor warranty.

B. Compressor Failure:

1. When a compressor fails within the warranty period, the compressor shall be replaced.
2. If the system has multiple compressors on a single refrigerant circuit, and one compressor fails, all compressors shall be replaced during the warranty period.

3.2 REFRIGERANT PIPE INSTALLATION

A. All pipe shall be installed and leak tested in strict accordance with the manufacturer’s requirement using the tools, products, and procedures recommended by the manufacturer.

B. The system shall be installed by persons who have been trained and certified by the variable refrigerant flow equipment manufacturer.

3.3 SUBMITTALS

A. Submit with the equipment submittals the following information:

1. Names and certification numbers of technicians installing the system.
2. Manufacturer’s detailed installation procedures.
3. Manufacturer’s detailed test procedures.

B. Submittals shall include detailed piping drawings including length and size of piping and all required fittings. Drawings shall be:

1. Drawn on building floor plan.
2. Be based upon contractor’s review of existing conditions.
3. Be based upon review of all bid documents to ensure proper clearance to equipment is provided.

3.4 CONTROL PANELS

A. Coordinate control panel locations with the Owner.

END OF SECTION

SECTION 239006 - HEAT TRANSFER (ELECTRIC HEATERS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General:

1. Furnish all labor, materials, tools and equipment and perform all operations in connection with the installation of electric heaters and appurtenances where shown on the drawings and specified hereinafter.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 23 specifications apply to this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall meet or exceed the standards and procedures of the following as referenced (latest editions):

a. Underwriters Laboratory
b. NFPA 90A
c. AMCA 210 Test Code For Air Moving Devices
d. National Electrical Code

B. All motors and equipment shall be U.L. labeled.

C. All insulation and materials shall have a flame spread rating of less than 25 and smoke developed of less than 50.

D. All electric heaters shall have impedance protection per UL519.

E. Manufacturers:

1. The following electric heater manufacturers are acceptable:

a. Markel
b. Raywall
c. Reddi

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment shall meet or exceed the scheduled efficiencies or ASHRAE 90.1, whichever is greater.

2.2 ELECTRIC UNIT HEATERS

A. Casing:

1. All metal surfaces shall be corrosion resistant and finished in baked enamel.

B. Controls:

1. Provide transformer for fan and control circuit.
2. Provide an integral factory thermostat.
3. Thermal protection shall shut unit off in event of overheating with automatic reset.

C. Motors:

1. Motors shall be totally enclosed, thermally protected, with sleeve or ball bearings, continuous heavy-duty type, and all angle operation.

D. Fan:

1. Fan shall be dynamically balanced.

E. Accessories:

1. Wall mounted bracket.

2.3 ELECTRIC WALL HEATERS:

A. Construction:

1. Sleeve shall be 16 gauge zinc coated steel.
2. Louver shall have 1/16" x 3/8" rounded blades space 1/4" on center with 3 vertical stiffening rods welded to each blade. Louver frame shall be natural anodized aluminum.
3. Louver assembly shall be attached by tamper resistant screws.

B. Heating Elements:

1. Elements shall be corrosion resistant steel sheathed type elements bonded to corrosion resistant steel fins.
2. Each element shall consist of a helically coiled nickel chromium alloy wire embedded in and surrounded by magnesium oxide.
3. Element shall not exceed 60 w/ inch.

C. Fan:

1. Motor shall be a permanently lubricated unit bearing, totally enclosed shade pole type with impedance protection.

D. Electrical:

1. Heaters shall have a thermal overload that disconnects elements and motor if normal operating temperatures are exceeded.
2. Overload reset shall be manual only.
3. Circuit breaker.
4. Transformer.

PART 3 - EXECUTION

3.1 ELECTRIC UNIT HEATERS

A. Louvers and diffusers shall be adjusted for optimal airflow pattern.

3.2 ELECTRIC WALL HEATERS:

A. Coordinate wall box requirements with building contractor for semi recessed and recessed units.

END OF SECTION