SECTION 092500 – GYPSUM DRYWALL

PART 1 – GENERAL

2.1 SUMMARY

A Extent of each type of gypsum drywall construction required indicated on Drawings.

A. This Section includes following types of gypsum board construction:

1. Steel studs framing for exterior and interior load bearing and non-load bearing walls.
2. Gypsum board screw-attached to steel framing and furring members.
3. Fiber-Reinforced-Cement Panels.
4. Reinforced drywall screw-attached to steel framing and furring members.
5. Acoustical Insulation specified to be installed in metal stud partitions.

B. Cementitious Backer Units as base for ceramic wall tile specified in Division-9 Section "Tile".

C. Glass mesh sheathing as base for Exterior Insulation and Finish Systems specified in Division-7 Section "Exterior Insulation and Finish System"; steel framing for E.I.F.S included in this Section 09250.

3.1 PERFORMANCE REQUIREMENTS:

A. General: The contractor/supplier **shall be responsible for the design of light gage metal stud framing system, components and methods of attachment of framing to building structure**.

B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated:

1. Design Loads: Design member for following loads:
   a. Wind Loads: See Sheet S1.0.
   b. Earthquake: See Sheet S1.0.
   c. Dead Load: Actual weights of materials and construction.
2. Deflection Limits:
   a. Comply with code requirements unless more stringent requirements listed herein.
   b. Exterior Load-bearing and Non-loadbearing (Masonry): l/720.
   c. Exterior Load-bearing and Non-loadbearing Synthetic Plaster (EFIS): l/360.
   d. Interior Non-Bearing Wall Synthetic Plaster/Drywall: l/240.
3. Design framing system to provide for movement of framing members without damage or over stressing sheathing, failure, connection failure, undue strain on fasteners and anchors, or other detrimental effect when subjected to maximum a ambient temperature change of 120 degrees F.

C. Design exterior non-loadbearing curtain wall framing to accommodate horizontal deflection with regard for contribution of sheathing materials.

4.1 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

5.1 SUBMITTALS

A. Product data from manufacturers for each type of product specified.

B. Submit samples of each product specified herein.

C. Submit, as part of shop drawing review phase of the project, structural engineer design narrative and structural engineering calculations for light gage metal framing system proposed to be used for exterior framing, interior structural framing and interior suspended (furred) framing.

1. Indicated size, gages, and spacing of framing materials to be used.
2. Indicate method of attachment of framing to building structure.
3. Indicate methods by which suspended and furred walls and ceilings are to be supported from the structure.

6.1 QUALITY ASSURANCE

A. Work included in this Section to comply with United States Gypsum Company, "Gypsum Construction Handbook", Third Edition, 1987, and "Recommended Specifications for Application and Finishing Gypsum Board", 6A-216-82, as prepared by the Gypsum Association.

1. If there are ambiguities or options between these requirements and/or ambiguities and options between these and the requirements herein specified, the more stringent requirement shall govern.

B. Engineering Responsibility: Engage qualified, Georgia licensed professional engineer to prepare design calculations, shop drawings and other required structural data.

D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance rating determined per ASTM E 119 by testing and inspecting organization acceptable to authorities having jurisdiction.

1. Provide fire-resistance-rated assemblies, identical to those indicated by reference to GA File Nos. in GA-600 "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.

E. Single-Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from single manufacturer.

F. Welding: Quality producers over personnel according to AWS D1.1 "Structural Welding Code-Steel" and AWS D1.3 Structural Welding Code - Structural Steel".

D. Metal Stud manufacturer: Manufacturer of metal studs to be a member of the ‘Steel Stud Manufacturer’s Association (SSMA)’:

1. Products to be identified using SSMA four-part identification code.

7.1 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

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

C. Handle gypsum boards to prevent damage to edges, ends and surfaces; do not bend or otherwise damage metal corner beads and trim.

8.1 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

B. Minimum Room Temperatures:

1. For non-adhesive attachment of gypsum board to framing, maintain not less than 40^{o}F (4^{o}C).
2. For adhesive attachment and finishing of gypsum board maintain not less than 50^{o}F (10^{o}C) for 48 hours prior to application and continuously thereafter until drying complete.

C. Ventilate building spaces to remove water not required for drying joint treatment materials.

1. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

9.1 ASBESTOS

A. Products specified herein to be 100% free of Asbestos.

1. Submit Manufacturer certification that all products contained herein do not contain asbestos.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements provide products of one of following:

1. Steel Framing and Furring:
   a. Dale/Incore Industries, Inc.
   b. Dietrich Industries, Inc.

c. Formetal Co. Inc;
d. Incor, Inc.
e. Marino Industries Corp.
f. Telling Industries as an approved manufacturer pending compliance with the contract documents.

2. Gypsum Boards and Related Products:
   a. Centex American Gypsum Co.
   b. Domtar Gypsum Co.
   c. Genstar Building Materials Company.
   d. Georgia-Pacific Corp.
   e. Gold Bond Building Products Div., National Gypsum Co.
   f. United States Gypsum Co.

2.3 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS AND WALLS

A. Definition: For the purposes of this section suspended and furred ceiling and walls shall be defined as any wall which is not floor supported.

B. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.

1. Sizes (Depth, thickness and gage) of members indicated are minimums.
2. Members to be designed by supplier’s structural engineer to comply with performance standards listed above.

C. Components listed herein shall be used for applications noted, including:

1. Suspended and furred ceilings, soffits and walls.
2. Fire rated assembled; suspended and attached to underside of structure.

D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating soft temper.

E. Channels: Cold-rolled steel, 0.0598" min. thickness of base (uncoated) metal and 7/16" wide flanges, protected with rust-inhibitive paint, and as follows:

1. Carrying Channels: 1½" deep, 475 lbs per 1000 ft., unless otherwise indicated.
2. Furring Channels: ¾" deep, 300 lbs per 1000 ft., unless otherwise indicated.

F. Steel Studs: ASTM C 645, with flange edges bent back 90^{o} and doubles over to form 3/16" min. lip (return), min. thickness of base (uncoated) metal and min. depth as follows:

1. Thickness: 20 ga. (0.0359"), unless otherwise indicated.
2. Depth: 4”, unless otherwise indicated.

G. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, f" depth, and min. thickness of base (uncoated) metal as follows:

1. Thickness: 20 ga. (0.0359"), unless otherwise indicated.

H. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, complying with ASTM C 645 for material, finish and widths of face and fastening flange, fabricated to form ½" deep channel of following configuration:

1. Single-Leg Configuration: Asymmetric-shaped channel with face connected to single flange by single slotted leg (web).

2.4 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.

1. Sizes (Depth, thickness and gage) of members indicated are minimums.
2. Members to be designed by licensed structural engineer to comply with performance standards listed above

B. Steel Studs, Runners, and Kickers: ASTM C 645, with flange edges of studs bent back 90^{o} and doubled over to form lip (return) and complying with following requirements for min. thickness of base (uncoated) metal and for depth:

1. Interior Non-Loadbearing Walls and Partitions: Min. 1-1/4" face width with 3/16" lip:
   a. Depth: 4", unless otherwise indicated.
   b. Thickness (based on 16" o.c. spacings):
      1) Thickness: 25-ga. (0.0209") in walls up to and including 13'-0" high.
      2) Thickness: 22-ga. (0.0269") in walls 13'-1" to 15'-1" high.
      3) Thickness: 20-ga. (0.0329") in walls 15'-2" to 16'-1".
      4) Consult architect for walls over 16'-1" in height.

2. Exterior Non-Loadbearing Walls: Min. 1-3/8" face width with 3/8" lip:
   a. Depth: 6", unless otherwise indicated.
   b. Thickness (based on 16" o.c. spacings):
      1) Thickness: 20 ga. (0.0329") in walls up to and including 12'-9".
      2) Thickness: 18 ga. (0.0428") in walls 12'-10" to 13'-11".
      3) Thickness: 16 ga. (0.0538") in walls 14'-0" to 14'-11".
      4) Thickness: 14 ga. (0.0677") in walls 15'-0" to 15'-11".
      5) Thickness: 12 ga. (0.0966") in walls 16'-0" to 18'-6".
      6) Consult architect for walls over 18'-6" in height.

C. Channel Bridging (Braces): ASTM C 645, Channel Shaped, depth and minimum thickness of base (uncoated) metal as follows:

1. Depth: 1½" deep.
2. Thickness: 16 Gauge.

D. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth and min. thickness of base (uncoated) metal as follows:

1. Depth: f".
2. Thickness: 20 ga. (0.0359"), unless otherwise indicated.

E. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, complying with ASTM C 645 for base metal, finish and widths of

face and fastening flange, fabricated to form ½" deep channel of following configuration:

1. Single-Leg Configuration: Asymmetric-shaped channel with face connected to single flange by single slotted leg (web).

F. Z-Furring Members: Manufacturer's standard zee-shaped furring members with slotted or non-slotted web, fabricated from hot-dip galvanized steel sheet complying with ASTM A 525, Coating Designation G60; with min. base metal (uncoated) thickness of 25 ga. (0.0209"), face flange of 1¼", wall attachment flange of f", and of depth required to fit insulation thickness indicated.

G. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with recommendations of gypsum drywall manufacturers for applications indicated.

H. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, min. thickness of base (uncoated) metal of 20 ga. (0.0359"), designed for screw attachment to steel studs and steel rigid furring channels used for furring.

2.5 GYPSUM BOARD

A. General: Provide gypsum board of types indicated in max. length available to minimize end-to-end joints.

B. Thickness: Provide gypsum board in thicknesses indicated, or if not otherwise indicated, in either ½" or e" thicknesses to comply with ASTM C 840 for application system and support spacing indicated.

C. Gypsum Wallboard: ASTM C 36, and as follows:

1. Types:
   a. Regular, unless otherwise indicated.
   c. Type X for fire-resistance-rated assemblies.
2. Edges: Tapered and featured (rounded or beveled) for prefilling.
3. Thickness: 5/8”, unless otherwise indicated.

D. Products: Subject to compliance with requirements, provide one of following products where Type X gypsum wallboard indicated:

1. "Gyprock Fireguard 'C' Gypsum Board"; Domtar Gypsum Co.
2. "Fire-Shield G"; Gold Bond Building Prod. Div., National Gypsum Co.
3. "SHEETROCK Brand FIRECODE 'C' Gypsum Panels"; U. S. Gypsum Co.

E. Water-Resistant Gypsum Backing Board: ASTM C 630, and as follows:

1. Types: Regular, unless otherwise indicated.
2. Thickness: ½", unless otherwise indicated.

2.6 REINFORCED DRYWALL BOARDS

A. Proprietary drywall boards reinforced for improved impact resistance, fire rated where

indicated, with feathered edges. Boards, when tested in accordance with ASTM E 695 (modified) shall have no failure after 17 impacts with a 50 pound, 9" diameter leather ball, 28" in length, when board is installed on 2 x 4's at 16" o.c.. Approved manufacturers subject to conformance with requirements contained herein:

1. USG Sheetrock Mold Tough VHI Firecode Core.
2. Hi-impact wallboard panels consisting of gypsum core encased in a heavy natural-finish paper on the face side and a strong liner paper; 5/8" thick; National Gypsum, "Hi-Impact Wallboard".

B. Application: Reinforced drywall to be utilized on interior partitions located between classrooms and other instructional areas where gypsum wall board indicated to be installed. Extend from finished floor to top of partition.

2.7 GLASS MESH REINFORCED SHEATHING

A. Proprietary backing units with glass mesh fiber mesh reinforcing and water resistant coating on both faces, complying with one of the following:

1. Coated Gypsum Panels: Water resistant, silicone-treated gypsum core with glass fiber mesh surface mats and manufacturer's proprietary water/vapor retarding, alkali resistant coating on both faces, ½" thick x 48" wide x 96", 108" or 120" long, weighing 2.0 lbs./s.f.
2. Cement-Coated Portland Cement Panels: High density portland cement surface coating on both faces, lightweight concrete core composed of portland cement and expanded ceramic aggregate; 7/16" thick x 36" wide x 36", 48", 60", 64", or 72" long; 3.2 - 3.8 lbs./s.f.
3. Vinyl-Coated Portland Cement Panels: Core formed in continuous process from aggregated portland cement slurry and reinforced with vinyl-coated woven glass fiber mesh embedded in both surfaces, with one face smooth and other textured; ½" thick and x 36" wide x 48", 60", and 72" long; 3 lbs./s.f.
4. Products: Subject to compliance with requirements, provide one of following products:
   a. "Dens-Glass Gold"; Georgia Pacific Corp.
   b. "Wonder-Board"; Modulars Inc.
   c. "Durock Tile Backer Board"; Durabond Div., USG Industries, Inc.

2.8 TRIM ACCESSORIES

A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, plastic or metal combined with paper, with metal complying with following requirements:
   a. Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.
2. Profile: All Corner and Edge trim to have raised lip for tape and mud application unless specifically noted as being non-taped.

B. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:

1. "LC Bead"; mud-on type, unless otherwise indicated.
2. "L" Bead; mud-on type where indicated.
3. "U" Bead; mud-on type where indicated.

C. One-Piece Control Joints: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.

D. Metal Cornerbead and Edge Trim for Exterior Ceilings: Comply with following requirements:

1. Edge trim complying with ASTM C 1047, formed from rolled zinc, shape "LC" Bead per Fig. 1 unless otherwise indicated.

E. Column Collar: Where Gypsum board abut round or partially round concrete columns provide preformed Column Trim of inside dimension to match column diameter.

1. Column Collar to be Single piece extruded aluminum of finish to match ceiling grid.
2. Size: Provide edge moldings fabricated to diameter required to fit penetration exactly.
3. Style: 3/4" Reveal Edge; of type to accommodate ceiling specified.
4. Approved Manufacturers; Subject to conformance with specification:
   a. Fry Reglet Corporation.
   b. MM Systems Corporation.
   c. Pittcon Industries

2.9 GYPSUM BOARD JOINT TREATMENT MATERIALS

A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for application indicated.

B. Joint Tape: Paper reinforcing tape, unless otherwise indicated.

1. Use pressure sensitive or staple-attached open-weave glass fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with following requirements for formulation and intended use.

1. Ready-Mix Formulation: Factory-premixed product.
2. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
3. Topping compound formulated for fill (second) and finish (third) coats.
4. All-purpose compound formulated for use as both taping and topping compound.

2.10 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and recommendations of manufacturer of gypsum board.

B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating

gypsum boards.

C. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.

D. Fastening Systems:

1. Gypsum Board Adhesive; For metal: Special adhesive recommended for laminating gypsum boards to steel framing.
2. Gypsum Board Screws: ASTM C 1002.

E. Asphalt Felt: ASTM D 226, Type I (No. 15).

F. Concealed Acoustical Sealant: Nondrying, non-hardening, non-skinning, non-staining, nonbleeding, gunnable sealant complying with requirement specified in Division-7 section "Joint Sealers."

G. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass or slag.
2. Thickness: Thickness as indicated on drawings. If not indicated, as follows:
   a. In Stud Partitions: Full Thickness of wall or partition.

H. Reinforced Drywall Boards Finishing Materials: Tape and joint compounds recommended by reinforced drywall manufacturer.

I. Glass Mesh Mortar Unit Finishing Materials: Tape and joint compounds recommended by glass mesh mortar unit manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction; do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure inserts and other structural anchorage provisions installed to receive ceiling anchors in manner to develop their full strength and at spacing required to support ceiling.

B. Metal stud framing and furring for partitions, walls, fur down areas, soffits, ceilings and fire rated assemblies shall be attached to roof structure at the **UNDERSIDE** of the roof structure in accordance with the following:

1. Provide double 6" 18 gage horizontal metal stud, long leg vertical, at underside of structure, spanning a minimum of three structural members. Horizontal studs to be at 16" on center.
2. Attach vertical studs to horizontal stud, using screws; min five per connection point.

3.3 NON-RATED PARTITION CONSTRUCTION

A. Where indicated and specified herein the contractor shall construct partitions, walls, ceilings and assemblies in accordance with applicable requirements of contract documents

1. Unless detailed or noted otherwise extend partitions to no less than 8" above the 'upper' adjacent ceiling. If no ceiling exists on one or both sides of wall, extend partition to deck.
2. Extend walls to roof deck where walls are noted on drawings as being extending to deck ('D').

3.4 FIRE RATED, SMOKE RATED AND SMOKE TIGHT CONSTRUCTION

A. Where indicated and specified herein the contractor shall construct partitions, walls, ceilings and rated assemblies in accordance with applicable U.L. Design Numbers.

1. All Materials utilized shall be in accordance with applicable U.L. Design Number.
2. Installation methods shall comply with applicable U.L. Design Number.
3. Partitions, walls and ceilings, where designated to be fire and/or smoke rated, shall be installed in a manner to maintain the continuity of the rating, whether specifically shown on drawings or not.
4. Walls and ceilings shall be continuous without interruptions.
    a. Gypsum board shall extend around columns or beams or other obstructions occurring in wall in order that the specified rating may be retained.
    b. Do not recess equipment, devices or specialties in fire rated walls or ceilings unless provisions are made to maintain rating behind recessed item.
5. Walls shall, unless noted or detailed otherwise, extend from:
    a. Floor to roof deck, where shown or required to maintain continuity of smoke barrier.
    b. Floor to fire rated ceiling assembly where fire rated assembly occurs, unless noted to extend to deck.
    c. Top of Masonry wall to roof deck where masonry wall is terminated at or near ceiling level.
6. Where fire rated wall or partition abuts a fire rated ceiling assembly or roof deck, seal in accordance with applicable details, provisions of specifications, **AND** as required by Local Fire Marshall to maintain specified fire rating and resist the passage of smoke.
    a. Gap between top of wall and roof shall be sealed (both sides) with fire rated sealant.
    b. Gap between wall and ceiling shall be sealed (both sides) with fire rated sealant.
7. Penetrations in smoke and fire rated partitions shall be sealed to maintain

specified fire rating and to resist the passage of smoke. Methods utilized **SHALL** comply with applicable details, provisions of specifications, **AND** the requirements of the Local Fire Marshall.

B. Applicable U.L. Design Numbers:

1. Unless noted or detailed otherwise fire rated walls and partitions shall comply with the following:
   a. Smoke, .5, 1 hour partitions: U.L. Design U465
   b. 1.5 Hour partitions: U.L. Design U452
   c. 2.0 Hour Partitions: U.L. Design U454
   d. 3.0 Hour Partitions: U.L. Design U455
   e. 4.0 Hour Partitions: U.L. Design U463
2. Unless noted or detailed otherwise fire rated ceilings and assemblies shall have the same U.L. Design numbers as equivalent rating on walls, except that ceiling is turned horizontally.

3.5 INSTALLATION OF STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with United States Gypsum Co., "Gypsum Construction Handbook".

1. Solid back blocking required behind all permanent wall mounted fixtures, including but not limited to: overhead cabinets (top & bottom), base cabinets (top), miscellaneous shelving, door stops, plumbing fixtures, toilet accessories (all), mechanical equipment and controls, and electrical equipment and controls.

C. Size, space, brace and attach metal framing in accordance with framing manufacturer's recommendations.

1. Do not exceed limitations for unbraced stud lengths for manufacturer's published structural characteristics for each depth and thickness.
2. Do not exceed limitations for spacing and span furring members of manufacturer's published structural characteristics for each profile, depth and thickness.
3. Provide internal stiffeners and external bracing as specified herein, detailed and as required by framing manufacturer.
4. If drawings conflict with manufacturer's recommendations or limitations, request decision of Architect for resolution.
5. Unless otherwise instructed by Architect, the contractor shall assume the most stringent of the requirements governs.

D. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details shown on Drawings:

1. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
2. Where partitions and wall framing abuts overhead structure.
3. Provide slip or cushioned type joints as detailed or required to attain lateral support and avoid axial loading.

E. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members or as indicated.

3.6 INSTALLATION OF STEEL FRAMING FOR SUSPENDED CEILINGS

A. Install Steel Framing for Suspended and Furred Ceilings in the following locations:

1. Where fire rated or smoke tight ceilings are specified.
2. Where Suspended Gypsum Board Ceilings are specified.
3. Where Suspended Gypsum board and plywood ceilings are specified.
4. Where furred areas of ceilings and walls are indicated.
5. Elsewhere where shown on drawings or specified herein.

B. Secure hangers to structural support by attaching to bottom chord of pre-fabricated metal trusses.

1. Do not attach hangers to metal deck tabs.
2. Do not attach hangers to metal roof deck.
3. Do not attach hangers to metal roofing.
4. Do not connect or suspend steel framing from ducts, pipes or conduit.

C. Keep hangers and braces 2" clear of ducts, pipes and conduits.

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

E. Install suspended steel framing components in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.

1. Wire Hangers: 0.1620" dia. (8 gage), 4' o.c. and 6" from each end.
2. Carrying Channels (Main Runners): 1-½", 4' o.c. and 6" from each end.
   a. Install carrying channels perpendicular to building structural members.
3. Rigid Furring Channels (Furring Members): 16" o.c. and 6" from each end.
   a. Install furring channels perpendicular to carrying channels.

F. Installation Tolerances: Install steel framing components for suspended ceilings so that cross furring members or grid suspension members are level to within c" in 12' measured both lengthwise on each member and transversely between parallel members.

G. Saddle Wire-tie using double strand 18 gauge tie wire or clip furring members to main runners (carrying channels) and to other structural supports.

H. At fire rated and smoke tight assemblies comply with requirements of applicable U.L. Design numbers.

3.7 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install steel framing for walls and partitions in accordance with:

1. Manufacturer's recommendations and requirements.
2. Provisions of these specifications.
3. Applicable details.

B. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.
2. Attach tracks to structure (floor, walls, columns, roof structure / deck) at a maximum of 24" on center using concrete stub nails, power driven fasteners or 1/2" bolts and nuts.

C. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than c" from plane of faces of adjacent framing.

1. Studs to be installed plumb and true.

D. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings.

1. Where walls terminate below floor or roof structure, provide stud braces (kickers) from top of partition to structural components above.
   a. Stud braces (kickers) to be set with a minimum angle from horizontal of 30 degrees and a maximum of 60 degrees.
   b. Stud braces (kickers) to be at 48" on center staggered.
2. Where walls extend to structure above, provide 4" stud brace at top of partition to allow anchoring of top of partition.
   a. Brace to extend across a minimum of two structural members (purlins, joists, beams, top chord of pre-fabricated trusses) when partition is perpendicular to structural members; across three structural members when partition is parallel to structural member. Secure to structural member. Secure stud to brace.
   b. Do Not attach stud to metal roofing.

E. Install steel studs and furring in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.

1. For single or double layer construction: 16" o.c.
2. Install steel studs so that flanges point in same direction and gypsum boards installed in direction opposite that of flange.
3. Place studs in direct contact with door and window jambs, abutting partitions, and partitions corners.
4. Provide metal channel bridging at center line of stud partitions at 5'-0" on center vertically.

F. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer.

1. Studs at door jambs to be minimum 20 gage.

2. Provide double studs and jambs and heads of doors and window.
3. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames
4. Install runner track section (for cripple studs) at head and secure to jamb studs.
5. Install cripple studs over openings at same spacing as primary studs.
6. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
7. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

G. Frame openings other than door openings to comply with details indicated or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

H. Provide solid back blocking behind all permanent wall mounted fixtures, including but not limited to: overhead cabinets (top & bottom), base cabinets (top), miscellaneous shelving, door stops, plumbing fixtures, toilet accessories (all), mechanical equipment and controls, and electrical equipment and controls.

3.8 INSTALLATION METAL STUDS FOR EXTERIOR WALLS

A. Metal Studs and Tracks: Install metals studs and tracks in accordance with manufacturers requirements, requirements for 'Installation of Steel Framing for Walls and Partitions' as described above and the following:

1. Attach bottom and top runners 16" o.c. to steel structure with power driven anchors, or 1/2" bolts and nuts.
2. Install continuous horizontal channel bridging in stud openings.
   a. Bridging to be at a maximum of 4'-0" on center vertically.
   b. Secure bridging to studs as recommended by Manufacturer.
3. Install studs plumb; do not vary fastening surface of any framing or furring member max. 1/16" from plane of faces of adjacent framing or furring members.
4. Refer to drawings for special framing details.

3.9 INSTALLATION METAL STUDS - FURRED PARTITIONS AND SOFFITS

A. Metal Studs and Tracks: Install metals studs and tracks in accordance with manufacturers requirements, requirements for 'Installation of Steel Framing for Walls and Partitions' as described above and the following:

1. Provide 45 degree kickers (braces) from partition to structure at 48" on center.
2. Provide a 6" 18 gauge horizontal stud, with long dimension vertical, attached to structure and vertical leg of studs to serve as a stiffener. Span a minimum of 3 structural members.
   a. Screw attach vertical studs to 6" stud; min five screws per connection.
3. Provide continuous channel bridging between studs at midpoint of height.
   a. Wire-tie, using 8 Gauge wire, horizontal bridging to structure above to provide added support for furred framing.
4. Install studs plumb; do not vary fastening surface of any framing or furring member max. 1/8" from plane of faces of adjacent framing or furring members.
5. Provide back-blocking and framing for the support of wall mounted equipment.
6. Refer to drawings for special framing details.

3.10 INSTALLATION OF TILE BACKER BOARD

A. Tile Backer Board: Provide and install Water Resistant Tile Backer Board in areas scheduled to receive ceramic wall tile where partitions are constructed of metal studs and gypsum board.

1. Install in accordance with the manufacturer’s instructions.
2. Seal "Raw" edges in a manner acceptable to manufacturer.
3. Do not use tile backer board for ceiling applications.

3.11 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.

B. Fire and Smoke Rated Partitions, Walls and Ceiling Assemblies: Where fire rated installation is indicated, installation shall comply with the following requirements:

C. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board installed.

D. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24" in alternate courses of board.

E. Install ceiling boards across framing in manner which minimizes number of end-butt joints, and which avoids end joints in central area of each ceiling; stagger end joints at least 24".

F. Install wall/partition boards in manner which minimizes number of end-butt joints or avoids them entirely where possible.

1. At stairwells and similar high walls, install board horizontally with end joints staggered over studs.

G. Install exposed gypsum board with face side out.

1. Do not install imperfect, damaged or damp boards.
2. Butt boards together for light contact at edges and ends with max. 1/16" open space between boards.
3. Do not force into place.

H. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking provided behind end joints.

1. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends.
2. Do not place tapered edges against cut edges or ends.
3. Stagger vertical joints over different studs on opposite sides of partitions.

I. Attach gypsum board to steel studs so that leading edge or end of each board attached to open (unsupported) edge of stud flange first.

J. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

K. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32" wide.

1. Apply spot grout at each jamb anchor clip just before inserting board into frame.

L. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories. Unless noted otherwise control joints in gypsum board to be spaced in accordance with the following criteria:

1. Maximum area between control joints: 100 Square feet.
2. Maximum Dimension of area: 12 feet.
3. Joints to be equally spaced.
4. Locate at each wall offset.
5. Layout of joints to be approved by Architect prior to installation.

M. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls properly braced internally.

1. Except where concealed application required for sound, fire, air or smoke ratings, accomplish coverage with scraps of min. 8 sq. ft. area, and limited min. 75% of full coverage.
2. Fit gypsum board around ducts, pipes, and conduits.
3. Where partitions intersect flutted metal deck or panel, cut gypsum board to fit profile of flute and allow ¼" to ½" wide joint for sealant.

N. Isolate perimeter of non-load-bearing drywall partitions at structural abutments.

1. Provide ¼" to ½" space and trim edge with "U" bead edge trim.
2. Seal joints with acoustical sealant.

O. Where sound-rated work indicated, seal construction at perimeters, control and expansion joints, openings and penetrations with continuous bead of acoustical sealant including bead at both faces of partitions.

1. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction including sealing of partitions above acoustical ceilings.

P. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.12 METHODS OF GYPSUM BOARD APPLICATION

A. Single-Layer Application: Install gypsum wallboard as follows:

1. On ceilings apply gypsum board prior to wall/partition board application to greatest extent possible.
2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which minimize end joints.
   a. On partitions/walls 8'-1" or less in height apply gypsum board

horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.

b. On Z-furring members apply gypsum board vertically (parallel to framing) with no end joints; locate edge joints over furring members.

c. Wall Tile Base: Where drywall is base for thin-set ceramic tile and similar rigid applied wall finishes, install gypsum backing board.

3. In "dry" areas install gypsum backing board or wallboard with tapered edges taped and finished to produce flat surface.

4. At showers, tubs, electric water coolers and similar "wet areas" install glass mesh mortar units and treat joints to comply with manufacturer's recommendations for type of application indicated.

B. Double-Layer Application: Install gypsum backing board for base layer and gypsum wallboard for face layer.

1. On ceilings apply base layer prior to application of base layer on walls/partitions; apply face layers in same sequence.
   a. Offset joints between layers at least 10".
   b. Apply base layers at right angles to supports unless otherwise indicated.
2. On partitions/walls apply base layer and face layers vertically (parallel to framing) with joints of base layer over supports and face layer joints offset at least 10" with base layer joints.
3. On Z-furring members apply base layer vertically (parallel to framing) and face layers either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member; locate edge joints of base layer over furring members.

C. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

1. Fasten with screws.
2. Fasten to wood supports with single nailing.

D. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:

1. Fasten both base layers and face layers separately to supports with screws.

3.13 INSTALLATION OF DRYWALL TRIM ACCESSORIES

A. General: Where feasible, use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports; otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim indicated.

1. Provide type with face flange to receive joint compound except where "U-bead" (semi-finishing type) indicated.
2. Install "LC" bead where drywall construction tightly abutted to other construction and back flange can be attached to framing or supporting substrate.

3. Install U-bead where indicated, and where exterior gypsum board edges not covered by applied moldings or indicated to receive edge trim with face flanges covered with joint compound.

D. Install control joints at locations indicated, or if not indicated at spacings and locations required by referenced gypsum board application and finish standard, and approved by Architect for visual effect.

E. Install access panels where indicated in accordance with manufacturer's directions.

1. Anchor panels securely to auxiliary framing.
2. Set panel flush with face of gypsum board.

3.14 FINISHING OF DRYWALL

A. General:

1. Apply joint treatment at gypsum board joints (both directions), flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration. based on levels defined in GA –214.
   a. Level 1: Unexposed surfaces (duct shafts, above ceilings, etc.)
   b. Level 2: Surfaces to receive ceramic tile or similar materials.
   c. Level 3: Surfaces to receive heavy textured coatings.
   d. Level 4: Surfaces to receive wall covering or flat, minimum sheen paints and coatings.
   e. Level 5: Surfaces to receive semi-gloss or gloss paints and coatings and surfaces receiving natural or strong artificial light if finish not heavily textured.
2. Re-treat to next level any surfaces showing joint or fastener treatment imperfections

B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.

C. Apply joint tape at joints between gypsum boards, except where trim accessories indicated.

D. Finish interior gypsum wallboard by applying following joint compounds in 3 coats (not including prefill of openings in base), sand between coats and after last coat:

1. Compounds:
   a. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.
   b. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
   c. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.

E. Finish exterior gypsum soffit board by using setting-type joint compounds to prefill joints, embed tape, and to apply first, fill (second) and finish (third) coats; smooth each coat before joint compound hardens to minimize need for sanding; sand between coats and after finish coat.

1. Painting of exterior gypsum soffit board after finish coat dried is specified in Division-9 Section "Painting."

F. Base for Acoustical Tile: Where gypsum board indicated as base for adhesively-applied acoustical tile, install tape and 2-coat compound treatment, without sanding.

G. Water-Resistant Gypsum Backing Board Base for Ceramic Tile: Comply with ASTM C 840 and manufacturer's recommendations for treatment of joints behind tile.

H. Water-Resistant Backing Board Base for Ceramic Tile: Finish joints between water-resistant backing board with tape and setting-type joint compound to comply with gypsum board manufacturer's recommendations and installation standards referenced in Division-9 Section "Tile."

I. Partial Finishing: Omit third coat and sanding on concealed drywall work indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

3.15 PROTECTION

A. Provide final protection and maintain conditions, in manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Final Acceptance.

END OF SECTION 092500

SECTION 093000 – TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Stone thresholds.
3. Waterproof membrane.
4. Crack isolation membrane.
5. Tile backing panels.
6. Metal edge strips.

B. Install tile backer board on galvanized steel furring channels over all existing CMU to receive ceramic tile.

1.2 REFERENCES

A. American National Standards Institute (ANSI) A108/A118 Series for Ceramic Tile products and installation and ANSI A 137.1.

B. Tile Council of North America (TCNA) Handbook for Ceramic, Glass and Stone Tile Installation 2011 edition.

C. Manufacturers printed installation instructions.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches (300 mm) square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch (150-mm) lengths.
5. Metal edge strips in 6-inch (150-mm) lengths.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of product, signed by product manufacturer.

C. Material Test Reports: For each tile-setting and -grouting product.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as 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.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type from one 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. Source Limitations for installation Materials: Obtain installation materials from one manufacturer to comply with manufacturer's Full System Warranty.

1. Cementitious backer units.
2. Self leveling underlayment
3. Waterproofing membrane
4. Crack isolation membrane
5. Thin set mortar
6. Grout
7. Joint sealants
8. Cleaners
9. Sealers

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product. Obtain products compatible with primary manufacturers products and systems:

1. Stone thresholds.
2. Metal edge strips.

D. 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. Mock ups of each floor and wall tile are required. The mockups should be 100 s.f. of floor and 100 s.f. of wall. The floor and wall transition must be a part of the mock ups in

places where there are both floor and wall tile. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Pre-installation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.7 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.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 MAINTENANCE

A. Do not use no-rinse enzyme cleaners on tile work.

B. Use only cleaners and sealers approved by the installation materials manufacturer.

1.9 PROJECT 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 and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 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 unless otherwise indicated.

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 TCA 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. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. See Interior Tile Installation Schedule at end of this section. Furnish tile from American Olean; Florida Tile or DALTILE CORPORATION.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

B. Granite Thresholds: ASTM C 615, with [**polished**] [**honed**] <**Insert finish**> finish.

1. Description: Uniform, fine-grained, white, gray or black stone as selected by architect without veining.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. C-Cure; C-Cure Board 990.
b. Custom Building Products; Wonderboard.
c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
d. USG Corporation; DUROCK Cement Board.

2. Thickness: 1/2 inch (12.7 mm).

2.5 WATERPROOF MEMBRANE

A. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane.
b. Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane.

c. Laticrete International, Inc.; Hydro Ban.

2.6 CRACK ISOLATION MEMBRANE

A. A self-bonding fabric and asphaltic mat designed to reduce crack transmission in ceramic tile or stone floors in extra heavy duty commercial applications applied over peel and stick primer recommended by manufacturer. Comply with ANSI A118.12 High Performance.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Bonsal American; an Oldcastle company; Flexguard
b. Custom Building Products; Crack Buster Pro Crack Prevention Mat Underlayment.
c. Proma Adhesives, Inc.; Pro CBM

2.7 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Cleavage Membrane: Asphalt felt, ASTM D 226 Type 1 (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.

2. Waterproofing Membrane: specified above.
3. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062-inch (1.57-mm) diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

4. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed. Thin set additive by Custom Building Products.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

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

a. Bonsal American; an Oldcastle company. Superior Permaflex 600
b. Custom Building Products. MEGAFLEX
c. Laticrete International, Inc. #125

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

C. Medium-Bed, Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of [**3/4 inch**].

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

a. Bonsal American; an Oldcastle company. Permaflex 550
b. Custom Building Products. Marble and Granite mortar mix
c. Laticrete International, Inc. XLT

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.

2.8 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D.

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

a. Bonsal American; an Oldcastle company. B7000
b. Custom Building Products. CEGLITE
c. Laticrete International, Inc. Spectra Loc Pro

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.

2.9 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 "Joint Sealants."

1. Custom Building Products 100% silicone caulk-ASTM C920 rated sealant in colors matching grout. Shore A hardness 35+ for floor traffic movement joints.

2.10 MISCELLANEOUS MATERIALS

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

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; white zinc alloy exposed-edge material.

C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

D. 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.

1. Aqua Mix by Custom Building Products; heavy duty grout and tile cleaner.
2. Latricrete International, Inc.
3. Bonsal American.

2.11 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 installed tile.

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 adhesives bonded mortar bed or thin-set 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 adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1B and is sloped toward drains.

C. 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.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

a. Tile floors in wet areas.
b. Tile floors in laundries.
c. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
d. Tile floors composed of rib-backed tiles.

B. 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.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. 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 the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. 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. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Floor Tile and wall tile over 12x12: **1/4 inch (6.35 mm)**.
2. Glazed Wall Tile: 1/16 inch (1.6 mm).

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles. Sealant filled joints must be installed at a maximum distance of 10’ in both directions.

1. Where movement joints occur in mud bed, apply crack isolation membrane in accordance with TCNA F125 Partial to relocate movement joints to the next nearest grout joints in tile work. Mud bed to be steel troweled smooth for proper application of sheet and liquid membranes.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
2. Do not extend cleavage membrane waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane waterproofing or crack isolation membrane with elastomeric sealant.

J. Metal Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

3.4 TILE BACKING PANEL INSTALLATION

A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

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

1. Apply waterproofing membrane in the field and overlap onto crack isolation membrane used over movement joints a minimum of 6” to create a waterproof condition.
2. Flash and reinforce waterproofing membrane up perimeter walls and any columns, chases or field interruptions to a height of 3 inches to create a waterproof condition.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

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

B. Install crack isolation membrane per TCNA F125 Partial at all mud bed and concrete slab saw cut joints to relocate movement joints to the next nearest grout joint in tile work.

3.7 CLEANING AND PROTECTING

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

1. Remove epoxy grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. 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. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. 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.

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

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

3.8 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor: Identified at **CT-1 on finish schedule**

1. Tile Installation F112-11: Cement mortar bed (thickset) bonded to concrete; TCNA F112 and ANSI A108.1B.

a. 6x6 quarry tile (Daltile Sahara Sand)

b. Thin-Set Mortar for Cured-Bed Method: Latex- portland cement mortar.
c. Grout: Water cleanable epoxy grout .Install movement joints in mud bed according to locations on drawings, at perimeter of tile installations where tile abuts walls or other vertical surfaces and at intervals not to exceed 8 feet in both directions.
d. Apply crack isolation membrane over movement joints per TCNA F125 Partial Coverage.

B. Interior Floor Installations, Concrete Subfloor: Identified as **CT-2 on finish schedule.**

1. Tile Installation TCNA F113-11 Medium Bed thin set
   a. 6X6 quarry tile (Daltile Sahara Sand)
   b. Full coverage crack isolation membrane is to be applied per Tile Installation method TCNA F125-Full, above.
   c. Medium Bed Portland Cement Bond Coat
   d. Water cleanable epoxy grout.

C. Interior Wall Installations, Metal Studs or Furring: Daltile SEMI-GLOSS: Field tile White (2) K101; Accent tile 50% Luminary Gold (2) 0142 and 50% Cobalt (3) DM14.

1. Tile Installation W244: Thin-set mortar on cementitious backer unit underlayment with vapor retarder membrane; TCNA W244.

   a. Tile Type: 6 x 6 glazed tile.
   b. Thin-Set Mortar: Latex-portland cement mortar.
   c. Grout: Water-cleanable epoxy grout.

D. Shower Receptor and Wall Installations, Concrete or Masonry:

1. Tile Installation TCNA B415-11: Thin-set mortar on waterproof membrane with integrated bonding flange for bonded membranes.

   a. Tile Type: 6 x 6 glazed tile.
   b. Thin-Set Mortar: Latex- portland cement mortar.
   c. Grout: Water cleanable epoxy grout.
   d. This is to be a fully waterproofed shower area. Apply waterproofing membrane to proper thickness, tied into drain flanges and flashed up walls to a height above the shower heads.

E. Movement Joints

1. Follow TCNA EJ 171 for all applicable movement joint conditions on all installations.

END OF SECTION 093000

BRUNSWICK HIGH SCHOOL
FOOTBALL FIELD HOUSE RENOVATIONS / ADDITIONS

SECTION 095100 – ACOUSTICAL CEILINGS

PART 1 – GENERAL

1.01 SUMMARY

A. Extent of each type of acoustical ceiling shown and scheduled on drawings.

B. Types of acoustical ceilings specified in this section include following:
   1. Acoustical panel ceilings, exposed suspension systems.

1.02 SUBMITTALS

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

B. Samples for Initial Selection Purposes:
   1. Submit manufacturers' standard size samples of acoustical units, but min. 6" square, and of exposed ceiling suspension members including wall and special moldings.
   2. Provide samples showing full range of colors, textures and patterns available for each type component required.

C. Samples for Verification Purposes: Submit following:
   1. 6" square samples of each acoustical panel type, pattern and color.
   2. Set of 12" long samples of exposed runners and moldings for each color and system type required.

D. Certificates: Submit certificates from manufacturers of acoustical ceiling units and suspension systems attesting that their products comply with specification requirements.

1.03 QUALITY ASSURANCE

A. Fire Performance Characteristics:
   1. Provide acoustical ceiling components identical to those tested for following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

   2. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.
   3. Surface Burning Characteristics: As follows, tested per ASTM E 84.
      a. Flame Spread: 25 or less.
      b. Smoke Developed: 50 or less.

B. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any).

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store in fully enclosed space where protected against damage from moisture, direct sunlight, surface contamination or other causes.

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

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

1.05 PROJECT CONDITIONS

A. Space Enclosure: Do not install interior acoustical ceilings until space enclosed and weatherproof, wet-work in space completed and nominally dry, work above ceilings complete, and ambient conditions of temperature and humidity continuously maintained at values near those indicated for final occupancy.

1.06 SPECIAL WARRANTY:

A. Ceiling Panel Types AT - Manufacturer’s Written Warranty:
   1. 10 years against sagging and warping of ceiling panels in temperatures up to 104° F and in unlimited relative humidity conditions except exterior application and direct exposure to moisture or standing water.
   2. Applies to conditions before and after installation of ceiling panels.

B. Suspension System Only- Manufacturer’s Written Warranty:
   1. 10 years against Rust in temperatures up to 120 degrees F and unlimited relative humidity conditions except exterior applications and direct exposure to moisture or standing water. Applies to conditions before and after installation of Suspension System.

1.07 EXTRA MATERIALS

A. Deliver extra materials to Owner.

B. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels.

C. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.

D. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0% of amount installed.

PART 2 – PRODUCTS

2.01 ACOUSTICAL CEILING UNITS, GENERAL

A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated, prepared for mounting method designated and complying with FS SS-S-118 requirements, including those indicated by reference to type, form, pattern, grade (NRC or NIC' as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).
   1. Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal support), FS SS-S-118; or Type E-400 mounting as per ASTM E 795.

B. Sound Attenuation Performance: Provide acoustical ceiling units with ratings for ceiling sound transmission class (STC) of range indicated as determined according to AMA 1-II "Ceiling Sound Transmission Test by Two-Room Method" with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).

C. Colors, Textures, and Patterns: Provide products to match appearance characteristics indicated or, if not otherwise indicated, selected by Architect from manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of quality designated.

2.02 ACOUSTICAL PANELS

A. Type AT: Mineral Composition - Water Felted Panels with Standard Washable Painted Finish, Fissured and Perforated Pattern, Non-Fire Resistance Rated, High Acoustics :
   1. Physical Characteristics:
      a. Color/Light Reflectance: White, LR .85 Minimum ; Black at room 2108 TV Studio
      b. NRC: .75 Minimum, UL Certified Performance Marked on Each Carton
      c. AC: 180 Minimum, UL Certified Performance Marked on Each Carton
      d. CAC: 35 Minimum, UL Certified Performance Marked on Each Carton
      e. Edge Detail: Square Edge Lay-in
      f. Size: 24” x 24” x 5/8” except as otherwise indicated
   2. Products: Subject to full compliance with requirements provide one of the following:
      a. “Fine Fissured” Armstrong World Industries, Inc. # 1728
      b. “Certain teed “Fine Fissured” ”, # HHF-157
      c. “Radar Clima” Plus – USG Interiors #2210

B. Type GLP : Gypsum Panels – Gypsum Core, with Vinyl Facing, Stippled Pattern, Fire Resistant Rated:
   1. Physical Characteristics:
      a. Color/Light Reflectance: White LR/1 (75% and over).
      b. Grade: Not Applicable.
      c. STC Range: 45-49
      d. Edge Detail: Square
      e. Size: 24” x 24” x ½”
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. “Vinyltone Vinyl Faced Gypsum Lay-in Panels”; BPB.
      b. “Gridstone Vinyl Laminated Gypsum Panels”; Gold Bond Products, Div. National Gypsum Co.
      c. “GLIP Stipple Pattern”; USG Acoustical Products Co.

2.03 METAL SUSPENSION SYSTEMS, GENERAL

A. Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.

B. Finishes and Colors:
   1. Provide manufacturer's standard factory-applied finish for type of system indicated.

2. For exposed suspension members and accessories with painted finish, provide color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.

C. High Humidity Finish: Hot-Dipped Galvanized Steel grid members with Aluminum Capping rated severe environmental, ASTM C 635, required at:
1. Type CAT (coated acoustical panels).

D. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.

E. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretched, Class 1 coating, sized so that stress at 3-times hanger design loan (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide min. 12 gage.

F. Edge Moldings and Trim:
1. Metal of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.04 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS

A. Non-Fire-Resistance-Rated Double Web Steel Suspension System: Manufacturer's standard system roll-formed from prefinished cold-rolled steel sheet with 15/16" wide exposed faces on structural members; other characteristics as follows:
1. Structural Classification: Intermediate-Duty System.
2. Finish: Painted, white.; Black at room 2108 TV Studio

B. Manufacturers: Subject to compliance with requirements, provide products of one of following:
1. Manufacturers of Non-Fire-Resistance-Rated Double Web Steel Suspension Systems:
a. Chicago Metallic Corporation.
b. Donn Corporation.
c. Eastern Products Div., Armstrong World Industries, Inc.
d. National Rolling Mills, Inc.

2.05 MISCELLANEOUS MATERIALS

A. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.
1. Products: Subject to compliance with requirements, provide one of following:
a. BA-98; Pecora Corp.
b. Tremco Acoustical Sealant; Tremco.
c. Norseal V-730; Norton

PART 3 – EXECUTION

3.01 PREPARATION

A. Coordination:
1. Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

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

B. Testing Substrates: Before installing adhesively applied tile on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level below tile manufacturer's recommended limits.

C. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling.
1. Avoid use of less-than-half width units at borders.
2. Comply with reflected ceiling plans wherever possible.

3.02 INSTALLATION

A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and CISCA standards applicable to work.

B. Arrange acoustical units and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans.
1. Install tile with pattern running in one direction.

C. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members.
1. Locate hangers min. 6" from each end and 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".
2. Provide additional hanger at each corner of grid supporting light fixtures or similar items where weight of item exceeds max. recommended by grid manufacturer.

D. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices secure and appropriate for substrate, and not deteriorate or fail with age or elevated temperatures.
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum not part of supporting structural or ceiling suspension system.
2. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, countersplaying or other equally effective means.

E. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

F. Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing moldings.

G. Screw-attach moldings to substrate at max. intervals of 16" o.c. and max. 3" from ends, leveling with ceiling suspension system to tolerance of ⅛" in 12'-0".
1. Miter corners accurately and connect securely.
2. Provide ¼" x 1¼" hex-head Tapcon screws at concrete and masonry walls.

H. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members.
1. Scribe and cut panels to fit accurately at borders and at penetrations.

2. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

3.03 CLEANING

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
   1. Remove and replace work not successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095100

SECTION 096513 – RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

1.2 SUBMITTALS

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

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

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

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

B. Mockups: Provide resilient products with mockups specified in other Sections.

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 (10 deg C) or more than 90 deg F (32 deg C).

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than **70 deg F (21 deg C)** or more than **95 deg F (35 deg C)**, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.

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

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than **55 deg F (13 deg C)** or more than **95 deg F (35 deg C)**.

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

1.6 EXTRA MATERIALS

A. Furnish extra materials 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 (3 linear m)** for every **500 linear feet (150 linear m)** or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
   a. Endura Rubber Flooring; Division of Burke Industries, Inc.
   b. Flexco, Inc.
   c. Johnsonite.
   d. Mondo Rubber International, Inc.
   e. Musson, R. C. Rubber Co.
   f. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
   g. Roppe Corporation, USA.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: **Type TS (rubber, vulcanized thermoset)**.
2. Manufacturing Method: **Group I (solid, homogeneous)**.
3. Style: **Cove (base with toe)**.

C. Minimum Thickness: **0.125 inch (3.2 mm)**.

D. Height: **4 inches (102 mm)**.

E. Outside Corners: **Preformed**.

F. Inside Corners: **Preformed**.

G. Finish: **As selected by Architect from manufacturer's full range**.

H. Colors and Patterns: **As selected by Architect from full range of industry colors**.

2.2 RESILIENT MOLDING ACCESSORY <**Insert drawing designation**>

A. Resilient Molding Accessory:

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

a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
b. Flexco, Inc.
c. Johnsonite.
d. Roppe Corporation, USA.

B. Material: **Rubber**.

C. Profile and Dimensions: **As indicated**.

D. Colors and Patterns: **As selected by Architect from full range of industry colors**.

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 manufacturer for applications indicated.

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

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: Not more than 50 g/L.
b. Rubber Floor Adhesives: Not more than 60 g/L.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

E. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

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.

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 adhesion of resilient products.

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

3.2 PREPARATION

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

B. Wall Substrates: Prepare 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.
4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. 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.

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

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

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

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 practicable 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. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

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 **carpet** and **resilient floor covering** that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

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

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

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

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.

D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096813 – TILE CARPETING

PART 1 - GENERAL

1.1 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show 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 of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for points, based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

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. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Master II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups on site. Select one complete office as the mock-up.
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. Comply with CRI 104.

1.8 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.9 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

B. Tile – J & J Kinetics, 24” x 24” solution dyed polyester.

C. Color: As selected by Architect from manufacturer's full range.

D. Applied Soil-Resistance Treatment: Manufacturer's standard material.

E. Antimicrobial Treatment: Manufacturer's standard material.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

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

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099000 – INTERIOR, EXTERIOR AND INDUSTRIAL PAINTS AND COATINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Interior paint and coatings systems (LEED-09 NC/CI/CS Compliant) including surface preparation.

B. Interior high-performance paint and coatings systems including surface preparation.

C. Exterior paint and coatings systems including surface preparation.

1.2 REFERENCES

A. Steel Structures Painting Council (SSPC):

1. SSPC-SP 1 – Solvent Cleaning.
2. SSPC-SP 2 – Hand Tool Cleaning.
3. SSPC-SP 3 – Power Tool Cleaning.
4. SSPC-SP11 – Power Tool Cleaning to Bare Metal.
5. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

C. South Coast Air Quality Management District (SCAQMD): Rule 1113 – Architectural Coatings.

D. Green Seal, Inc.:

1. GS-11 Standard for Paints and Coatings (1st Edition, May 20, 1993).
2. GC-03 - Environmental Criteria for Anti-Corrosive Paints.

E. United States Green Building Council (USGBC): LEED-09 NC/CI/CS.

1.3 SUBMITTALS

A. Product Data: For each paint system indicated, including.

1. Product characteristics.
2. Surface preparation instructions and recommendations.
3. Primer requirements and finish specification.
4. Storage and handling requirements and recommendations.
5. Application methods.
6. Cautions for storage, handling and installation.

B. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

C. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

D. Only submit complying products based on project requirements. One must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO). To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

E. USGBC LEED V4 Submittals:

1. MRc2 Environmental Product Declaration Product Language: Products shall be selected with a preference to products that have product-specific environmental product declaration documentation.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish surfaces for verification of products, colors and sheens.
2. Finish area: one 6x6 interior area of:
   a. CMU walls
   b. Gypsum board walls
3. Provide samples that designate primer and finish coats.
4. Do not proceed with remaining work until the Architect approves the mock-up.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.

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

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the

coatings.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products selected are Sherwin-Williams, which is located at: 101 Prospect Ave.; Cleveland, OH 44115; Toll Free Tel: 800-524-5979; Tel: 216-566-2000; Fax: 440-826-1989; Email: request infospecifications@sherwin.com; Web:www.swspecs.com.

B. Benjamin Moore and Valspar products meeting the specification and performance characteristics of the selected products are approved.

2.2 APPLICATIONS/SCOPE

A. Interior Paints and Coatings: (LEED-09 NC/CI/CS COMPLIANT)

1. Concrete: Poured, precast, tilt-up, cast-in-place, cement board, plaster.
2. Metal: Aluminum, galvanized steel.

B. Interior High Performance Paints and Coatings:

1. Concrete: precast, cast-in-place, cement board.
2. Masonry: CMU - concrete, split face, scored, smooth, stucco.
3. Non-Ferrous Metal: Galvanized steel and aluminum.
4. Metal Ferrous: Ceilings, structural steel, joists, trusses, beams, and similar items including dryfall coatings.
5. Wood: Walls, ceilings, doors, trim, cabinet work, and similar items.
6. Drywall: Drywall board, Gypsum board
7. Plaster: Walls, ceilings.

C. Exterior Paints and Coatings:

1. Concrete: Cementitious siding, flexboard, transite, and shingles (non-roof).
2. Masonry: Concrete masonry units, cinder or concrete block.
3. Metal: Aluminum, galvanized steel.
4. Metal: Miscellaneous iron, ornamental iron, ferrous metal.
5. Wood: Siding, trim, shutters, sash, and miscellaneous hardboard.

6. Architectural PVC, plastic, fiberglass.

2.3 PAINT MATERIALS – GENERAL

A. Paints and Coatings:

1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Refer to Finish Schedule for paint colors, and as selected.

E. LEED Requirements: Products in compliance with requirements of IEQ Credit 4.2 USGBC LEED-09 NC/CI/CS.

2.4 INTERIOR PAINT SYSTEMS (LEED-V4 NC/CI/CS COMPLIANT)

A. CONCRETE: Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place including Plaster Walls and Ceilings.

1. Epoxy Systems (Water Based):
   a. Semi-Gloss Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
      2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series.
      3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series (4 mils wet, 1.5 mils dry per coat).

B. CONCRETE: Ceilings, Poured Concrete, Precast Concrete, Cement Board, Cast-In-Place including Plaster Ceilings.

1. Dryfall Waterborne Topcoats:
   a. Flat Finish:
      1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
      2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6 mils wet, 1.7 mils dry per coat).

C. MASONRY: CMU – Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted.

1. Epoxy Systems (Water Based):
   a. Semi-Gloss Finish:

1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series (4 mils wet, 1.5 mils dry per coat).

D. METAL: Aluminum, Galvanized.

1. Alkyd Systems (Water based):
   a. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
      2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
      3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

E. METAL: Galvanized; Ceilings, Duct work.

1. Dryfall Waterborne Topcoats:
   a. Flat Finish:
      1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
      2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6.0 mils wet, 1.7 mils dry per coat).

F. METAL: (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Ferrous Metal)

1. Alkyd Systems (Water based):
   a. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
      2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
      3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series ((4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

G. WOOD: (Walls, Ceilings, Doors, Trim):

1. Alkyd Systems (Water based):
   a. Semi-Gloss Finish:
      1) 1st Coat: S-W Premium Wood & Wall Primer, B28W8111 (4 mils wet, 1.8 mils dry).
      2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
      3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series ((4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

H. DRYWALL: (Walls, Ceilings, Gypsum Board and similar items)

1. Epoxy Systems (Water Based):
   a. Eg-Shel/Low Luster Finish:

1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series (4 mils wet, 1.5 mils dry per coat).

2.5 EXTERIOR PAINT SYSTEMS

A. CONCRETE: (Cementitious Siding, Flexboard, Transite Board, Shingles (Non-Roof), Common Brick, Stucco, Tilt-up, Precast, and Poured-in-place Cement).

1. Latex Systems:
   a. Satin Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 dry).
      2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series.
      3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5 mils dry per coat).

B. MASONRY: Concrete Masonry Units (CMU) – Cinder or Concrete Block.

1. Latex Systems:
   a. Satin Finish:
      1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
      2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series.
      3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5 mils dry per coat).

C. CONCRETE: Concrete Floors (non-vehicular), Patios, Porches, Steps and Platforms.

1. Acrylic System Water-Based:
   a. Floor Finish:
      1) 1st Coat: S-W Sher-Crete Flexible Concrete Waterproofer-Smooth, A5-250 Series.
      2) 2nd Coat: S-W Sher-Crete Flexible Concrete Waterproofer-Smooth, A5-250 Series (10.0-12.0 mils wet per coat).

D. METAL: Aluminum, Galvanized.

1. Latex Systems:
   a. Semi-Gloss Finish:
      1) 1st Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
      2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).

E. METAL: Misc. Iron, Ornamental Iron, Structural Iron and Steel, Ferrous Metal.

1. Latex Systems:
   a. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).

2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).

F. ARCHITECTURAL PVC, PLASTIC, FIBERGLASS

1. Latex Systems:
   a. Gloss Finish:
      1) 1st Coat: S-W Extreme Bond Bonding Primer, B51W00150 (3.1 mils wet, .9 mils dry).
      2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series.
      3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series (4.0 mils wet, 1.3 mils dry per coat).

G. DRYWALL: Gypsum Board, Exterior Drywall.

1. Latex Systems:
   a. Flat Finish:
      1) 1st Coat: S-W Exterior Latex Wood Primer, B42W08041 (4.0 mils wet, 1.4 mils dry).
      2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series.
      3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4.0 mils wet, 1.2 mils dry per coat).

H. VINYL SIDING, EIFS, SYNTHETIC STUCCO:

1. Latex Systems:
   a. Satin Finish:
      1) 1st Coat: S-W A-100 Exterior Latex Satin, A82 Series.
      2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5 mils dry per coat).

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

1. Prior to attempting to remove mildew, it is recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or

discolor existing paint films. Bleach alternative cleaning solutions are advised.

2. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
3. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
4. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, from release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

D. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

E. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments.

F. Copper and Stainless Steel: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP 2, Hand Tool Cleaning.

G. Exterior Composition Board (Hardboard): Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

H. Drywall – Exterior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

I. Drywall – Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

J. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP16 is necessary to remove these treatments.

K. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

L. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.

1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
4. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
5. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration

caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.

6. Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.
7. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.
8. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.
10. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

M. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color, unless the paint system features Sherwin-Williams VinylSafe technology. Painting with darker colors that are not Sherwin-Williams VinylSafe may cause siding to warp. Follow all painting guidelines of the vinyl manufacturer when painting. Only paint properly installed vinyl siding. Deviating from the manufacturer's painting guidelines may cause the warranty to be voided.

N. Stucco: Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments such as Loxon.

O. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION 099000

SECTION 101400 – SIGNS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of signs:

1. Panel signs.

1.2 SUBMITTALS

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

B. Develop a sign schedule for the project. The schedule shall use door numbers from the floor plans. The schedule shall be in chart form and shall have empty columns for each door with a space for the Owner to write desired sign message. One column shall be labeled “Room Number” and another column labeled “Sign Message”.

C. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture:

a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.

2. Samples for verification of color, pattern, and texture selected and compliance with requirements indicated:

a. Cast Acrylic Sheet and Plastic Laminate: Provide a sample panel not less than 8-1/2 inches by 11 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

1.3 QUALITY ASSURANCE

A. Signage shall consist of room number and room function to meet the requirements of the Americans with Disabilities Act – 1990 and ANSI A117.1-1986

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Specifications are based on products from Mohawk Systems, P. O. Box 966, Schenectady, NY 12301-0966. (518) 370-3433 or Fax (518) 370-3332; Series 200A, Sand Carved Design M308B. Also approved are:

    a. Best Manufacturing Company – Graphite Blast
    b. Multi-Graphics
    c. The Southwell Company – Image Carved ADA Signs

2.2 MATERIALS

A. All signs shall be manufactured using Graphic Process Series 200A – Sand Carved.

1. Tactile characters/symbols shall be raised the required 1/32” inches from sign face. Glue on letters are not acceptable.
2. All text shall be accompanied by Grade 2 Braille.
3. Perimeter borders shall be 3/8” minimum.

B. Plaque material shall be melamine plastic laminate, approximately 1/8” thick with contrasting core color. The melamine shall be non-static, fire-retardant and self-extinguishing. The plastic laminate will be impervious to most acids, alkalies, alcohol, solvents, abrasives, and boiling water.

C. Letterform shall be Univers 67 upper case or other sans serif of simple serif letterforms.

2.3 FASTENERS

A. Fasteners: Use stainless steel concealed fasteners.

2.4 ANCHORS AND INSERTS

A. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

3.2 CLEANING AND PROTECTION

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.3 SIGN SCHEDULE

ROOM #	SIGN COPY	SIGN TYPE	NUMBER OF SIGNS
101	LOBBY	C	1
102	102	B	1
103	103	B	1
104		A4	1
106	106	B	1
109	109	B	1
110	ELECTRIC	C	1
111	DATA	C	1
112	112	B	1
113	ELEC / MECH	B	1
114	114	B	1
115	115	B	1
115B	115B	B	1
118	MALE LOCKERS	C	1
119	119	B	2
121	MALE LOCKERS	C	1

END OF SECTION 101400

SECTION 102113.19 – PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as **toilet enclosures and urinal screens**.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

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[**ceiling grid, ceiling-mounted items, and**] overhead support or bracing locations.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments 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 and source.

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** bumper(s) with associated fasteners.
4. Door Pull: **One** door pull(s) with associated fasteners.
5. Fasteners: **Ten** fasteners of each size and type.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; 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 U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1** for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS <**Insert drawing designation**>

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

1. Accurate Partitions Corporation.
2. All American Metal Corp.
3. American Sanitary Partition Corporation.
4. Ampco, Inc.
5. Bradley Corporation; Mills Partitions.
6. General Partitions Mfg. Corp.
7. Global Steel Products Corp.
8. Hadrian Manufacturing Inc.
9. Knickerbocker Partition Corporation.
10. Marlite.
11. Metpar Corp.

12. Partition Systems Incorporated of South Carolina; Columbia Partitions.
13. Scranton Products.
14. Weis-Robart Partitions, Inc.

B. Toilet-Enclosure Style: **Overhead braced Floor anchored**.

C. Door, Panel**,** and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's standard continuous, **extruded-aluminum or stainless-steel** strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
3. Color and Pattern: **Two colors and patterns** in each room **as selected by Architect from manufacturer's full range**.

D. Pilaster **Shoes and Sleeves (Caps)**]: Manufacturer's standard design; **stainless steel**.

E. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; **stainless steel**.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch- (1.59-mm-) 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 compartments 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 in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments 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 the 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.

2.4 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

D. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

A. Fabrication, General: 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: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at[**tops and**] bottoms of posts. Provide shoes[**and sleeves (caps)**] at posts to conceal anchorage.

E. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments 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: 1/2 inch (13 mm).
b. Panels and Walls: 1 inch (25 mm).

2. Full-Height (Continuous) Brackets: Secure panels 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 (44 mm) 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 (51 mm) 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.

D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to 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 102113.19

SECTION 102800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Toilet and bath accessories.
2. Warm-air dryers.

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.

D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.3 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule. Product selections are Bradley.

1. Products of Bobrick and ASI with equal characteristics may be provided.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.

C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).

E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

F. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

G. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.2 FABRICATION

A. General: One, maximum 1-1/2-inch- (38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.

D. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

E. 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 according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Toilet Tissue Dispenser

1. Jumbo Roll Toilet Tissue Dispenser: Fabricate cabinet and mounting plate of 18-8, type 304, 20-gage stainless steel with satin finish. Provide tumbler lock. Fabricate door of 18-8, type 304, 18-gage stainless steel with satin finish and drawn, one-piece, seamless construction. Provide wide viewing slot to reveal toilet tissue supply inside cabinet. Fabricate dispensing mechanism of high-impact rigid vinyl. Dispensing mechanism shall be chemical resistant and flame-retardant.
2. Standard of Quality: Bradley Model PS900869 stainless steel twin 9-inch Jumbo Roll Toilet Tissue Dispenser.>

B. Paper Towel Dispenser: Provide stainless-steel paper towel dispenser complying with the following:

1. Products: Bradley Model 250-15.
2. Surface-Mounted Type: Sized for minimum of 300 C-fold or 400 multifold paper towels without using special adapters; with hinged front equipped with tumbler lockset; and with refill indicators that are pierced slots at sides or front.

C. Grab Bar: Provide stainless-steel grab bar complying with the following:

1. Mounting: Concealed with manufacturer's standard flanges and anchors.
2. Gripping Surfaces: Smooth, satin finish.
3. Outside Diameter: 1-1/4 inches (32 mm).

D. Sanitary Napkin Disposal Unit: Provide stainless-steel sanitary napkin disposal unit complying with the following:

1. Products: Bradley Model 4722-15.
2. Surface-Mounted Type: With seamless exposed walls; self-closing top cover; locking bottom panel with stainless-steel, continuous hinge; and removable, reusable receptacle.

E. Mirror Unit: Provide mirror unit complying with the following:

1. Products: Bradley Model 780.
2. Stainless-Steel, Angle-Framed Mirror: Fabricate frame from minimum nominal 0.05-inch- (1.3-mm-) thick stainless-steel angles, with square corners mitered, welded, and ground smooth.

F. Shower Curtain Rod: Provide stainless-steel shower curtain rod with 3-inch (75-mm) stainless-steel flanges designed for exposed fasteners, in length required for shower opening indicated, and complying with the following:

1. Products: Bradley Model 9531.
2. Heavy-Duty Rod: 1-1/4-inch (32-mm) OD; fabricated from nominal 0.05-inch- (1.3-mm-) thick stainless steel.

G. Soap Dish: Provide stainless steel recessed soap dish.
1. Products: Bradley Model 9401 in concrete masonry walls and Model 9403 in steel stud framed walls.

H. Shower Curtain: Provide shower curtain complying with the following:

1. Products: Bradley Model 9534.
2. Duck Shower Curtain: Minimum 8-oz. (227-g), white, 100 percent cotton duck material with hemmed edges and corrosion-resistant grommets at minimum 6 inches (152 mm) o.c. through top hem.

3. 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.

I. Robe Hook: Provide robe hook complying with the following:

1. Products: Bradley Model 932.
2. Double-Prong Unit: Stainless-steel, double-prong robe hook with rectangular wall bracket and backplate for concealed mounting.

J. Mop and Broom Holder: Provide mop and broom holder complying with the following:

1. Products: Bradley Model 9983.
2. Mop and Broom Holder with Utility Shelf: 36-inch- (914-mm-) long unit fabricated of minimum nominal 0.05-inch- (1.3-mm-) thick stainless steel with shelf; support brackets for wall mounting; three hooks for wiping rags; four spring-loaded, rubber hat, cam-type, mop/broom holders mounted on front of shelf; and approximately 1/4-inch- (6-mm-) diameter, stainless-steel rod suspended beneath shelf for drying rags.

K. Warm-Air Dryer: Provide one of the following in stainless steel warm-air dryer:

1. American Dryer, Extremeair.
2. Dyson Airblade V.
3. Xlerator XL-SB.

3.4 TOILET AND BATH ACCESSORY SCHEDULE

Room #	Mirror	Toilet Tissue Dispenser	Electric Hand Dryer	Napkin Disposal	Paper Towel Dispenser	Grab Bar	Mop & Broom Holder	Shower Rod & Curtain	Soap Dish	Robe Hook
GRAB BARS: L = L-SHAPED; S = PAIR STRAIGHT; U = U-SHAPED										
104	1	1	1		~~1~~	1L				1
108 & 109	2	2	1		~~1~~	2U		2	2	2
118A	3	2	1		~~1~~	1L, 3U		3	3	5
122	3	2	1			1L, 3U		3	3	5

END OF SECTION 102800

SECTION 104416 – FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, **hand-carried** fire extinguishers **and mounting brackets** for fire extinguishers and fire extinguisher cabinets for portable fire extinguishers.

B. Symbols:

1. FEC 1: Cabinet with Multipurpose Dry Chemical Extinguisher.(multipurpose)
2. FE 1: Bracket Mounted Multipurpose Dry Chemical Extinguisher. (multipurpose)

1.2 SUBMITTALS

A. Product Data, Fire Extinguishers: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher **and mounting brackets**.

B. Product Data, Fire Extinguisher Cabinets: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

C. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

D. Samples for Initial Selection: For each type of fire protection cabinet indicated.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Size: 6 by 6 inches (150 by 150 mm) square.

F. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. **Use same designations indicated on Drawings.**

G. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

C. 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 FMG.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

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

1. Fire End & Croker Corporation.
2. J. L. Industries, Inc.; a division of Activar Construction Products Group.
3. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
4. Larsen's Manufacturing Company.
5. Moon-American.
6. Potter Roemer LLC.

B. Multipurpose Dry-Chemical Type in Steel Container (FE 1): UL-rated **4-A:60-B:C, 10-lb (4.5-kg)** nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated **black** baked-enamel finish.

2.3 FIRE PROTECTION CABINET

A. Cabinet Construction: **1-hour fire rated**.

B. Cabinet Material: **Steel** sheet.

C. Surface Mounted Cabinet: Cabinet box mounted on surface of walls of sufficient depth to house fire extinguisher.

D. Cabinet Trim Material: **Aluminum sheet**.

E. Door Material: **Aluminum sheet**.

F. Door Style: **Center glass panel with frame**.

G. Door Glazing: **Tempered float glass (clear)**.

H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide **recessed door pull and friction latch**.
2. Provide **continuous hinge, of same material and finish as trim,** permitting door to open 180 degrees.

I. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.

    a. Identify fire extinguisher in fire protection cabinet with the words "**FIRE EXTINGUISHER**."

        1) Location: Applied to **cabinet door**.
        2) Application Process:
        3) Lettering Color: **Red**.
        4) Orientation: **Vertical**.

J. Finishes:

1. Aluminum: **Clear anodic – all exterior surfaces.**
2. Steel: **Baked enamel or powder coat interior of cabinet**.

2.4 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. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces 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 not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 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 walls and partitions for suitable framing depth and blocking where **semi-recessed** cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

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

3.2 PREPARATION

A. Prepare recesses for **semi-recessed** 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 heights indicated below:**

1. Fire Protection Cabinets: **54 inches (1372 mm)** above finished floor to top of cabinet.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. General: Install fire extinguishers **and mounting brackets** in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: **54 inches (1372 mm)** above finished floor to top of fire extinguisher.

D. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, 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 manufacturers' 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 104416

SECTION 105113 – METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Welded corridor lockers.
2. Welded, open-front athletic lockers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of metal locker.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.

C. Samples: For each color specified, in manufacturer's standard size.

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

E. Samples for Verification: For the following products, in manufacturer's standard size:

1. Lockers and equipment.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.6 COORDINATION

A. Coordinate sizes and locations of **concrete** bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

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

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Welded Metal Lockers: **Lifetime** from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

1. Obtain locks from single lock manufacturer.

2.2 WELDED COACHES LOCKERS (12”W x 22”D or 24” D x 60” H)

A. Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
2. Door Style: **Vented panel as follows:**

a. Louvered Vents: No fewer than [**six louver openings at top and bottom for single-tier** lockers.
b. Security Vents: Manufacturer's standard, stamped horizontal or vertical.

B. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 0.060-inch (1.52-mm) nominal thickness.
2. Backs: 0.048-inch (1.21-mm) nominal thickness.
3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.

C. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

D. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees[**; self-closing**].

1. Hinges: Manufacturer’s standard, steel, continuous or knuckle type.

E. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and prelocking.

a. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks and doors less than 48 inches (1219 mm) high with two latch hooks; fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

F. Locks: **Combination padlocks**.

G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **aluminum** plates, with numbers and letters at least 3/8 inch (9 mm) high.

H. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

I. Coat Rods: **1-inch- (25-mm-)** diameter steel, **nickel plated**.

J. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

K. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.

L. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

M. Finish: Baked enamel or powder coat.

1. Color: **Two colors, with door one color and frame and body another color; as selected by Architect from manufacturer's full range**.

2.3 WELDED, OPEN-FRONT ATHLETIC LOCKERS (24”W x 18”D x 84”H)

A. Locker Arrangement: Open front, with **seat/shelf upper shelf with security box and full-width security compartment**.

B. Material: **Metallic-coated** steel sheet.

C. Body: Assembled by **welding or riveting or bolting** body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops and Bottoms: 0.060-inch (1.52-mm) nominal thickness, with single bend at edges.
2. Backs: 0.048-inch (1.21-mm) nominal thickness.
3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.

D. Perforated Sides: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet with manufacturer's standard diamond perforations. Perforations shall not occur **above upper shelf**.

E. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet or 0.105-inch (2.66-mm) nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames.

F. Reinforced Bottoms: Structural channels, formed from 0.075-inch (1.90-mm) nominal-thickness steel sheet; welded to front and rear of side-panel frames.

G. Seats/Shelves: Full width of metal locker; channel formed; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; with stiffeners for reinforcement.

H. Security Boxes: Consisting of partition extending from upper shelf to top of metal locker, fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; with channel-formed, 0.060-inch (1.52-mm) nominal-thickness, steel sheet door frame, and door fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet with right-angle single bend at edges; with manufacturer's standard, steel continuous hinge that is completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Single-Point Latching: Stainless-steel strike plate with integral pull; with steel, nonmoving latch hook **with steel padlock loop that projects through door and is finished to match metal locker body**.

I. Security Compartments: Full width of metal locker, with door fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet.

J. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **aluminum** plates, with numbers and letters at least 3/8 inch (9 mm) high.

K. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

L. Coat Rods: Manufacturer's standard.

M. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

1. Closures: **Hipped**-end type.

N. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.

O. Boxed End Panels: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.

P. Materials:

1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 (ZF180) zinc-iron, alloy (galvannealed) coating designation.

Q. Finish: Baked enamel or powder coat.

1. Color: **As selected by Architect from manufacturer's full range**.

2.4 LOCKS

A. Combination Padlocks: **Provided by Owner**.

2.5 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
2. Coat Rods: **For each compartment of each locker.**
3. Open-Front Athletic Lockers: Two single-prong wall hooks bolted to locker back and coat rod.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

E. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

F. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

G. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of non-recessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.6 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls[**, and elsewhere as indicated,**] for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top [**and bottom of lockers**] [**of lockers and to floor**].
3. Anchor back-to-back metal lockers to floor.

B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
2. Attach sloping-top units to metal lockers, with closures at exposed ends.
3. Attach boxed end panels using concealed fasteners to conceal exposed ends of non-recessed metal lockers.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. [**Verify that integral locking devices operate properly.**]

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 107300 – ALUMINUM WALKWAY COVERS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Design, fabrication, and installation of welded extruded aluminum walkway cover systems.

B. Products Furnished but not Installed Under this Section: Column sleeves (styrofoam blockouts) or anchor bolts (if required)

1.02 REFERENCES

A. The Aluminum Association (AA):

1. The Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.

B. American Architectural Manufacturers Association (AAMA):

1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. American Society of Civil Engineers (ASCE):

1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.

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

1. ASTM B 209, Specification for Aluminum and Aluminum - Alloy Sheet and Plate.
2. ASTM B 221, Specification for Aluminum and Aluminum - Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
3. ASTM C 150, Specification for Portland Cement.
4. ASTM C 404, Specification for Aggregates for Masonry Grout.

E. American Welding Society (AWS):

1. ANSI/AWS D1.2, Structural Welding Code - Aluminum.

1.03 SYSTEM DESCRIPTION

A. Design Requirements:
1. Design Walkways in accordance with The Aluminum Design Manual 2000.
2. Comply with the wind requirements of ASCE 7.

3. Provide an all welded extruded aluminum system complete with internal drainage. Non-welded systems are not acceptable.
4. Provide expansion joints to accommodate temperature changes of 120 degrees F. Provide expansion joints with no metal to metal contact.

B. Performance Requirements:

1. Grout: Compressive strength of 2000 psi, minimum.

1.04 SUBMITTALS

A. Product Data: Manufacturer's product information, specifications, and installation instructions for walkway cover components and accessories.

B. Shop Drawings: Include plan dimensions, elevations, and details.

C. Samples:

1. Selection: Manufacturer's standard range of colors for the finishes selected.
2. Verification: 2-inch-square samples of each finish selected on the substrate specified.

D. Design Data: Design calculations bearing the seal of a Registered Professional Engineer, licensed in the state where the project is located. Design calculations shall state that the walkway cover system design complies with the wind requirements of ASCE 7, the stability criteria of applicable building code, and all other governing criteria.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least ten years' experience in the design, fabrication, and erection of extruded aluminum walkway cover systems.

B. Installer Qualifications: Have walkway covers installed by manufacturer, third party installation is not acceptable.

PART 2 – PRODUCT

2.01 MANUFACTURERS

A. The design is based on products fabricated by: Peachtree Protective Covers, Inc., 1477 Rosedale Drive, Hiram, GA 30141, 770-439-2120, fax 770-439-2122.

1. Comparable products by the following manufacturers also will be acceptable:
   a. Dittmer Architectural Aluminum.
   b. Avadek Walkway Cover Systems.
   c. Tennessee Valley Metals as an approved manufacturer pending compliance with the contract documents.
   d. Mitchel Metals as an approved manufacturer pending compliance with the contract documents.

2. Substitutions: Comparable products of other manufacturers will be considered under standard substitution procedures.

2.02 MATERIALS

A. Aluminum Members: Extruded aluminum, ASTM B 221, 6063 alloy, T6 temper.

B. Fasteners: Aluminum, 18-8 stainless steel, or 300 series stainless steel.

C. Protective Coating for Aluminum Columns Embedded in Concrete: Clear acrylic.

D. Grout:

1. Portland Cement: ASTM C 150, Type I.
2. Sand: ASTM C 404.
3. Water: Potable.

E. Gaskets: Dry seal santoprene pressure type.

F. Aluminum Flashing: ASTM B 209, Type 3003 H14, 0.040 inch, minimum.

2.03 MIXES

A. Grout: 1 part Portland cement to 3 parts sand, add water to produce a pouring consistency.

2.04 FABRICATION

A. General:

1. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.
2. Welding: In accordance with ANSI/AWS D1.2.
3. Bent Construction: Factory assemble beams to columns to form one-piece rigid bents. Where used make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints can be used if supported by engineering calculations and/or testing.
4. Deck Construction: Fabricate from extruded modules that interlock in a self-flashing manner. Positively fasten interlocking joints creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each. Assemble deck with sufficient camber to offset dead load deflection.

B. Columns: Provide radius-cornered tubular extrusions with cutout and internal diverter for drainage where indicated. Circular downspout opening in column not acceptable.

C. Beams: Provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner.

D. Deck: Extruded self-flashing sections interlocking into a composite unit. Provide welded plate closures at deck ends.

E. Fascia: Manufacturer's standard shape. Provide fascia splices where continuous runs of fascia are jointed. Locate splices to be in line with bents and fasten in place on hidden or non-vertical surfaces.

F. Factory Finishing: Finish designations prefixed by AA comply with system established by the AAMA for designating aluminum finishes.

THE EQUIVALENT NUMBER FOR BELOW IS 204 R1.

1. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.4 mils to 0.7 mils thick), complying with AAMA 611.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

3.02 ERECTION

A. Erect protective cover true to line, level, and plumb. Protect aluminum columns embedded in concrete with clear acrylic. Fill downspout columns with grout to the discharge level to prevent standing water. Install weep holes at top of concrete in non-draining columns to remove condensation.

B. Provide hairline miters and fitted joints.

3.03 CLEANING

A. Clean all protective cover components promptly after installation.

3.04 PROTECTION

A. Protect materials during and after installation.

END OF SECTION 107300

SECTION 22 0110 – PLUMBING GENERAL PROVISIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

B. It is recognized that separate sub-contracts may be instituted by THIS CONTRACT'S GENERAL CONTRACTOR with others. It is the responsibility of THIS CONTRACT'S GENERAL CONTRACTOR to completely inform, coordinate and advise those sub-contractors as to all of the requirements, conditions and information associated with providing and installing their portion of the total job.

1.2 IMPOSED REGULATIONS:

A. Applicable provisions of the State and Local Codes and of the following codes and standards in addition to those listed elsewhere in the specifications are hereby imposed on a general basis for plumbing work. In each case, the prevailing edition shall be the current adopted edition of the state where the project is located.

1. International Plumbing Code.
2. International Gas Code.
3. International Energy Conservation Code.
4. International Fire Code.

1.3 SCOPE OF WORK:

A. Provide all labor, materials, equipment and supervision to construct complete and operable plumbing systems as indicated on the drawings and specified herein. All materials and equipment used shall be new, undamaged and free from any defects.

1.4 EXISTING SERVICES AND FACILITIES:

A. Damage to Existing Services: Existing services and facilities damaged by the Contractor through negligence or through use of faulty materials or workmanship shall be promptly repaired, replaced, or otherwise restored to previous conditions by the Contractor without additional cost to the Owner.

B. Interruption of Services: Interruptions of services necessary for connection to or modification of existing systems or facilities shall occur only at prearranged times approved by the Owner. Interruptions shall only occur after the provision of all temporary work and the availability of adequate labor and materials will assure that the duration of the interruption will not exceed the time agreed upon.

C. Removed Materials: Existing materials made unnecessary by the new installation shall be removed, shall remain the property of the Owner and shall be stored at a location and in a manner as directed, or, if classified by the Owner's authorized representative as unsuitable for further use, shall become the property of the Contractor and shall be removed from the site.

1.5 PRODUCT WARRANTIES:

A. Provide manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed for the Purchaser or Owner by the manufacturer, when and if the product fails within certain operational conditions and time limits. Where the warranty requirements of a specific specification section exceed the manufacturer's standard warranty, the more stringent requirements will apply and modified manufacturer's warranty shall be provided. In no case shall the manufacturer's warranty be less than one (1) year.

1.6 PRODUCT SUBSTITUTIONS:

A. General: Materials specified by manufacturer's name shall be used unless prior approval of an alternate is given by addenda. Requests for substitutions must be received in the office of the Architect at least 10 days prior to opening of bids.

PART 2 – PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS:

A. Standard Products: Provide not less (quality) than manufacturer's standard products, as specified by their published product data. In addition to the indication that a particular product/model number is acceptable, comply with the specified requirements. Do not assume that the available off-the-shelf condition of a product complies with the requirements; as an example, a specific finish or color may be required.

B. Uniformity: Where multiple units of a general product are required for the work, provide identical products by the same manufacturer, without variations except for sizes and similar variations as indicated.

C. Product Compatibility, Options: Where more than one product selection is specified, either generically or proprietarily, selection is Purchaser's or Installer's option. Provide adaptations as needed for interfacing of selected products in the work.

D. Equipment Nameplates: Provide a permanent operational data nameplate on each item of power operated equipment, indicating the manufacturer, product name, model number, serial number, speed, capacity, power characteristics, labels of tested compliance, and similar essential operating data.

E. Locate nameplates in easy-to-read locations. When product is visually exposed in an occupied area of the building, locate nameplate in a concealed position (where possible) which is accessible for reading by service personnel.

PART 3 – EXECUTION

3.1 PRODUCT INSTALLATION, GENERAL:

A. Except where more stringent requirements are indicated, comply with the product manufacturer's installation instructions and recommendations, including handling, anchorage, assembly, connections, cleaning and testing, charging, lubrication, startup, test operation and shut-down of operating equipment. Consult with manufacturer's technical experts, for specific instructions on unique product conditions and unforeseen problems.

B. Protection and Identification: Deliver products to project properly identified with names, models numbers, types, grades, compliance labels and similar information needed for distinct identifications; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior storage.

C. Permits and Tests: Provide labor, material and equipment to perform all tests required by the governing agencies and submit a record of all tests to the Owner or his representative. Notify the Architect five days in advance of any testing.

END OF SECTION 22 0110

SECTION 22 0120 – PLUMBING STANDARDS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Industry Standards: It is a general requirement that plumbing work comply with applicable requirements and recommendations of standards published by listed agencies and trade associations, except to the extent more detailed and stringent requirements are indicated or required by governing regulations. Listing of Associations, Standards, and Abbreviations:

1.	AGA	American Gas Association 1515 Wilson Blvd. Arlington, VA 22209
2.	ASHRAE	American Society of Heating, Refrigerating & Air Conditioning Engineers, Inc. 1791 Tullie Circle, NE, Atlanta, GA. 30329 404/636-8400
3.	AWS	American Welding Society, Inc. 2501 NW 7th St., Miami, FL 33125 305/642-7090
4.	CISPI	Cast Iron Soil Pipe Institute 2020 K. St., NW, Washington, DC 202/233-4536
5.	NEC	National Electrical Code by NFPA
6.	NEMA	National Electrical Manufacturers Association 1300 N 17th Street, Suite 1847 Rosslyn, VA 22209 703/841-3200
7.	NFPA	National Fire Protection Association 407 Atlantic Ave., Boston, MA 02210 617/482-8755
8.	UL	Underwriters' Laboratories, Inc. 207 East Ohio St., Chicago, IL 60611 312/642-6969

PARTS 2 AND 3 – PRODUCTS AND EXECUTION (Not applicable)

END OF SECTION 22 0120

SECTION 22 0210 – PLUMBING COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Plumbing Coordination Drawings: Prepare a set of coordination drawings showing the coordination of the major elements, components and systems of the plumbing work, and showing the coordination of plumbing work with other work. Prepare drawings at accurate scale and sufficiently large to show locations of every item, including clearances for installing, maintaining, insulating, breaking down equipment, replacing motors and similar requirements. Prepare drawings to include plans, elevations, sections and details as needed to conclusively show successful coordination and integration of the work. Submit drawings for review by the Architect/Engineer.

B. Coordinate the actual location of all plumbing work visible in finished spaces with the Architect/Engineer.

PART 2 – PRODUCTS

2.1 PRODUCT COORDINATION:

A. Power Characteristics: Refer to the electrical sections of the specifications and the electrical drawings for the power characteristics available for the operation of each power driven item of equipment. The electrical design was based on the typical power requirements of the equipment manufacturers scheduled or specified. Any modifications to the electrical system which are required due to the use of an approved equivalent manufacturer shall be made at no additional cost to the owner. All changes must be clearly documented and submitted for review by the Architect/Engineer prior to purchasing equipment. Coordinate purchases to ensure uniform interface with electrical work. The plumbing contractor shall furnish a detailed list of equipment electrical characteristics to the electrical contractor for the purpose of preparing the coordination affidavit required by Division 26.

B. Coordination of Options and Substitutions: Where the contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, do not proceed with purchasing until coordination of interface of equipment has been checked and satisfactorily established.

C. Firestopping: Refer to architectural drawings for the locations of all fire rated ceilings, floors and walls. The contractor shall furnish detailed shop drawings of all firestopping details to be

used for both piping and ductwork. All firestopping details shall be U.L. listed and subject to approval by the Authority having jurisdiction.

PART 3 – EXECUTION

3.1 INSPECTION AND PREPARATION:

A. Substrate Examination: The Installer of each element of the work must examine the condition of the substrate to receive the work, and the conditions under which the work will be performed, and must notify the Contractor in writing of conditions detrimental to the proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Do not proceed with the installation of sleeves, anchors, hangers, roof penetrations and similar work until coordination drawings have been processed and released for construction. Where work must be installed prior to that time in order to avoid a project delay, review proposed installation in a project coordination meeting including all parties involved with the interfacing of the work.

3.2 CUTTING AND PATCHING:

A. Structural Limitations: Do not cut structural framing, walls, floors, decks and other members intended to withstand stress, except with the Architect's or Engineer's written authorization. Authorization will be granted only where there is not other reasonable method for completing the work, and where the proposed cutting clearly does not materially weaken the structure.

B. Where authorized, cut opening through concrete (for pipe penetrations and similar services) by core drilling or sawing. Do not cut by hammer-driven chisel or drill.

C. Other work: Do not endanger or damage other work through the procedures and processes of cutting to accommodate mechanical work. Review the proposed cutting with the Installer of the work to be cut, and comply with his recommendations to minimize damage. Where necessary, engage the original Installer or other specialists to execute the cutting in the recommended manner.

D. Where patching is required to restore other work, because of either cutting or other damage inflicted during the installation of plumbing work, execute the patching in the manner recommended by the original Installer. Restore the other work in every respect, including the elimination of visual defects in exposed finishes, as judged by the Architect. Engage the original Installer to complete patching of the following categories of work:

1. Exposed concrete finishes.
2. Exposed masonry.
3. Waterproofing and vapor barriers.
4. Roofing, flashing and accessories.
5. Interior exposed finishes and casework, where judged by the Architect to be difficult to achieve an acceptable match by other means.

3.3 COORDINATION OF PLUMBING INSTALLATION:

A. General: Sequence, coordinate and integrate the various elements of plumbing work so that building systems will perform as indicated and be in harmony with other work of the building. The Architect/Engineer will not supervise the coordination, which is the exclusive responsibility of the Contractor. Comply with the following requirements:

1. Install piping and similar services straight and true, aligned with other work and with overhead structures and allowing for insulation where applicable. Conceal where possible.
2. Arrange work to facilitate maintenance and repair or replacement of equipment. Locate services requiring maintenance on valves and similar units in front of services requiring less maintenance. Connect equipment for ease of disconnecting, with minimum of interference with other work.
3. Give the right-of way to piping systems required to slope for drainage (over other service lines). Piping shall be located to avoid interference with ductwork and light fixtures.
4. Store materials off the ground and protected from standing water and weather.

B. Drawings: Conform with the arrangement indicated by the contract documents to the greatest extent possible, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, comply with the Architect's decision on resolution of the conflict.

C. Electrical Work: Coordinate the plumbing work with electrical work, and properly interface with the electrical service. In general, and except as otherwise indicated, install plumbing equipment ready for electrical connection. Refer to electrical sections of the specifications for electrical connection of plumbing equipment.

D. Utility Connections: Coordinate the connection of plumbing systems with exterior underground utilities and services. Comply with the requirements of governing regulations, franchised service companies and controlling agencies. Provide a single connection for each service except where multiple connections are indicated.

END OF SECTION 22 0210

SECTION 22 0220 – PLUMBING SUBMITTALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUBMITTAL FORMS AND PROCEDURES:

A. The purpose of submittals is to demonstrate to the Architect/Engineer that the Contractor understands the design concept. The Architect/Engineer's review of such drawings, schedules, or cuts shall not relieve the Contractor from responsibility for deviation from drawings or specifications unless he has, in writing, called the Architect/Engineer's attention to such deviations at the time of submission, and has received from the Architect/Engineer, in writing, permission for such deviations. All submittals must be completely checked by the Contractor prior to submission for review.

B. Hard Copy Submittals: Submittal data shall be placed in one or more hard-back 3-ring binders, arranged and labeled according to specification section. Each binder shall contain a title page and table of contents. Provide separator tabs, and label by specification section. Make note in the table of contents, any drawings that accompany the submittal. Title page shall contain Project Name, Contractor’s Name, Division 22 Superintendent’s name, Suppliers and point of contact for each, and date. Except as otherwise indicated in other sections, submit 5 complete copies. Quantity indicated does not include copies required for regulatory agencies.

C. Electronic Submittals: If the Architect agrees to allow electronic submittals via an on-line information management product such as “Submittal Exchange, etc., all electronic submittal files shall be organized to match the bid documents for specification section and name. Each submittal file shall be complete for each specification section. Multiple partial submittals per specification section will be rejected. Make note in the table of contents, any drawings that accompany the submittal. Title page shall contain Project Name, Contractor’s Name, Division 22 Superintendent’s name, Suppliers and point of contact for each, and date.

D. Submittals shall be made for all items contained in the following specification sections:

1. Plumbing Coordination
2. Plumbing Identification
3. Plumbing Pipe, Tube, and Fittings
4. Plumbing Hangers and Supports
5. Plumbing Vibration and Seismic Control
6. Plumbing Piping Systems Insulation
7. Gas Piping System
8. Domestic Water Piping System
9. Soil, Waste and Vent Piping System

10. Water Heaters
11. Plumbing Fixtures

E. Response to Submittals: A Submittal Review Report shall be issued by the Architect/Engineer with the following classifications for each item:

1. **"No Exceptions Taken"**: No corrections, no marks. Contractor shall submit copies for distribution.
2. **"Make Corrections Noted"**: A few minor corrections. Items may be ordered as marked up without further resubmission. Submit copies for distribution.
3. **"Revise and Resubmit"**: Minor corrections. Item may be ordered at the Contractor's option. Contractor shall resubmit drawings with corrections noted.
4. **"Rejected"**: Major corrections or not in accordance with the contract documents. No items shall be ordered. Contractor shall correct and resubmit drawings.

PART 2 – PRODUCTS

2.1 SUBMITTAL REQUIREMENTS:

A. General: Each specification section shall list the required submittal items. All submittal items shall conform to the requirements listed below. For each major section of submittal data, include a summary page which lists items and model numbers for each piece of equipment.

B. Shop Drawings: Prepare shop drawings to accurate scale except where diagrammatic representations are specifically indicated. Show clearance dimensions of critical locations, and show dimensions of spaces required for operation and maintenance of equipment. Show piping connections and other service connections, and show interface with other work including structural support. Indicate by note, the portions of plumbing work shown on the shop drawings which deviated from the indication of work in the contract documents, and explain the reasons for the deviations. Show how such deviations coordinate with interfacing deviations on shop drawings for other portions of the work, currently or previously submitted.

C. Manufacturer's Data: Where pre-printed data is submitted for more than one distinct product, size, type, material, trim, accessory group or other variation, mark submitted copy with black pen to indicate which of the variations is to be provided. Delete or mark-out significant portions of preprinted data which are not applicable. Where operating ranges are shown, mark data to show portion of range required for project application. Expansion or elaboration of standard data to describe a non-standard product must be processed as a shop drawing submittal. For each product include the manufacturer's production specifications, installation or fabrication instructions, nearest source of supply (including telephone number), sizes, weights, speeds, operating capacities, piping and service line connection sizes and locations, statements of compliance with required standards and governing regulation (include manufacturer's signed statements if not covered in printed data), performance data (where applicable) and similar information needed to confirm compliance with the requirements.

D. Certifications: Where specifically indicated, submit with notarized execution.

E. Test Reports: Submit test reports which have been signed and dated by the firm performing the test and prepared in the manner specified in the standard or regulation governing the test procedures as indicated.

F. Manufacturer's Product Warranties: Where pre-printed and published warranty includes substantial deviation from required warranty (as judged by the Architect or Engineer), product is automatically disqualified from use on the project, except where manufacturer prepares and issues a specific product warranty on the product, stating that it is in lieu of the published warranty, and is executed by an authorized officer, and complies with the requirements. Warranties shall comply with the requirements of individual specification section where those requirements exceed the manufacturer's standard warranty.

PART 3 – EXECUTION

3.1 CLOSEOUT REQUIREMENTS:

A. Operating Instructions: Submit manufacturer's operating instructions for each item of plumbing equipment and supplement with additional project application instructions where necessary. Prepare and submit specific operating instructions for charging, start-up, control or sequencing of operation, phase or seasonal variations, shut-down, safety and similar operational instructions. Prepare in typewritten form in completely explained and easily understood English language.

B. Maintenance Manuals: Organize each copy of the required system maintenance manuals to include an index followed by thumb-tab marked sections for each of the following:

1. System operating instructions.
2. Emergency instructions including addresses and telephone numbers of service sources.
3. Regular system maintenance procedures including lubrication.
4. Spare parts listing and stocking recommendations.
5. Inspection, adjusting, rebalancing, cleaning, parts replacement, and similar maintenance instructions and recommendations, including the proper use of tools and accessories.
6. Valve schedule and control diagram for each system.
7. Manufacturer's data for each operating item in each system.
8. Manufacturer's product warranties and guarantees relating to the system and equipment items in the system.
9. Corrected or approved issues of submittal items relating to the system.
10. Bind each maintenance manual in one or more vinyl-covered, 2", 3-ring binder, plus pocket-folder type binders for folded drawings, and mark the back spine of each binder with system identification and volume number.

C. Maintenance Materials: Deliver to Owner’s representative at the location as directed, in containers or packages suitable for storage and fully identified.

D. Guarantees: Where indicated as "Certified", provide guarantee which, in addition to execution by an authorized officer of each guarantor, is attested to by the Secretary of each guarantor and bears the corporate seal.

END OF SECTION 22 0220

SECTION 22 0230 – PLUMBING IDENTIFICATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in the manufacture of identification systems required for this product.

B. Submittals: Submit manufacturer's data on materials and submit a sample of each type required.

PART 2 – PRODUCTS

2.1 PLUMBING IDENTIFICATION MATERIALS:

A. Plastic Pipe Markers:

1. General: Product manufacturer's standard pre-printed, flexible or semi-rigid, permanent, color-coded, plastic-sheet pipe markers, complying with ANSI A13.1.
2. Small Pipe: For external diameters less than 6 inches (including insulation, if any), provide full band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
   a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
   b. Adhesive lap joint in pipe marker overlap.
   c. Laminated or bonded application of pipe marker to pipe (or insulation).
   d. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4 inch wide; full circle at both ends of pipe marker, tape lapped 1-1/2 inch.
3. Large Pipes: For external diameters of 6 inches and larger (including insulation, if any), provide either full-band or strip-type pipe markers, but not narrower than 3 x letter height (and of required length), fastened by one of the following methods:
   a. Laminated or bonded application of pipe marker to pipe (insulation).
   b. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2 inches wide: full circle at both ends of pipe marker, tape lapped 3 inches.
4. Lettering: Comply with piping system names as specified, scheduled or shown, and abbreviate only as necessary for each application length.
5. Arrows: Print each pipe marker with arrow indicating direction of flow, either integrally with piping system service lettering or as separate unit of plastic (to accommodate both directions).
6. Install pipe markers on piping of the following piping systems:

Domestic Cold Water
Domestic Hot Water
Dom. Hot Water Return
Natural Gas

B. Plastic Tape: Manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick:

1. Width: Provide 1-1/2 inches wide tape markers on pipes with outside diameters including insulation of less than 6 inches, 2-1/2 inches wide tape on larger pipes.
2. Color: Comply with ANSI A13.1.

C. Engraved Plastic-Laminate Signs:

1. General: Provide engraving stock melamine plastic laminated, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core, letter color, except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
2. Thickness: 1/16 inch, except as otherwise indicated.
3. Fasteners: Self-tapping stainless steel screws, except contact type permanent adhesive where screws cannot or should not penetrate the substrate.

D. Valve Tags:

1. Valve tags shall be 18 gauge (minimum) brass with 1-1/4" (minimum) height and width. Identification letters and numbers shall be stamped in tag and shall be filled with black paint
2. Valve tags shall be attached to valve using cable ties. Cable ties shall be self-locking nylon ties.
3. Valve tags shall be installed at all shut-off, balancing, metering, and drain valves. Valve tag shape and designations shall be as follows:

Identification System	Shape	Numbers
Domestic Cold Water	Hexagonal	CW-1, 2, 3, ...
Domestic Hot Water	Hexagonal	HW-1, 2, 3, ...
Dom. Hot Water Return	Hexagonal	HWR-1, 2, 3, ...
Natural Gas	Octagonal	NG-1, 2, 3, ...

E. Valve Charts:

1. Valve charts shall be provided for plumbing systems. Charts shall be located janitor closet.
2. Valve charts shall be typed listing all valve tags. List shall include identification number, valve location in system (e.g., Corridor 123, Water Heater WH-1, etc.) and its function (e.g., shut-off, balancing, drain, etc.). Charts shall be mounted in a wooden frame with glass cover.

2.2 LETTERING AND GRAPHICS:

A. General: Coordinate names, abbreviations and other designations used in the identification work, with the corresponding designations shown, specified or scheduled. Provide numbers, lettering recommended by manufacturers or as required for proper identifications and operation/maintenance of the systems and equipment.

B. Multiple Systems: Where multiple systems of the same generic name are shown and specified, provide identification which indicates the individual system number as well as the service.

PART 3 – EXECUTION

3.1 APPLICATION AND INSTALLATION:

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting and other covering or finish, including valve tags in finished spaces, install identification after completion of covering or painting.

B. Piping System Identification:

1. General: Install pipe markers on each system indicated to receive identification, and include arrows to show normal direction of flow.

C. Locate pipe markers as follows wherever piping is exposed to view in mechanical rooms, accessible maintenance spaces (including accessible areas above ceilings) and exterior non-concealed locations:

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures. Mark each pipe at branch, where there could be a question of flow pattern.
3. Near locations where pipes pass through walls or ceilings, or enter non-accessible enclosures.
4. Near major equipment items and other points of origination and termination.
5. Spaced intermediately at maximum spacing of 50 feet along each piping run, except reduce spacing to 25 feet in congested areas of piping and equipment.

D. Do not mark piping exposed in finished occupied spaces.

E. Plumbing Equipment Identification: Install an engraved plastic laminate sign on or near each major item of plumbing equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for all major items of plumbing equipment.

F. Valve tags shall be attached to the valve handwheel with cable ties.

END OF SECTION 22 0230

BRUNSWICK HIGH SCHOOL

SECTION 22 0240 – PLUMBING WORK CLOSEOUT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DOCUMENTATION PROCEDURES:

A. Signed Commitments: Do not proceed with transfer of plumbing systems to the Owner for operation until warranties, performance certifications and similar commitments to be signed by Contractor and other entities have been executed and transmitted to Architect (for Owner's records).

1.3 RECORD DRAWINGS:

A. Explanation: Except where otherwise indicated, plumbing drawings (contract drawings) prepared by Architect/Engineer, contract/drawings, are diagrammatic in nature and may not show locations accurately for various components of plumbing systems. Shop drawings, including coordination drawings, prepared by Contractor shall show certain portions of work more accurately to scale and location, and in greater detail.

B. General Recording Procedure: Maintain a white-print set, blue-line or black-line, of plumbing contract drawings and shop drawings in clean, undamaged condition, for mark-up of actual installations which vary substantially from the work as shown. Mark-up whatever drawings are most capable of showing the installed conditions accurately; however, where shop drawings are marked, record a reference note on appropriate contract drawing. Mark with erasable pencil and use multiple colors to aid in the distinction between work of separate systems. In general, record every substantive installation of plumbing work which previously is either not shown or shown inaccurately, but in any case record the following:

1. Underground and aboveground piping, both exterior and interior, drawn to scale and fully dimensioned.
2. Plumbing "Project Record" shall be maintained as part of the "Project Record" specified in Division 1.

PART 2 – PRODUCTS

2.1 NOT APPLICABLE:

PART 3 – EXECUTION

3.1 CLOSEOUT PROCEDURES:

A. General Coordination: Sequence closeout procedures properly, so that work will not be endangered or damaged, and so that every required performance will be fully tested and demonstrated.

B. System Performance Test Run: At the time of plumbing work closeout, check each item in each system to determine that it is set for proper operation. With Owner's representative and Architect/Engineer present, operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During or following test runs, make final corrections or adjustments of system to refine and improve performances wherever possible, including noise and vibration reductions, elimination of hazards, better response of controls, signals and alarms, and similar system performance improvements. Provide testing or inspection devices as may be requested for Architect's/Engineer's observation of actual system performances. Demonstrate that controls and items requiring service or maintenance are accessible. Test run shall be scheduled to coincide with Engineer's final inspection of the plumbing work.

C. Cleaning and Lubrication: After final performance test run of each plumbing system, clean system both externally and internally. Flush piping system by operating drains and similar means, and clean strainers and traps. Lubricate both power and hand operated equipment and remove excess lubrication. Touch-up minor damage to factory painted finishes and other painting specified as plumbing work; refinish work where damage is extensive.

D. General Operating Instructions: In addition to specified training of Owner's operating personnel specified in individual plumbing sections, and in addition to preparation of written operating instructions and compiled maintenance manuals specified, provide general operating instructions for the plumbing systems. Conduct a walk-through explanation and demonstration for orientation and education of Owner's personnel to be involved in continued operation of building.

1. Describe each basic system and how its control system functions, including flow adjustments, temperature control and similar operations.
2. Explain and point out identification system, displayed diagrams, signals, alarms and similar provisions of the work.
3. Describe basic sequencing requirements and interlock provisions for system start-up, phasing and shut-down.
4. Emphasize emergency procedures and safety provisions for protection of equipment and safety of occupants during equipment malfunction, disasters, power failures and similar unusual circumstances.
5. Outline basic maintenance procedures.

E. Demonstrate what adjustments have been made and can continue to be made to reduce noise and vibration, improve system output, decrease energy consumption and similar performance improvements.

F. Point out operational security provisions, safety, unavoidable hazards and similar operator limitations. Display and conduct a "thumb-through" explanation of maintenance manuals, record drawings, meter readings and similar service items.

G. Construction Equipment: After completion of performance testing and Owner's operating instructions and demonstrations, remove installers tools, test facilities, construction

equipment and similar devices and materials used in execution of the work but not incorporated in the work.

3.2 CONTINUED SYSTEM OPERATIONS:

A. Final Acceptance: At time of substantial completion of plumbing work, Owner's operating personnel will take over operation of plumbing systems. However, until time of final acceptance, respond promptly with consultation and services on whatever operation or maintenance problems may remain or arise.

END OF SECTION 22 0240

SECTION 22 0310 – PLUMBING PIPE, TUBE AND FITTINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Industry Standards:

1. Qualify welding procedures, welders and operators in accordance with ASME B31.1 for shop and project site welding of piping work.
2. Certify welding of piping work using the Standard Procedure Specifications by, and welders tested under supervision of, the National Certified Pipe Welding Bureau.
3. Where plastic piping is indicated to transport potable water, provide pipe and fittings bearing approval label by the National Sanitation Foundation (NSF).

B. SUBMITTALS:

1. Submit manufacturer's data, welding certifications, test reports, and product warranties as applicable for all piping materials.
2. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable style number.

PART 2 – PRODUCTS

2.1 PIPING MATERIALS:

A. General: Provide pipe and tube of the type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements and comply with governing regulations and industry standards.

B. Black Steel Pipe: ASTM A 53, Schedule 40.

C. Copper Tube: ASTM B88-89 Type (wall thickness) as indicated for each service; hard-drawn temper, except as otherwise indicated. Solder for use on domestic water piping shall be lead free type.

D. Plastic Pipe:

1. PVC-DWV: ASTM D2665-88

2. ABS-DWV: ASTM D2661-87

E. Plastic Pipe - Natural Gas Service:

1. Polyethylene: ASTM D2513

2.2 PIPE/TUBE FITTINGS:

A. General: Provide factory-fabricated fittings of the type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube valve or equipment connections in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

B. Welded Fittings for Steel Pipe: ASTM A234.

C. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by the Installer to comply with installation requirements.

1. Tin-Antimony Solder: ASTM B 32, Grade 95TA.

D. Mechanical Couplings for Hard Copper Tube: Coupling housings shall be ductile iron (ASTM A536), coated with copper colored alkyd enamel and cast with angle-pattern bolt pads for system rigidity. Bolts and nuts shall be carbon steel track-type (ASTM A183), minimum tensile 110,000 psi. Gaskets shall be Grade “E” EPDM FlushSeal® type, for water services from -30 to +230EF. Mechanical couplings shall be by Victaulic, Anvil or Grinnell.

E. Mechanical Couplings for Copper Pipe: Fittings 2"-4" size shall be wrought copper (ASTM B75 C12200 or ASTM B152 C11000 and ANSI B 16.22). Fittings 5" - 8" size shall be bronze sand casting (ASTM B584-87) or copper alloy CDA844 (81-3-7-9) (ANSI B 16.18). Fittings shall have pre-grooved ends for use with mechanical couplings of the same manufacturer. Fittings shall be manufactured to copper tubing sizes. (Flaring of tube and fitting ends to IPS dimensions is not allowed.)

F. Solvent Cement for PVC Joints: D2564-88.

G. Solvent Cement for ABS Joints: D2235-88.

H. Pipe Sleeves:

1. Iron Pipe Sleeves: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
2. Sheet Metal Pipe Sleeves: Fabricate from galvanized sheet metal closed with lock-seam joints. For following pipe sizes provide gauge indicated: 3 inch pipe and smaller, 20 gauge; 4 to 6 inch pipe, 16 gauge; over 6 inch pipe, 14 gauge.
3. Pipe Sleeve Caulking: 3M Fire Barrier Caulk, CP25N/S, except where another caulking system or material is specified or approved by Jaco or Flamestopper.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. General: Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with a minimum of joints and couplings, but with adequate and accessible unions for disassembly and maintenance/ replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance.

1. Comply with ASME B31.1 Code for Pressure Piping.

B. Locate piping runs as indicated on the drawings. Route vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown, or described by diagrams, details and notations or, if not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building and its equipment. Where possible, locate insulated piping for 1.0" clearance outside insulation. Changes in direction shall be made with fittings.

C. Piping System Joints: Provide joints of the type indicated in each piping system.

D. Welded Joints: Weld pipe joints in accordance with recognized industry practice and as follows: Weld pipe joints only when ambient temperature is above 0 degrees F. where possible. Bevel pipe ends at a 37.5 degree angle where possible, smooth rough cuts and clean to remove slag, metal particles and dirt. Install welding rings for butt welded joints. Use pipe clamps or tack-weld joints with 1.0" long welds; 4 welds for pipe sizes to 10". Build up welds with a stringer-bead pass, followed by a hot pass, followed by a cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow holes and non-metallic inclusions. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements. Install forged branch-connection fittings wherever branch pipe is indicated, or install regular "T" fitting (at Contractor's option).

E. Mechanical Coupling Joints: Square cut pipe ends and deburr. Roll-groove pipe ends to manufacturer’s specifications. Lubricate gaskets completely on interior and exterior using a non-petroleum based lubricant. Slide gasket over pipe ends between grooves. Engage coupling housing into grooves and tighten until housing bolt pads are in full contact on each side of joint. For pipes 2 inches and smaller, no groove is required. Mark pipe ends for proper insertion into couplings and fittings. Engage piping into fitting to full depth, indicated by marked pipe ends. Align pipe ends, position compression tool and press trigger until assembly cycle is complete. All grooved couplings, fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer’s factory trained field representative shall provide on-site training for contractor’s field personnel in the proper use of grooving tools, application of groove and

installation of grooved piping products. Factory trained representative shall periodically inspect the product installation. Contractor shall remove and replace any improperly installed products.

F. Soldered Joints: Solder copper tube and fitting joints where required, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings with steel wool. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens. Use a non-corrosive paste flux and wire solder composed of 95 percent tin and 5 percent antimony.

G. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations and with applicable industry standards. Install all storm, soil, waste and vent plastic pipe underground in compliance with ASTM D 2321.

H. Insulating (Dielectric) Nipples: Comply with manufacturer's instructions for installing nipples in a manner which will prevent galvanic action and stop corrosion where the joining of ferrous and non-ferrous piping occurs.

I. Pipe Sleeves: Install pipe sleeves of the types specified wherever piping passes through the walls, floors or structural members of the work. Provide sleeves of adequate size, accurately centered in pipe runs. Size sleeves so that piping and insulation will have free movement in the sleeve, including allowance for thermal expansion. Where insulation includes a vapor barrier covering provide sleeve with sufficient clearance for installation of vapor barrier. Install length of sleeve equal to thickness of construction penetrated, except extend floor sleeves 0.25 inches above floor finish. Provide temporary support of sleeves during placement of concrete and other work around sleeves and provide temporary closure to prevent concrete and other materials from entering pipe sleeves.

1. Sleeve Type: At interior partitions and ceilings, install sheet metal sleeves.
2. Sleeve Type: At exterior penetrations both above and below grade, install iron pipe sleeves.
3. Sleeve Type: Except as otherwise specified, install steel pipe sleeves.
4. Caulk pipe sleeves at exterior penetrations and at other locations where indicated. Provide sufficient quantities of oakum and lead to make permanent weather-tight closure between sleeve and piping, slightly recessed at exposed surface.

J. PVC piping exposed to sunlight shall be coated with water-based latex white paint to prevent UV light degradation.

3.2 CLEANING, FLUSHING AND INSPECTING:

A. General: Clean exterior surfaces of installed piping systems of superfluous materials and prepare for application of specified coatings.

B. Flush out piping system with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

3.3 PIPING TESTS:

A. General: Provide temporary equipment for testing, including pump and gages. Test piping systems before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating.

1. Required test period is 2 hours.

B. Unless otherwise specified for specific systems, hydraulically test each pressurized piping system at 150% of operating pressure indicated, but not less than 100 psig test pressure.

C. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

D. Repair piping systems sections which fail the required piping test, by disassembly and re-installation, using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compound, mastics, or other temporary repair methods. Drain test water from piping systems after repair work and retesting has been completed.

END OF SECTION 22 0310

SECTION 22 0320 – PLUMBING HANGERS AND SUPPORTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties on all items.

PART 2 – PRODUCTS

2.1 HANGERS AND SUPPORTS:

A. General: Except as otherwise indicated, provide factory-fabricated piping hangers and supports of the type specified complete with bolts and washers. Comply with the manufacturer's published product information. Size hangers and supports properly for piping and weight of the medium being transported. Provide insulation shields for all insulated piping.

B. Hangers for domestic hot and cold water piping shall be copper plated band type with adjusting nut; Grinnell, Fig. CT-69, B-Line Fig. B 3172CT, or equivalent by Michigan Hanger, PHD Manufacturing or Hubbard Enterprises/Holdrite.

C. Hangers for cast iron or plastic drain and vent piping, and natural gas piping shall be Clevis type, B-Line Fig. B 3100, or equivalent by Grinnell, Michigan Hanger, PHD Manufacturing or Hubbard Enterprises/Holdrite.

D. Special Hangers: Special hangers and attachments shall be as detailed or indicated on the drawings.

PART 3 – EXECUTION

3.1 HORIZONTAL PIPING SUPPORT:

A. Maximum spacing of hangers and supports for above-ground horizontal pipe and tubing shall be as follows:

1. Cast-iron pipe (all sizes) shall be supported at not more than five foot intervals and near each hub or hubless pipe joint and at multiple fittings as required.

B. Steel Pipe:

Nominal Pipe Size (inches)	Support Spacing (feet)
1-1/4 & smaller	7
1-1/2	9
2	10
2-1/2	11
3 & larger	12

C. Copper Tubing:

Tubing Size (inches)	Support Spacing (feet)
3/4 & smaller	5
1 to 2-1/2	6
3	10
4 and larger	12

D. Plastic Pipe:

Nominal Pipe Size (inches)	Support Spacing (feet)
3/4	3.0
3/4 to 1	3.5
1-1/4 to 1-1/2	4.0
2 to 2-1/2	4.5
3 and larger	5.5

E. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated, or by other recognized industry methods.

F. Branch piping located in walls, partitions or pipe chases shall be rigidly supported inside the wall or chase.

G. Piping installed above a roof shall be supported on pre-fabricated, non-penetrating supports by *Pipe Pier* or approved equal. Provide matching adjustable elevation kits.

3.2 VERTICAL PIPING SUPPORT:

A. Cast Iron Pipe: Support at each floor and support at each base and roof level with pipe clamps.

B. Plastic Piping: Support at 8 feet maximum intervals and near each joint.

C. Copper Tubing: Support at riser tops and 5 feet maximum on center for pipe 1-1/2" and larger and 4 feet on center for pipe 1-1/4" and smaller. Use copper plated pipe clamps.

D. Steel Pipe: Supports at top and bottom of riser and on 10 feet maximum centers.

E. Fixture Supports: See Fixture Schedule. Provide concealed supports and carriers recommended by the manufacturer of the fixtures and equipment to suit the structural and finish conditions.

3.3 ADJUSTMENT OF HANGERS AND SUPPORTS:

A. Adjust hangers and supports to bring piping to proper level, elevations and slopes.

END OF SECTION 22 0320

SECTION 22 0330 – PLUMBING EXCAVATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Coordination: Where excavation and backfill for plumbing work passes through or occurs in the same areas as work specified in the Division 2 sections, comply with both the requirements of the Division 2 sections and the requirements of this section, whichever is the more stringent (as determined by the Architect/Engineer in cases of conflicting requirements).

1.3 JOB CONDITIONS:

A. Existing Utilities: Locate and protect existing utilities and other underground work in a manner which will ensure that no damage or service interruption will result from excavating and backfilling.

PART 2 – PRODUCTS

2.1 BACKFILL MATERIALS:

A. Subbase Material: A graded mixture of gravel, sand, crushed stone or crushed slag.

PART 3 – EXECUTION

3.1 EXCAVATING:

A. Inspection: The excavator must examine the areas to be excavated, and the conditions under which the work is to be performed, and notify the Contractor in writing of conditions detrimental to the proper completion of the work. Do not proceed with excavating until unsatisfactory conditions have been corrected in a manner acceptable to the excavator.

B. General:

1. Do not excavate until the work is ready to proceed without delay, so that the total time lapse from excavation to completion of backfilling will be minimum.

2. Provide signs, illuminations and barricades as necessary to prevent accidents at excavations.
3. Excavate with vertical sided excavations to the greatest extent possible, except where otherwise indicated. Where necessary, provide sheeting and cross-bracing to sustain sides of excavations. Remove sheeting and cross-bracing during backfilling wherever such removal would not endanger the work or other property. Where not removed, cut sheeting off at a sufficient distance below finished grade to not interfere with other work.
4. Excavate for piping with 6" to 9" clearance both sides of pipe, except where otherwise shown or required for proper installation of pipe joints, fittings, valves and other work. Provide a minimum of 12" clearance around underground tanks.
5. For work to be supported directly on undisturbed soil, do not excavate beyond required depths, and hand excavate the bottom cut to accurate elevations. Except as otherwise indicated, support the following work on undisturbed soil at the bottom of the excavations:
   a. Piping of 5" and less pipe/tube size.
   b. Cast-in-place concrete.
6. Where directed, excavate additional depth to reach satisfactory soil-bearing conditions. Backfill with subbase material, compacted as directed, to indicated excavation depth.
7. Except as otherwise indicated, excavate for exterior water-bearing piping so that the top of piping will not be less than 2'- 0" vertical distance below finished grade.
8. Store excavated material (temporarily) near the excavation, in a manner which will not interfere with or damage the excavation or other work.
   a. Retain excavated material which complies with the requirements for backfill material.
   b. Dispose of excavated material which is either in excess of quantity needed for backfilling or does not comply with requirement for backfill material.

3.2 DEWATERING:

A. Maintain dry excavations by removing water. Pump minor inflow of ground water from excavations; protect excavations from major inflow of ground water by installing temporary sheeting and waterproofing. Provide adequate barriers which will protect other excavations from being damaged by water, sediment or erosion from or through excavations.

3.3 BASE PREPARATION:

A. Install subbase material to receive plumbing work, and compact by tamping to form a firm base for the work. For piping, shape the subbase to fit the shape of the bottom 90 degrees of the cylinder, for uniform continuous support.

B. Shape subbases and bottoms of excavations with recesses to receive pipe bells, flanges connections, valves and similar enlargements in the piping systems.

3.4 BACKFILLING:

A. Do not backfill until installed work has been tested and accepted, wherever testing is indicated.

B. Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to the required densities. Do not backfill with frozen soil materials.

C. Backfill simultaneously on opposite sides of work, and compact simultaneously; do not dislocate the work from installed positions.

D. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM Standard Proctor), using power-driven hand-operated compaction equipment.

1.	Lawn/Landscaped Areas:	90%
2.	Roadways:	95%
3.	Paved Area, Other than Roadways:	95%

E. Backfill to elevations matching adjacent grades, at the time of backfilling excavations for mechanical work.

F. Where compaction tests indicate lower densities of backfill than specified, continue compaction (and re-excavation and backfilling where necessary) and provide additional testing as directed by the Architect/Engineer.

3.5 PERFORMANCE AND MAINTENANCE:

A. Where subsidence is measurable or observable at plumbing work excavations during the guarantee period, remove the surface (pavement, lawn or other finish), add backfill material, compact and replace the surface treatment. Restore the appearance, quality and condition of the surface or finish to match adjacent work, and eliminate evidence of the restoration to the greatest extent possible.

END OF SECTION 22 0330

SECTION 22 1110 – DOMESTIC WATER PIPING SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Code Compliance: Comply with governing regulations which require the products used for domestic water piping work to be selected from lists in certain published standards or codes as indicated therein.

1.3 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties as applicable for all items.

B. Provide certified copy of contractor’s sterilization test.

PART 2 – PRODUCTS

2.1 PIPING MATERIALS:

A. General: Comply with section 220310 for product requirements of piping materials. For each service, provide the piping materials indicated including, pipe, fitting, hangers supports, anchors, valves and accessories. Where more than one type is indicated, selection is Installer's option. Where type is not otherwise indicated, provide materials complying with governing regulations.

B. Service Water Piping:

1. Pipe Sizes 4" and Smaller:	Copper tube of the size indicated.
2. Wall Thickness:	Type K
3. Fittings:	Wrought copper-solder joint (with lead free solder).

C. Water Distribution Piping:

1. Pipe Sizes 4" and Smaller:	Copper tube of the size indicated.
2. Wall Thickness:	Type K (below ground). Type L (above ground).
3. Fittings:	Wrought copper-solder joint (with lead free solder).

2.2 ACCESSORIES:

A. General: Provide factory-fabricated piping products of the size, type, rating and capacity indicated. Where not indicated, provide proper selection as determined by the Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections.

B. Water Hammer Arrestors: Bellows type; precharged compressor chamber; stainless steel casing and bellows. Provide sizes complying with PDI Standard WH-201. Josam 75000 Series, Jay R. Smith Fig 5000, or Zurn 1700 Series

C. Exterior Wall Hydrant HB/E: All brass freezeproof automatic draining type with polished brass finish, flush mounting wall box, adjustable packing nut, teflon impregnated packing, vacuum breaker with hose thread and loose key operated. Woodford Manufacturing Co. Model B67, Josam #71000 or Zurn Z-1300.

D. Interior Wall Hydrant HB/B: All brass with polished brass finish, flush mounting wall box, adjustable packing nut, teflon impregnated packing, vacuum breaker with hose thread and loose key operated. Woodford Manufacturing Co. Model B79, Josam #71020 or Zurn Z-1320.

E. Domestic Water Piping Strainers: Strainers shall be a "Y" bronze body type with 20 mesh stainless steel screen, and threaded ends, rated for 250 psig wwp at 210 degrees F. Strainers for domestic water shall be Watts Model 777 or equivalent by Wilkins, Keckley or Mueller.

F. Flow Control Valves: Valves for domestic hot water return shall have brass and stainless steel bodies, with integral ball valve, ground joint union, and solder ends. Valve shall be rated for 600 psig and flow rate, as shown on drawings. Flow control valves shall be Autoflow Model FU-050, Hayes 2500 or equivalent by Griswold.

G. Pressure Reducing Valves: Valves shall be bronze body construction with renewable seats and integral check valve and strainer. Pressure reducing valves shall be by Bell & Gossett, Taco, Amtrol, or Armstrong.

H. Pressure Relief Valves: Valves shall be bronze construction engineered in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code for Heating Boilers. Capacities shall be certified by the National Board of Boiler and Pressure Vessel Inspectors. Valves shall be by Bell & Gossett, Taco, Watts, or Armstrong.

I. Gate Valves: Valves 3 inches and smaller shall be all bronze, meeting MSS-SP80, inserted bonnet, solid wedge, non-rising stem type and rated at 125 SWP, 200 WOG. Handles shall be malleable iron with bronze stem. Valves shall be by Milwaukee, Nibco, Watts or Red-White.

J. Globe Valves: Valves 3 inches and smaller shall be all bronze, meeting MSS-SP80, inserted bonnet with integral seat and renewable disc. Valves shall be rated at 125 SWP, 200 WOG. Handles shall be malleable iron with bronze stem. Valves shall be by Milwaukee, Nibco, Watts or Red-White.

K. Check Valves: Valves 2 inches and smaller shall be bronze body with bronze seat and disc and shall be rated at 125 SWP, 200 W0G. Valves shall be by Milwaukee, Nibco, Watts or

Red-White.

L. Ball Valves: Ball valves may be substituted for gate valves at the contractor's option. Ball valves shall have two-piece bronze or brass body, meeting MSS-SP110, full or standard port, blowout-proof stem and adjustable packing nut independent of handle. Valves shall be rated for 150 SWP, 600 WOG or 300 CWP. Valves shall be by Apollo, Milwaukee, Nibco, Victaulic, Watts or Red-White.

M. Thermometers: Piping systems thermometers shall be the red-reading mercury filled adjustable angle type. Thermometers shall be adjustable to any angle through a 180 degree arc and shall be provided with a locking device. Where possible, thermometers shall be installed not higher than 8 feet above finished floor. Final positioning of each thermometer shall be such that it is readable from the floor and it shall be locked in that position. Thermometers shall have V-cast aluminum case with baked enamel finish and 9 inch scale. Thermometers shall be provided with separable sockets, and where installed on insulated pipes, sockets shall be extension neck type. Thermometer scale range shall be 30 to 300 degrees F for hot water systems. Thermometers shall be by Wika, Trerice, Winters or Weiss.

N. Pressure Gauges: Gauges shall be connected to the piping system with threaded chrome-plated brass pipe and fittings. Gauges shall be the flangeless type and shall have 4-1/2 inch dials, cast aluminum cases, stainless steel heavy duty rotary gear movements, phosphor bronze bourdon tubes, forged brass rod sockets and tips, 1/2% accuracy of scale range, plexiglass dial covers, and 1/4 inch lower connections. Each gauge shall be provided with chrome plated brass lever handle cock and a stainless steel pulsation dampener. Provide compound gauges for locations which under negative pressure. Range for pressure gauges shall be selected so that the normal operating point for each application falls in the approximate midpoint of the gauge range. Gauges shall be by Wika, Trerice, Winters or Weiss.

O. Access Panel: Access panels shall be 16 gauge steel door and frame with concealed hinge and vandal resistant latch. Panels shall be flush type. Access panel shall be J. R. Smith 4765-AK or equal by Zurn, Josam or Mifab.

P. Escutcheon Plates: Metal split-ring type units, with nickel or chrome plated finish. Provide units sized to fit closely outside of pipe insulation or bare pipe where no covering is required.

Q. Automatic Air Vents: Provide automatic float type air vents in locations indicated on the drawings. Units shall be suitable for a maximum working pressure of 75 psig and a maximum operating temperature of 240 degrees F. Automatic air vents shall be as manufactured by Taco, Bell & Gossett, Amtrol, Wheatley or Armstrong.

R. Sheet-Metal Pipe Sleeves: Fabricate from galvanized sheet metal closed with lock-seam joints. For following pipe sizes provide gauge indicated: 3 inch pipe and smaller, 20 gauge; 4 inch to 6 inch pipe, 16 gauge; over 6 inch pipe, 14 gauge.

S. Pipe Sleeve Caulking: 3M Fire Barrier Caulk, CP25N/S, except where another caulking system or material is specified, or equivalent by Hilti or Tremco.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPING:

A. General: Comply with the requirements of section 220310 for installation of basic piping materials.

B. Expansion Compensation: Except as otherwise indicated, install piping, including mains, branches and runouts with offsets to allow for free expansion and contraction sufficient to prevent leaks and over-stressing of the piping system.

C. Sterilization: The entire water distribution system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be liquid chlorine conforming to Federal Specification BB-C-120. The sterilization solution shall be allowed to remain in the system for a period of 24 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 parts per million. After completion of sterilization water samples shall be sent to the Local Health Department (LDH) for testing. Approval must be received from LDH before the system is put into service.

3.2 INSTALLATION OF ACCESSORIES:

A. Install premanufactured accessories in accordance with the manufacturer's instructions and recommendations.

B. Access Panel: Install access panels as shown on drawings. Paint access panels to match walls or ceilings.

C. Escutcheon Plates: Install escutcheon plates at pipe sleeves where piping is exposed to view in occupied spaces of the building, on the exterior and elsewhere as indicated.

D. Water Hammer Arrestors: Install units at the top of each riser or as otherwise indicated to comply with PDI Standard WH-201.

E. Air Vents: Install manual air vents at high points in the system and as shown on the drawings.

END OF SECTION 22 1110

SECTION 22 1210 – SOIL, WASTE, VENT AND STORM PIPING SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties as applicable for all items.

1.3 QUALITY ASSURANCE:

A. Industry Standards: Comply with local regulations, the International Plumbing Code and standards established by the Plumbing and Drainage Institute (PDI) pertaining to floor drains.

B. General: Provide factory-fabricated drainage piping products of the size and type indicated. Where not indicated, provide proper selection as determined by the Installer to comply with the installation requirements and governing regulations. Contractor shall coordinate drainage products selected with finish conditions encountered.

C. Cast Iron Pipe: All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

PART 2 – PRODUCTS

2.1 PIPING MATERIALS:

A. General: Comply with section 220310 for product requirements of piping materials. For each service, provide the piping materials indicated, including pipe, fittings, joints, hangers, supports, anchors and accessories. Where type is not otherwise indicated, provide materials complying with governing regulations.

B. Watts, Mifab and Wade are approved manufacturers for drainage products.

C. Soil, Waste and Vent Piping (Belowground):

1. Schedule 40 ABS-DWV or PVC-DWV pipe and fittings. Joints shall be solvent cement socket type.

D. Soil, Waste Drain and Vent Piping (Above Ground):

1. Schedule 40 plastic ABS-DWV or PVC-DWV pipe and fittings. Joints shall be solvent cement socket type above ground. If ABS or DWV pipe and fittings are used aboveground all penetrations of rated walls, floors, and assemblies shall be protected in an approved manner, including penetrations of one side of an assembly.

2.2 FLOOR DRAINS

A. Drains installed in waterproofed floors shall be provided with flashing clamps.

B. Floor Drain FD-A: shall have a coated cast iron body with integral pipe stops, flashing collar, seepage flange, vandal-proof screws and 6”x6” square Nikaloy strainer. Drains shall be:

1. J.R. Smith 2010 Series
2. Josam 30000 Series
3. Zurn ZN-415 Series

C. Floor Drain FD-B: shall have a coated cast iron body with integral pipe stops, flashing collar, seepage flange, sediment bucket, vandal-proof screws and 9” diameter round Nikaloy strainer with raised flange. Where indicated on the drawings, drain shall have a trap primer connection. Drains shall be:

1. J.R. Smith 2010-U-B-NB-F38
2. Josam 30000-VP-9E1-80
3. Zurn ZN-415I-VP-Y

D. Floor Drain FD-C: shall have a coated cast iron body with integral pipe stops, flashing collar, seepage flange, sediment bucket, vandal-proof screws and 8” diameter polished nickel bronze strainer and oval funnel. Where indicated on the drawings, drain shall have a trap primer connection. Drains shall be:

1. J.R. Smith 2010-A-B Series
2. Josam 30000-8E3-80 Series
3. Zurn ZN-415-Y-ZN329 Series

2.3 CLEANOUTS:

A. Cleanout plugs shall be cast bronze or brass countersunk type with taper threads complying with ANSI B2.

B. Cleanouts on underground drainage shall have piping extended to the floor and finished with cleanout plug and removable floor plate.

C. Cleanouts shall be the same size as the pipe on which installed, except cleanouts on underground piping shall be a maximum of 4".

D. Cleanouts in waterproofed floors shall have flashing clamp.

E. Cleanouts in carpeted floors shall be provided with a carpet marker.

F. Concrete Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable round scoriated nickel bronze cover and rim, vandalproof securing screw, and countersunk bronze plug. Cleanouts shall be:

1.	J.R. Smith	4025C
2.	Josam	58360
3.	Zurn	ZN-1400

G. Quarry Tile or Ceramic Tile Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable square scoriated nickel bronze cover and rim, vandalproof securing screw, and countersunk bronze plug. Cleanouts shall be:

1.	J.R. Smith	4045C
2.	Josam	58360
3.	Zurn	ZN-1400-T

H. Resilient Tile Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable square nickel bronze cover recessed for tile, vandalproof securing screw, and countersunk bronze plug. Cleanouts shall be:

1.	J.R. Smith	4165C
2.	Josam	58360-12
3.	Zurn	ZN-1400-TX

I. Terrazzo Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable round nickel bronze cover recessed for terrazzo, vandalproo securing screw, and countersunk bronze plug. Cleanouts shall be:

1.	J.R. Smith	4188C]
2.	Josam	58360-12
3.	Zurn	ZN-1400-Z

J. Carpeted Floors: Cleanouts shall have cast iron body with integral pipe stop, adjustable round scoriated nickel bronze cover and rim, bronze carpet marker, and countersunk bronze plug. Cleanouts shall be:

1.	J.R. Smith	4025-Y
2.	Josam	58360-14
3.	Zurn	ZN-1400-CM

K. Exterior Areas: Cleanouts to grade shall have cast iron body with integral pipe stop, heavy duty round cast iron tractor cover with vandalproof screw, and countersunk bronze plug. Cleanouts shall be:

1.	J.R. Smith	4245C-U
2.	Josam	58500
3.	Zurn	ZN-1400-HD

L. Wall Cleanouts: shall consist of a threaded recessed tapped cleanout tee with tapered thread

bronze plug, vandalproof securing screw, and round stainless steel wall plate. Cleanout shall be:

1. J.R. Smith 4532S
2. Josam 58600-COT
3. Zurn ZN-1446

2.4 DRAINAGE ACCESSORIES:

A. Flashing for Plumbing Vent Piping Passing Through Roofs: Unless otherwise indicated, flashing for plumbing VTR's shall be Stoneman "Stormtite" Model S1000-4, open top, 4 pound seamless lead flashing assembly or equivalent. Install flashing in accordance with manufacturer's instructions.

B. Escutcheon Plates: Metal split-ring type units, with nickel or chrome plated finish. Provide units sized to fit closely outside of pipe insulation or bare pipe where no covering is required.

C. Inline Floor Drain Trap Sealer: Provide trap sealer with ASB plastic body, keeper pin neoprene rubber diaphragm and sealing gasket. Trap sealer unit shall comply with the requirements of ASSE 1072. Basis of design is Sure Seal model SS.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPING:

A. General: Comply with the requirements of section 220310 for installation of basic materials.

B. Testing: The piping of the soil, waste and vent system shall be tested with water before installing fixtures. Water test shall be applied to the soil, waste and venting system either in its entirety or in sections. If the test is applied to the entire system, all openings in the piping shall be closed except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening of the section under test shall be plugged and each section shall be filled with water and tested with at least a 10 foot head of water. In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested so that each joint or pipe in the building except the upper most 10 feet of the system has been submitted to a test of at least 10 foot head of water. The water shall be kept in the system, or in the portion under test, for at least 30 minutes before the inspection starts; the system shall be tight at all joints. Joints that fail the test shall be remade and retested.

C. Protection: The installer of drains shall advise the Contractor of required protection for the drains during the remainder of the construction periods, to avoid clogging with construction materials and debris to prevent damage from traffic and construction work.

D. During construction all pipe openings shall be capped or plugged, when not being worked on, to prevent foreign objects and construction debris from entering system.

E. Horizontal drainage piping 2-1/2" and smaller shall be graded at a minimum of 1/4 inch per foot, unless noted otherwise. Horizontal drainage piping 3" and larger shall be graded at a minimum of 1/8 inch per foot, unless noted otherwise.

F. All underground plastic soil, waste and vent and storm drainage piping shall be installed in compliance with ASTM D 2321.

3.2 INSTALLATION OF ACCESSORIES:

A. Install escutcheon plates at pipe sleeves where piping is exposed to view in occupied spaces of the building, on the exterior and elsewhere as indicated.

B. Cleanouts in vertical piping shall be roughed-in with the centerline 18" above the finished floor.

C. Install drains in accordance with manufacturer’s written instructions and in locations indicated.

D. Coordinate with soil and waste piping as necessary to interface drains with drainage piping system.

E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

F. Install drains at low points of the surface areas to be drained. Set tops of drains flush with finished floor or deck.

G. The installer shall advise the General Contractor of required protection for drains and cleanouts during the remainder of the construction period, to prevent damage from traffic and construction work.

H. After installation, cover the tops of drains with duct tape or some other strong material during the remainder of the construction process, to avoid clogging with construction materials and debris.

END OF SECTION 22 1210

SECTION 22 1410 – GAS PIPING SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties as applicable for all items.

PART 2 – PRODUCTS

2.1 PIPING MATERIALS:

A. General: Comply with the Section 22 0310 for product requirements of piping materials. For each service, provide the piping materials indicated including pipe, tube, fittings, hangers, supports, anchors, valves, and accessories. Where more than one type is indicated, selection is Installer's option.

B. Above Ground: Schedule 40 black steel pipe of the size indicated with Class 150 malleable iron threaded fittings.

C. Below Ground: Plastic pipe and fittings conforming to ASTM D2513, Grade 2406.

2.2 ACCESSORIES:

A. Gas Pressure Regulators: shall be diaphragm actuated with cast iron body, aluminum diaphragm chamber, and all internal parts designed for use with natural gas. Regulators shall be adjustable, with automatic loading, automatic low pressure cut-off, and full internal relief. The regulator shall be adjusted for outlet pressure indicated on the drawings. The outlet pressure shall not vary more than 1 inch w.c. from the set point at specified capacity. The regulator shall be capable of complete shut-off in the event the supply pressure is interrupted or the gas demand exceeds the regulator capacity and shall remain off until the regulator is manually reset. The regulator shall have a weatherproof, bug proof, screened vent cap installed in the vent tapping. Regulators shall be:

Regular	3/4" - 1-1/4"	1-1/2" - 2"
1. Sensus (Rockwell)	143-4	243-12-4
2. Fisher	1823B	--------
3. Singer	S-104	S-204

With Full Relief	3/4" - 1-1/4"	1-1/2" - 2"
4. Sensus (Rockwell)	143-6	143-12-6
5. Fisher	1833B	--------
6. Singer	S-106	S-206

B. Gas Solenoid Valves: Valves 3 inch in size and smaller, shall be 2-way, normally closed type with manual reset for low pressure service. The valve shall have an aluminum body, Buna N seat, and Buna N disc. Maximum pressure drop shall not exceed 1" w.c. at system capacity. The solenoid enclosure shall be NEMA 1 and have electrical characteristics as shown on the drawings. Valve shall be Underwriters Laboratories labeled. Valves shall be ASCO 8044 Combustion Valve Series or equivalent by Singer or Fisher.

C. Plug Valves: Valves shall have iron body (semi-steel) lubricated type cast bronze plug, and threaded ends rated for 175 psig W.O.G. working pressure. Plug valves shall be Rockwell 142, Walworth 655, or Powell 2200.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPING SYSTEM:

A. General: Comply with the requirements of the Section 220310 for installation of basic piping materials. Install piping products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to insure that products serve the intended function.

B. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly and apply to only male threads of metal joints.

C. Remove cutting and threading burrs before assembling piping.

D. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.

E. Plug each gas outlet, including valves with a threaded cap or plug immediately after installation and retain until continuing piping or equipment connection is completed.

F. Ground gas piping electrically and continuously within project, and bond to grounding electrode. Buried bare metal piping is acceptable as a grounding electrode.

G. Install drip-legs in gas piping at regulator station and other low points in the system.

H. Grade horizontal lines 1/4 inch in 15 ft. to drip-legs.

I. Support piping in accordance with the following schedule:

a. Pipe Size	Maximum Support Spacing
b. up to ½ inch	6 ft.
c. 3/4 - 1 inch	8 ft.

d. over 1 inch 10 ft.

J. Plastic pipe joints shall be made using the heat-fusion method.

K. Protection of Gas Piping Against Corrosion: Protect metal gas piping in contact with the earth, or other corrosive material, against corrosion. Protect pipe with corrosion-resistant pipeline coating over a rubber-based primer by Polyken. Joints shall be primed and wrapped with Foster Cold-Applied Pipeline Joint Tape.

L. Install underground piping with a minimum 18 inches of cover. Trench shall be graded to provide a firm, continuous bearing for pipe. Connections between plastic pipe and steel pipe shall be made only outside, underground, and with approved transition fittings.

M. Coordinate with gas utility company as necessary to interface gas distribution piping with gas service supply work.

N. Painting: All exposed metal gas piping shall be primed and painted with dark gray enamel.

3.2 EQUIPMENT CONNECTIONS:

A. General: Connect gas piping to equipment in accordance with the equipment manufacturer's instructions. Provide ground joint union and accessible cut-off valve at each connection to equipment.

3.3 FIELD QUALITY CONTROL:

A. Fuel Gas Piping Tightness Test: Prior to initial operation, test gas distribution piping system with air or inert gas at 3 psig or two times operating line pressure, whichever is greater. Do not use oxygen for tests.

B. Repair or replace fuel gas piping as required to eliminate leaks and retest as specified to demonstrate compliance.

END OF SECTION 22 1410

SECTION 22 1610 – PLUMBING PIPING SYSTEM INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE:

A. Plumbing piping systems to be insulated include:

1. Domestic Hot and Cold Water Piping, Above Ground

1.3 QUALITY ASSURANCE:

A. Manufacturers: Provide insulation products produced by one of the following for each type and temperature range of insulation.

1. Certainteed
2. Knauf
3. Manville
4. Owens-Corning
5. Pittsburgh Corning

B. Flame/Smoke Ratings: Provide composite piping insulation (insulation, jackets, covering, sealers, mastics and adhesives) with flame-spread rating not exceeding 25 and smoke developed rating not exceeding 50, as tested by ASTM E 84 (NFPA 255) method and UL 723.

1.4 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties for all items.

PART 2 – PRODUCTS

2.1 PIPE INSULATION:

A. Fiberglass Insulation: Insulation shall be preformed, two-piece, heavy density fiberglass with self sealing ASJ jacket conforming to FS HH-I-558 Form D, Type III, and Class 12. Valves and fittings shall be insulated with fiberglass insulation of the same material thickness as insulation on adjacent pipe and having a molded PVC jacket. Jackets shall be Certainteed

Snap-Form, Knauf Proto PVC or Zeston PVC. Insulation thickness shall be as follows:

1. Domestic Hot & Cold Water Piping: 1 inch thick for all sizes.

B. Aluminum Jacket: Corrugated, embossed or smooth sheet, .016 inch nominal thickness, ASTM B 209, temper H14, type 3003, 5005 or 5010. Provide stainless steel bands, minimum width of ½ inch.

PART 3 – EXECUTION

3.1 APPLICATION REQUIREMENTS:

A. General: Insulate all above ground domestic hot and cold water piping except do not insulate supplies to fixtures unless specifically required. Insulate horizontal waste lines receiving the discharge from HVAC drains. Insulate the underside of all roof drains and all roof drain piping installed above conditioned spaces.

B. Aluminum jackets shall be provided on all exterior insulated pipes.

C. In high abuse areas such as janitor closets and traffic areas in equipment rooms, kitchens and mechanical rooms aluminum jackets shall be provided. Pipe insulation to the 6 foot level shall be protected.

3.2 INSTALLATION OF PIPING INSULATION:

A. General: Install insulation products in accordance with the manufacturer's written instructions, and in accordance with recognized industry practices to ensure that the insulation serves its intended purpose. Do not use cut pieces or scraps abutting each other.

B. Insulation shall be applied on clean dry surfaces. All insulation shall be continuous through wall and ceiling openings and sleeves. Insulation on all cold surfaces, where vapor barrier jackets are used, will be applied with continuous unbroken vapor seal. Seal off ends of insulation on cold piping systems with white vapor barrier coating at valves, flanges, supports and exposed ends. Supports that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation.

C. Pipe covering protection shields shall be provided around exterior of pipe insulation at pipe hangers which fit around pipe insulation. Shields shall be 12 inches long by 180 degrees and shall be 18 gauges galvanized steel sheet. High density isolation inserts shall be provided at pipe saddles.

D. Unions shall not be insulated.

E. Cover valves, flanges, fittings and similar items in each piping system.

F. Extreme care shall be taken to insure a neat, uniform exterior surface on insulation applied to exposed pipes. Insulation in finished areas shall be painted in accordance with the paint

specifications.

G. The body (underside) of roof drains shall be insulated with blanket type fiberglass insulation. Overlap ends of insulation a minimum of 2". Overlap bottom of insulation a minimum of 3" at pipe connection. Adhere insulation to roof drain with 100% coverage of fire retardant adhesive. Tape all joints with 3" wide foil reinforced kraft tape.

3.3 PROTECTION AND REPLACEMENT:

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: The Installer of the insulation shall advise the Contractor of required protection for the insulation work during the remainder of the construction period, to avoid damage and deterioration.

END OF SECTION 22 1610

SECTION 22 1710 – PLUMBING VIBRATION AND SEISMIC CONTROL

PART 1 – GENERAL

1.1 SCOPE OF WORK:

A. Furnish all labor, materials, tools and equipment and perform all work necessary to complete the installation of the plumbing vibration and seismic control systems required by these specifications and as detailed on the drawings.

B. All foundations and supports required for the installation of plumbing equipment shall be furnished by the plumbing contractor shall unless specifically specified otherwise.

1.2 RELATED DOCUMENTS:

A. The drawings and general provisions of this division of the Contract, including the General and Special Conditions and Division 1 Specifications, apply to this Section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: The installation of the plumbing systems shall be installed in accordance with the following codes and standards. All seismic restraint systems such as sway bracing, cable restraints, seismic snubbers, seismic restraints, and vibration isolators shall also meet the requirements as set forth in the following standards and codes:

1. *2012 International Building Code* (IBC)
2. ASHRAE
3. SMACNA *Seismic Restraint Manual*
4. ASTM 488 *Anchor Locations*
5. FEMA Standards

B. The plumbing vibration and seismic control equipment and products shall be sized and provided by one of the manufacturers listed below. The manufacturer shall have tested all seismic products provided for the specific intended use and installation.

C. The following list of manufacturers are acceptable manufacturers:

1. Amber/Booth
2. Kinetics Noise Control
3. Mason
4. Vibration Mountings and Controls

D. Submittals:

1. The contractor shall submit for approval by the engineer all products intended to be used to meet the requirements of these specifications. Submittal data shall include a proposed

schedule for vibration isolation products, manufacturer's data and cut sheets of the specific vibration isolation and seismic control materials. Proposed vibration isolation schedule shall list all equipment specified to be isolated, the equipment weight, proposed isolator type or base type, number of isolators required, spring or isolator color, and deflection of the spring or vibration isolator based on the equipments weight.

2. The contractor shall submit for approval by the engineer, seismic anchorage requirements for all equipment. Anchorage calculations shall be prepared by a registered engineer and in the state where the project will be constructed. The engineer shall stamp calculations. Anchorage requirements shall be submitted for all base mounted equipment, suspended equipment, and roof mounted equipment. Seismic anchorage calculations shall include an "anchorage schedule" for the contractor's use. Anchorage schedule shall list the equipment, the size and quantity of fasteners and the minimum embedment depth of anchors. Calculations may be combined for similar types of equipment provided the size and weight does not vary more than 15% and the installation manner are similar.

PART 2 – PRODUCTS

2.1 GENERAL:

A. All equipment shall be mounted or suspended from approved foundations and supports as specified herein or as detailed on the drawings.

B. The vibration isolation products and systems shall have a deflection as recommended by the manufacturer but not less than the deflection indicated in the Vibration Isolation Schedule.

C. The vibration isolation manufacturer may select and propose non-seismic type isolators, provided snubbers are furnished and installed to limit the horizontal movement of equipment. Snubbers shall be selected to resist the maximum calculated lateral force of the equipment. Calculations shall be submitted and sealed by the professional engineer certifying the snubber's selection and anchorage requirements.

2.2 ISOLATOR TYPES:

A. Type 10 - Suspended Equipment and Piping: Vibration Isolators shall consist of a steel spring and neoprene element in series mounted in a stamped or welded steel bracket for insertion into the hanger rod assembly. The elastomer insert shall be neoprene, molded from oil resistant compounds and shall be color coded to indicate load capacity and selected to operate within its published load range. The steel spring shall consist of large diameter laterally stable steel springs assembled into formed or welded steel housing assemblies designed to limit movement. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. The steel bracket shall be fabricated from steel and provided with a corrosion resistance finished. The hanger bracket shall be designed to carry a 500% overload without failure and to allow a support rod misalignment through a 30-degree arc without metal-to-metal contact or other short circuit. The hanger bracket shall incorporate spring caps with indexed steps, which

correspond to the washer diameter of the hanger rod to keep the rod centered in the spring cap. Vibration isolation hangers shall be Kinetics Model SRH

2.3 SEISMIC CONTROL:

A. The mechanical systems serving the building shall be installed to meet the minimum requirements of the International Building Code regarding seismic protection and control. These specifications and the drawings indicate the minimum requirements and general intent. The actual requirements shall be determined by the seismic engineer and supplier and submitted for approval by the Mechanical Engineer.

B. The seismic engineer shall be a registered engineer in the state in which the facility is constructed and whose principal area of practice is seismic engineering and related fields.

C. All equipment installed either floor or pad mounted or suspended from the structure shall be restrained and anchored unless exempt as hereinafter indicated.

D. The following criteria applies to the plumbing systems:

Site Classification:	(A,B,C,…F)
Seismic Design Category:	(A,B,C,…F)
Seismic Occupancy Group:	(I, II, or III)
Importance Factor:	(1.0 or 1.5)

E. Where pipes or other plumbing systems cross the seismic isolation interface between two seismically isolated structures, the systems shall have flexible connections to accommodate the seismic displacement of the two structures. Flexible connectors shall be installed on one side of the interface.

F. The following plumbing components are exempt from seismic bracing or restraints:

1. All components in seismic design category D, E, and F, weighing 20 lbs or less when the importance factor = 1.0.
2. Piping installed 12” or less from the point of connection to the supporting structure and the top of the pipe when the importance factor = 1.0.
3. Equipment installed less than 4’-0” above the floor and weighing less than 400 lbs when the importance factor = 1.0.
4. Any piping installed in a structure when the Seismic Design Category is A or B.
5. Any piping installed in a structure when the Seismic Design Category is C and the importance factor = 1.0.

G. All plumbing-related life safety systems and hazardous substance systems installed in the building shall have an importance factor of 1.5. Systems having an importance factor of 1.5 shall be restrained. These systems are as follows:

1. Natural Gas Piping.

H. Where systems are specified to have spring isolation hangers, the hangers shall be installed as close as possible to the supporting structure.

I. Equipment installed on non-seismic type spring isolators shall have snubbers installed to limit the horizontal movement of the equipment in any direction.

J. Seismic restraint cables or seismic restraint braces shall be installed on piping systems and suspended equipment. Seismic restraint cables shall be stranded steel cable provided with mounting hardware for connection to the equipment hanger rod, to the equipment housing or trapeze hangers. The stranded steel cables and hardware shall be the product of a single manufacture and shall have been tested for the intended use. Published data shall be available and submitted to identify the load limitations of the proposed restraint hardware. As a minimum the following cable sizes shall be used on piping and equipment:

1. Piping 1" to 2 ½": 1/16" steel cable
2. Piping 3" to 8": 3/16" steel cable
3. Piping 10" and larger: 1/4" steel cable
4. Equipment weighting 400 lbs or less: 3/16" steel cable
5. Equipment weight 401 lbs and higher: 1/4" steel cable

K. Anchorage of equipment to concrete floors and pads shall be in-accordance with the submitted anchorage calculations.

L. Connections of seismic restraint cable hardware shall be in-accordance with the submitted anchorage calculations.

M. Snubbers shall be installed for equipment installed on non-seismic type spring isolators.

1. Type S-1 snubbers shall be welded steel angles with mounting holes and a resilient neoprene pad applied to the angle surface that faces the equipment. Snubbers shall be installed on all four (4) sides of the equipment and shall limit the horizontal movement to 1/4". A minimum of (4) snubbers will be required. Snubbers shall be attached to the floor or concrete pad with fasteners as indicated in the submitted seismic anchorage calculations. Snubbers shall be Kinetics Model HS-1.
2. Type S-2 snubbers shall be multi-directional by design and consist of a base plate with a welded cylinder and a mating seismic restraint angle with guide hole to receive the seismic restraint cylinder. The seismic restraint cylinder shall have a neoprene tube around the circumference of the cylinder and provide a maximum of 1/8" horizontal movement of equipment. A minimum of (2) Type S-2 snubbers shall be installed on any (1) piece of equipment. Snubbers shall be Kinetics Model HS-2.
3. Type S-3 snubbers shall be multi-directional plus vertically restrained type snubbers. Snubbers shall be fabricated of welded steel and consist of a base plate with welded vertical cylinder and a mating seismic restraint angle with guide hole to receive the vertical restraint cylinder. Additionally, the vertical restraint cylinder shall be threaded and provided with a limit bolt and washer that will limit the vertical movement as well as the horizontal movement of the equipment. Snubbers shall be Kinetics Model HS-3.

2.4 SCHEDULE FOR PLUMBING SYSTEMS:

Equipment Type	Isolator Type	Base Type	Deflection	Flex.Pipe

Piping located in Mechanical Rooms	Type 10	None	1.0”	None

PART 3 – EXECUTION

3.1 GENERAL:

A. If the equipment provided is not furnished with integral structural steel supports, mounting feet or lifting lugs, the contractor shall provide miscellaneous steel shapes as required to install or suspend the equipment and attach the vibration isolation or seismic restraints as specified herein.

B. Support steel shall include but not be limited to rails, brackets, angles, channels, and similar components.

C. All equipment specified to be isolated shall be installed and isolators shall be attached to the building structure or floor and the vibration isolators shall be adjusted and leveled so that the vibration isolators are performing properly.

D. All vibration isolation products, seismic restraint products and flexible pipe connector products shall be installed as outlined in the manufacturer’s printed installation instructions.

3.2 VIBRATION ISOLATION AND SEISMIC CERTIFICATE OF COMPLIANCE:

A. The manufacturer’s representative shall be responsible for providing such assistance and supervision as necessary to assure a correct installation and adjustment of vibration isolation products.

B. The manufacturer’s representative shall visit the installation once all installed items have been completed but prior to the installation of ceilings or walls that may conceal any devices and inspect the installation for compliance with the manufacturer’s installation instructions. Upon satisfaction that all devices are installed correctly and systems are isolated properly, the representative shall submit a written report outlining the installation as in compliance with these specifications and also the manufacturer’s installation instructions.

C. A separate report shall be prepared for the vibration isolation installation and the seismic installation.

END OF SECTION 22 1710

SECTION 22 2210 – WATER HEATERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Industry Standards:

1. Provide electric water heaters which have been listed and labeled by Underwriters' Laboratories.
2. Comply with National Electrical Code (NFPA 70) as applicable to installation and connection to electric water heaters.
3. Provide water heaters which have been listed and labeled by National Sanitation Foundation (NSF).
4. Provide water heaters with safety relief valves bearing ASME valve markings, all heaters.
5. Comply with American Gas Association (AGA) as applicable to certification of gas-fired water heaters.
6. Heaters(s) shall meet the requirements of ASHRAE 90.1-2004, state energy requirements, and the BOCA Energy Conservation Code.

1.3 SUBMITTALS:

A. Provide manufacturer's data, test reports, certifications and product warranties on all items.

PART 2 – PRODUCTS

2.1 GAS-FIRED WATER HEATERS:

A. Commercial High Efficiency Gas Water Heaters (WH-1 & WH-2): Water heater(s) shall have storage and recovery capacities indicated on plans. Water heater shall be a three-pass gas fired commercial type with a duplex alloy tank and heating surfaces requiring no lining or anodes, non-ferrous fittings at all tank connections, fiberglass insulation, and enameled jacket. The heater shall be provided with hand hole tank cleanout, ASME temperature and pressure relief valve, drain valve, secondary economizer for low temperature flue gas, UL compliant gas train (including regulator, dual safety shutoff valves and dual manual shutoff valves), immersion temperature limiting device, electronic flame safeguard with pre and post purge, programmable electronic operating control with digital temperature readouts, pre-mix low NOx burner with proportional gas/air, combustion sequence panel lights with lockout, VFD modulation with up to 7-to-1 turndown, NEMA-1 control enclosure, terminals for

remote on-off control, and switched contacts for remote lockout notification. Voltage shall be 120 volt, 1 phase, 60 Hz. The water heater shall be FM compliant, ASHRAE 90.1-2010 compliant, ASME stamped for 150 psi, and shall have manufacturer's standard 10-year tank warranty, 3-year scale failure warranty, and include factory authorized startup. Water heater shall include optional electronic low-water cutoff, manual-reset high limit, condensate neutralization system, and UL listed air intake termination cap. Water heater shall be A.O. Smith BT Series, PVI Conquest, or equal by Rheem, Rudd, Bradford White meeting capacity and size limitations.

2.2 ACCESSORIES:

A. Domestic Hot Water Circulation Pump: Pump shall be the in-line centrifugal type designed for 125 psi working pressure with bronze body and impeller, mechanical seals and stainless steel impeller shaft. The pump motor shall be the open drip-proof design with sleeve bearings, built-in thermal over-load protectors, and shall operate at 1750 RPM. Pump shall have the capacities as shown on the drawings. Pump shall be:

1. Bell & Gossett - Booster Series
2. Taco - Circulation Series
3. Thrush - Circulator Series
4. Grundfos - UP Circulator Series

B. Gas Vents: Gas vents for gas-fired water heaters shall be Type B gas vents by MetalFab, Metalbesotos, Metalvent, Ampco, or Stacks. Provide flashing, storm collar, vent cap, and all other accessories required for a complete installation. Provide barometric damper sized for water heater.

C. Thermal Expansion Tanks: Provide bladder type captive air expansion tanks with tank volume as indicated on the drawings. The shell shall be fabricated steel designed and constructed per ASME Section VIII. Tanks shall be suitable for potable water systems and maximum working pressure of 125 psig and a maximum operating temperature of 240 degrees F. Tanks shall be by Taco, Amtrol, Watts, or Wheatley.

D. Thermal Expansion Valve: Provide calibrated pressure relief valve with an adjustable range of 50-175 lbs. Thermal expansion valve shall be Watts 530, Cash-Acme Type FWC, or Wilkins P1500.

E. Vacuum Relief Valve: Provide a vacuum relief valve for automatic venting of a closed system to atmosphere when a vacuum is created. Valve shall be tested and rated under ANSI Z21.22. Vacuum relief valve shall be a Watts N36, Cash-Acme FRM-V, or Wilkins VR10.

F. Temperature Control Valve: Valve shall be a thermoscopic mixing valve with chrome finish, a maximum operating pressure of 125 PSIG and maximum operating temperature of 110ºF at 45 PSIG equal supply pressures. Valve shall be provided with spring loaded angle union integral check stops, integral strainers and "Fail Safe" shutdown. Valve shall control temperature at ±1ºC and shall have minimum and maximum flow rates of 1 gallon per minute and 26 gallons per minute respectively. Temperature Control Valve shall be RADA Model 20 or equal by Leonard, Symmons or Powers.

G. Water Heater Pan: Water heater pan shall be aluminum alloy pan with 2½" high sides, 1" PVC drain, zinc plated steel lock nut and neoprene flange gasket. Water heater pan shall be shall be by Holdrite Quick Pan series or equal.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Install water heaters and accessories where shown, in accordance with equipment manufacturer's written instructions and with recognized industry practices. Comply with requirements of state and local codes and applicable NFPA and ASME Boiler and Pressure Vessel Code Standards.

B. Flush water heaters upon completion of installation in accordance with manufacturer's instructions.

C. Start-up water heaters in accordance with manufacturer's written procedures, upon completion of heater installation and demonstrate compliance with requirements.

3.2 FIELD QUALITY CONTROL:

A. Test assembled water heater and accessories in accordance with applicable sections of ASME Boiler and Pressure Vessel Code.

END OF SECTION 22 2210

SECTION 22 3110 – PLUMBING FIXTURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Industry Standards: Comply with ANSI Standards pertaining to plumbing fixtures and systems.

B. Comply with ANSI A117.1 standard pertaining to plumbing fixtures for handicapped.

C. Comply with standards established by Plumbing and Drainage institute (PDI) pertaining to plumbing fixture supports.

D. Comply with applicable Federal Standard FS WW-P-541/Series sections pertaining to plumbing fixtures.

PART 2 – PRODUCTS

2.1 PLUMBING FIXTURES:

A. General: Provide factory-fabricated fixtures of the type, style and material indicated. For each type of fixture, unless otherwise specified, provide fixture manufacturer's standard trim, carrier seats and valves as indicated by their published product information, either as designed and constructed, or as recommended by the manufacturer, and as required for a complete installation. Where more than one type or manufacturer is indicated, selection is Installer's option.

2.2 MATERIALS:

A. General: Unless otherwise specified, comply with applicable Federal Specification WW-P-541/series sections pertaining to plumbing fixtures, fittings, trim, metals and finishes. Comply with requirements of WW-P-541/specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541.

B. Unless otherwise specified, faucets shall comply with National Sanitation Foundation International NSF Standard 61, and where applicable NSF Standard 61, Section 9. Faucets shall be NSF certified, and bear the NSF mark.

C. Provide materials which have been selected for their surface flatness and smoothness. Exposed surface which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration or other surface imperfections on finished units are not acceptable.

D. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless steel units.

E. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes and speck; glaze exposed surfaces and test for crazing resistance in accordance with ASTM C 554.

F. Vitreous China and Enamel Iron Fixtures shall be white unless specified otherwise.

G. Comply with additional fixture requirements contained in the fixture schedule.

H. Kohler, American Standard, Eljer, Crane, Chicago, Zurn, Sloan, T & S Brass, Symmons, Speakman, Elkay and Just are approved manufacturers for all lavatory, service sink, can wash and sink faucets.

I. Eljer is an acceptable manufacturer for all water closets, urinals and lavatories.

J. Zurn One and Sloan are acceptable manufacturers for all vitreous china and cast iron plumbing fixtures.

K. Flush valves shall be the size, roughing height, and flow rate specified hereinafter for each fixture. Flush valve shall be a diaphragm actuated type with chrome plated exterior, angle stop with cover, vacuum breaker, adjustable tailpiece, and cast escutcheon with setscrew. Where shown on the drawings provide a trap primer connection in the valve tailpiece. All flush valves specified to be 24" roughing shall be provided with wall brace.

L. All low voltage wiring, sensors, and transformers shall be provided under this section with the hardwired flush valves and/or faucets.

M. Toilet seats shall be same color as fixture. Seats shall be open front without cover, and solid molded plastic with self-sustaining check hinge. Seats shall be for elongated bowl unless specified otherwise.

N. Carriers shall be commercial grade and selected to match the fixtures for which they are used. Carriers shall be floor mounted and designed to transfer any fixture loading to the floor and not the wall unless specified otherwise. Carriers provided for wall hung urinals shall be two plate type. Carriers for wall hung water closets and urinals shall be provided with chrome plated mounting hardware.

O. Fixture stops shall be provided for all fixtures and shall be chrome plated with cast escutcheons with set screws. Stops for flush valves shall be by the flush valve manufacturer. Stops for shower valves shall be either angle or straight type and shall be concealed behind the shower cover plate. Stops for lavatories and sinks shall be loose key or wheel handle type as specified for each fixture.

P. Fixture drains shall be by the same manufacturer as the lavatory and sink faucets, with a

matching finish. Lavatory and sink drains shall be pop-up, grid, or crumb cup type as specified for each fixture. Drains shall be chrome plated brass or stainless steel unless noted otherwise. Drain tailpieces shall be minimum 17 gauge chrome plated cast brass.

Q. All p-traps, continuous wastes and fixture drain piping shall be 17 gauge chrome plated cast brass and of the size indicated in the fixture schedule on the plumbing drawings.

R. Insulation kits shall be provided for all handicap lavatories and sinks with exposed supply and waste piping. Insulation kits shall include covers for fixture drains, p-traps and supplies.

2.3 PLUMBING FIXTURE SCHEDULE:

A. Water Closet P-1A : shall be a floor mounted, floor outlet, vitreous china, siphon jet water closet with elongated bowl (designed for 1.28 gallon flush), 1-1/2" top spud, floor bolts, bolt caps, and outlet gasket. The water closet shall be fitted with a white seat and 1-1/2" (11-1/2" roughing) flush valve. Water closet and trim shall be:

	AMERICAN STD.	KOHLER	ZURN
	Madera	Wellworth	
Water Closet:	3451.001	K-4406	Z5655
Flush Valve:	SLOAN	DELANY	Included
Seat:	BENEKE	BEMIS	Included

B. Water Closet P-1B : shall be an ADA compliant floor mounted, floor outlet, vitreous china, siphon jet water closet with elongated bowl (designed for 1.28 gallon flush), 1-1/2" top spud, floor bolts, bolt caps, and outlet gasket. The water closet shall be fitted with a white seat and 1-1/2" (11-1/2" roughing) flush valve. Water closet and trim shall be:

	AMERICAN STD.	KOHLER	ZURN
	Madera ADA	Highline	
Water Closet:	3461.001	K-4405	Z5665
Flush Valve:	SLOAN	DELANY	Included
Seat:	BENEKE	BEMIS	Included

C. Urinal P-2A: shall be a wall hung, vitreous china, washout urinal (designed for 0.125 gallon flush), 2” outlet, 3/4” top spud and wall hangers. The urinal shall be fitted with a 3/4" (11-1/2” roughing) flush valve and back plate. Urinal shall be:

	AMERICAN STD.	KOHLER	ZURN
	Washbrook	Bardon	
Urinal:	6590.525	K-4904-ET-0	Z5798

D. Urinal P-2B: shall be the same as urinal P-2A except for mounting height. Refer to the Plumbing Fixture Schedule on the drawings for mounting height.

E. Lavatory P-3A: shall be a lavatory bowl integral with the countertop and provided by others. The lavatory shall be fitted with a chrome plated ADA compliant pushbutton metering faucet, thermostatic mixing valve, perforated offset grid drain, 1-1/4" p-trap, loose key angle supplies, and insulation kit. Lavatory and trim shall be:

Faucet:	CHICAGO	ZURN	SPEAKMAN
	802-336CP	Z-86500	S-4141-LD
Mixing Valve:	CHICAGO	ZURN	T & S BRASS
Drain:	McGUIRE	ZURN	WATTS
P-trap:	McGUIRE	ZURN	WATTS
Supplies:	McGUIRE	ZURN	WATTS
Insulation Kit:	McGUIRE	TRUEBRO	SKAL-GUARD

F. Sink P-5A: shall be an 18 gauge, type 302 stainless steel, ADA, self-rimming sink with 21" x 19" x 6-1/2" deep overall dimensions, single bowl, punched for 3 holes on 4" centers with underside sound deadened. The sink shall be fitted with a chrome plated ADA compliant spread gooseneck faucet with quarter turn 4" wrist blade handles and laminar flow outlet, offset perforated grid drain, 1-1/2" p-trap, wheel handle angle supplies and insulation kit. Sink and trim shall be:

Sink:	JUST	ELKAY	ADVANCED TABCO
	SL-ADA-1921-AGR	LRAD-2219	Equivalent
Faucet:	SPEAKMAN	ZURN	CHICAGO
	SC-3006-LD-LF	Z831B4-4F	786-GN2FCCP
Drain:	McGUIRE	ZURN	WATTS
P-Trap:	McGUIRE	ZURN	WATTS
Supplies:	McGUIRE	ZURN	WATTS
Insulation Kit:	McGUIRE	TRUEBRO	SKAL-GUARD

G. Laundry Sink P-5B: shall be an 14 gauge, type 304 stainless steel floor mounted utility sink with 33" x 27-1/2" x 14" overall dimensions and 8" backsplash. Sink shall be fitted with a chrome plated, back mounted faucet with 12" swing spout, rubber stopper drain, p-trap, and wheel handle angle supplies.

Sink:	ELKAY	JUST	ADVANCED TABCO
	SS8230	Equivalent	Equivalent
Faucet:	T & S BRASS	CHICAGO	MOEN COMM.
	B-0290-04	Equivalent	Equivalent
P-Trap:	McGUIRE	ZURN	WATTS
Supplies:	McGUIRE	ZURN	WATTS

H. Shower P-6A: shall consist of a single handle pressure balanced mixing valve with integral stops and vandal proof trim, a shower head and arm, and a 2" floor drain. The shower head shall include chrome plated brass head and supply arm with wall flange. Maximum flow rate shall be 1.5 gpm. The floor drain shall be a type "A" as specified in Section 15405. The shower head and mixing valve shall be:

	SPEAKMAN	SYMMONS	POWERS
Shower Valve:	SM-1422-M-SCS	86-L-X	P-900
Shower Head:	S-2252-AF	4-131	H-01

I. Shower P-6B: shall consist of a single handle pressure balanced mixing valve with integral stops and vandal proof trim, a hand shower, and a 2" floor drain. The hand shower shall include hand shower with swivel base, 24" slide bar, 60"chrome plated brass hose with rubber liner, supply ell with wall flange, in-line vacuum breaker and quick connect coupling.

Maximum flow rate shall be 1.5 gpm. The floor drain shall be a type "A" as specified in Section 15405. The hand shower and mixing valve shall be:

	SPEAKMAN	SYMMONS	POWERS
Shower Valve:	SM-1422-M-SCS	C-96-300-B30-V-X	P-900
Hand Shower:	VS-1000-AF-VS123	included	141-161-1.5GPM
Quick Connect:	ALSONS 750	QD	141-804A

J. Ice Maker Box P-7: shall be a recessed flush mounting plastic or painted steel box with ¼ turn cold water angle valve and water hammer arrestor. Ice maker box shall be:

OATEY	GUY GRAY	WATER TITE
38490	MIB1HA	W9700 HA

K. Whirlpool Connection P-8: shall consist of a thermostatic mixing valve and floor drain. The thermostatic mixing valve (TMV) shall be of chrome plated brass, stainless steel and polymer construction. TMV shall have NPT inlets with integral inlet spring loaded check stop valves and strainers, vacuum breaker, thermometer and hose outlet. Mixing valves shall be equipped with a maximum temperature limiting and single temperature locking feature. TMV shall be designed so that all internal operating components are enclosed in a one-piece replaceable cartridge for ease of service. Finish shall be Chrome plated. Valves shall be capable of controlling mixed water temperatures +/- 2 degrees F at flow rates between 1 and 24 gpm. Mixing valve shall be Armstrong/Rada model 320D or equivalent. The floor drain shall be a type FD-C as specific in Section 22 1210 with sediment basket and less grate.

L. Condensate Drain Box P-9: shall be a recessed flush mounting painted steel box with plugged 2" drain outlet and tamper resistant cover plate. Condensate Drain Box shall be GUY GRAY, OATEY or PLASTIC ODDITIES.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Install plumbing fixtures of types indicated where shown and at indicated heights or where not shown in accordance with manufacturer's written instruction, roughing-in drawings and with recognized industry practices.

B. Install all low voltage wiring, sensors, and transformers furnished with the hardwired flush valves and/or faucets. 120V power connections for the low voltage transformers shall be connected by the Division 26 contractor in accordance with specification section 261010. All low voltage wiring and needed pathways shall be provided under this section. Provide needed pathway/chase to form an accessible pathway from each sensor location to a point within 6" of low voltage transformer, and terminate with insulated throat bushing. Wiring installed in an open plumbing chase can be installed without conduit.

C. Fasten plumbing fixtures securely to indicated supports or building structure, and ensure that fixtures are level and plumb and tight against mounting surface.

D. Seal the outer perimeter of wall mounted lavatories and urinals and water closets to the wall and floor mounted water closets to the floor with a smooth bead of white silicone compound.

E. All fixtures provided under another division of the specifications shall be roughed-in and connected under this section. Provide individual shut-off valves or supply stops to all fixtures with a water or gas supply. Provide p-traps and extensions to waste stack in wall or to drain, as shown on the drawings, if not provided by the fixture supplier. Supply stops and p-traps shall be McGUIRE, EBC, or BRASS-CRAFT.

3.2 FIELD QUALITY CONTROL:

A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test and adjust fixtures for proper operation.

END OF SECTION 22 3110

SECTION 22 3210 – ELECTRIC WATER COOLERS & DRINKING FOUNTAINS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Industry Standards:

1. Provide drinking-water coolers which have been listed and labeled by Underwriters' Laboratories (UL399)
2. Provide drinking-water coolers which are rated and certified in accordance with Air Conditioning and Refrigeration Institute (ARI) Standard 1010.
3. Provide wheelchair water coolers which comply with ANSI A117.1-2003 and ADA guidelines.
4. Provide drinking-water coolers which are manufactured using lead-free components and solder in all waterways.

1.3 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties as applicable.

PART 2 – PRODUCTS

2.1 ELECTRIC WATER COOLER “EWC-1":

A. Provide wall mounted wheelchair type water coolers with integral water chiller capable of delivering 7.5 gph of 50 degrees water at 90 degrees F ambient temperature and 80 degrees F entering water temperature. Units shall have hermetically sealed refrigerant system complete with 120V/1PM/60HZ compressor and air cooled condenser. Cabinet, receptor, and back shall be stainless steel. Bubbler operator shall be a soft touch vandal proof bar full across the front of the unit. The water cooler shall be fitted with cast brass p-traps, a valved 1/2" cold water supply, a NEMA5-20P rated plug with 3 feet (min.) chord, and chair carrier. **[**Water cooler in dining area shall include glass filler.**]** Units shall be OASIS P8AM, HALSEY-TAYLOR HAC-8FS, SUNROC NWCA-8 or ELKAY EZS8. Chair carrier shall be J.R. Smith, Josam or Zurn.

2.2 ELECTRIC WATER COOLER “EWC-2":

A. Unit shall be the same as electric water cooler EWC-1 except for the mounting height. Refer

to drawings for mounting height.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. General: Install water coolers in accordance with manufacturer's written instructions and in accordance with the National Electrical code and recognized industry practices.

B. After water coolers are mounted on wall, bolt a 1-1/2 inch steel angle bracket to bottom of unit and attach to wall. Paint to match wall.

3.2 FIELD QUALITY CONTROL:

A. Test operates installed water coolers to demonstrate compliance with the requirements.

END OF SECTION 22 3210

SECTION 23 0110 – MECHANICAL GENERAL PROVISIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

B. It is recognized that separate sub-contracts may be instituted by THIS CONTRACT'S GENERAL CONTRACTOR with others. It is the responsibility of THIS CONTRACT'S GENERAL CONTRACTOR to completely inform, coordinate and advise those sub-contractors as to all of the requirements, conditions and information associated with providing and installing their portion of the total job.

1.2 IMPOSED REGULATIONS:

A. Applicable provisions of the State and Local Codes and of the following codes and standards in addition to those listed elsewhere in the specifications are hereby imposed on a general basis for mechanical work. In each case, the prevailing edition shall be the current adopted edition of the state where the project is located.

1. *International Mechanical Code.*
2. *International Gas Code.*
3. *International Energy Conservation Code.*
4. *International Fire Code.*

1.3 SCOPE OF WORK:

A. Provide all labor, materials, equipment and supervision to construct complete and operable mechanical systems as indicated on the drawings and specified herein. All materials and equipment used shall be new, undamaged and free from any defects.

1.4 EXISTING SERVICES AND FACILITIES:

A. Damage to Existing Services: Existing services and facilities damaged by the Contractor through negligence or through use of faulty materials or workmanship shall be promptly repaired, replaced, or otherwise restored to previous conditions by the Contractor without additional cost to the Owner.

B. Interruption of Services: Interruptions of services necessary for connection to or modification of existing systems or facilities shall occur only at prearranged times approved by the Owner. Interruptions shall only occur after the provision of all temporary work and the availability of adequate labor and materials will assure that the duration of the interruption will not exceed the time agreed upon.

C. Removed Materials: Existing materials made unnecessary by the new installation shall be removed, shall remain the property of the Owner and shall be stored at a location and in a manner as directed, or, if classified by the Owner's authorized representative as unsuitable for further use, shall become the property of the Contractor and shall be removed from the site.

1.5 PRODUCT WARRANTIES:

A. Provide manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed for the Purchaser or Owner by the manufacturer, when and if the product fails within certain operational conditions and time limits. Where the warranty requirements of a specific specification section exceed the manufacturer's standard warranty, the more stringent requirements will apply and modified manufacturer's warranty shall be provided. In no case shall the manufacturer's warranty be less than one (1) year.

1.6 PRODUCT SUBSTITUTIONS:

A. General: Materials specified by manufacturer's name shall be used unless prior approval of an alternate is given by addenda. Requests for substitutions must be received in the office of the Architect at least 10 days prior to opening of bids.

PART 2 – PRODUCTS

2.1 GENERAL MECHANICAL PRODUCT REQUIREMENTS:

A. Standard Products: Provide not less (quality) than manufacturer's standard products, as specified by their published product data. In addition to the indication that a particular product/model number is acceptable, comply with the specified requirements. Do not assume that the available off-the-shelf condition of a product complies with the requirements; as an example, a specific finish or color may be required.

B. Uniformity: Where multiple units of a general product are required for the mechanical work, provide identical products by the same manufacturer, without variations except for sizes and similar variations as indicated.

C. Product Compatibility, Options: Where more than one product selection is specified, either generically or proprietarily, selection is Purchaser's or Installer's option. Provide mechanical adaptations as needed for interfacing of selected products in the work.

D. Equipment Nameplates: Provide a permanent operational data nameplate on each item of power operated mechanical equipment, indicating the manufacturer, product name, model number, serial number, speed, capacity, power characteristics, labels of tested compliance, and similar essential operating data.

E. Locate nameplates in easy-to-read locations. When product is visually exposed in an

occupied area of the building, locate nameplate in a concealed position (where possible) which is accessible for reading by service personnel.

PART 3 – EXECUTION

3.1 PRODUCT INSTALLATION, GENERAL:

A. Except where more stringent requirements are indicated, comply with the product manufacturer's installation instructions and recommendations, including handling, anchorage, assembly, connections, cleaning and testing, charging, lubrication, startup, test operation and shut-down of operating equipment. Consult with manufacturer's technical experts, for specific instructions on unique product conditions and unforeseen problems.

B. Protection and Identification: Deliver products to project properly identified with names, models numbers, types, grades, compliance labels and similar information needed for distinct identifications; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior storage.

C. Permits and Tests: Provide labor, material and equipment to perform all tests required by the governing agencies and submit a record of all tests to the Owner or his representative. Notify the Architect five days in advance of any testing.

END OF SECTION 23 0110

SECTION 23 0120 – MECHANICAL STANDARDS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Industry Standards: It is a general requirement that mechanical work comply with applicable requirements and recommendations of standards published by listed agencies and trade associations, except to the extent more detailed and stringent requirements are indicated or required by governing regulations.

B. Listing of Associations, Standards, and Abbreviations:

1. AGA — *American Gas Association*
   1515 Wilson Blvd.
   Arlington, VA 22209
2. AMCA — *Air Movement & Control Association*
   30 W. University Dr., Arlington Heights, IL 60004
   302/394-0150
3. ARI — *Air-Conditioning and Refrigeration Institute*
   4301 North Fairfax Drive, Suite 425, Arlington, VA 22203
   703/524-8800
4. ASHRAE — *American Society of Heating, Refrigerating & Air Conditioning Engineers, Inc.*
   1791 Tullie Circle, NE, Atlanta, GA. 30329
   404/636-8400
5. AWS — *American Welding Society, Inc.*
   2501 NW 7th St., Miami, FL 33125
   305/642-7090
6. CISPI — *Cast Iron Soil Pipe Institute*
   2020 K. St., NW, Washington, DC
   202/233-4536
7. NEBB — *National Environmental Balancing Bureau*
   1611 North Kent St.,
   Arlington, VA 22209
8. NEC — *National Electrical Code* by NFPA
9. NEMA — *National Electrical Manufacturers Association*
   1300 N 17th Street, Suite 1847
   Rosslyn, VA 22209
   703/841-3200
10. NFPA — *National Fire Protection Association*

407 Atlantic Ave.,
Boston, MA 02210
617/482-8755

11. SMACNA — *Sheet Metal & Air Conditioning Contractors National* Association, Inc.
8224 Old Courthouse Rd., Tysons Corner
Vienna, VA 22180
703/790-9890

12. TIMA — *Thermal Insulation Manufacturers Association*
7 Kirby Plaza
Mt. Kisco, NY 10549
912/241-2284

13. UL — *Underwriters' Laboratories, Inc.*
207 East Ohio St.,
Chicago, IL 60611
312/642-6969

PARTS 2 AND 3 – PRODUCTS AND EXECUTION

A. Not applicable,

END OF SECTION 23 0120

SECTION 23 0210 – MECHANICAL COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Mechanical Coordination Drawings: Prepare a set of coordination drawings showing the coordination of the major elements, components and systems of the mechanical work, and showing the coordination of mechanical work with other work. Prepare drawings at accurate scale and sufficiently large to show locations of every item, including clearances for installing, maintaining, insulating, breaking down equipment, replacing motors and similar requirements. Prepare drawings to include plans, elevations, sections and details as needed to conclusively show successful coordination and integration of the work. Submit drawings for review by the Architect/Engineer.

B. Coordinate the actual location of all mechanical work visible in finished spaces with the Architect/Engineer. This includes air distribution devices, exposed ductwork, thermostats, humidistats, switches, sensors, etc.

PART 2 – PRODUCTS

2.1 MECHANICAL PRODUCT COORDINATION:

A. Power Characteristics: Refer to the electrical sections of the specifications and the electrical drawings for the power characteristics available for the operation of each power driven item of equipment. The electrical design was based on the typical power requirements of the equipment manufacturers scheduled or specified. Any modifications to the electrical system which are required due to the use of an approved equivalent manufacturer shall be made at no additional cost to the owner. All changes must be clearly documented and submitted for review by the Architect/Engineer prior to purchasing equipment. Coordinate purchases to ensure uniform interface with electrical work. The mechanical contractor shall furnish a detailed list of equipment electrical characteristics to the electrical contractor for the purpose of preparing the coordination affidavit required by Division 26.

B. Coordination of Options and Substitutions: Where the contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, do not proceed with purchasing until coordination of interface of equipment has been checked and satisfactorily established.

C. Firestopping: Refer to architectural drawings for the locations of all fire rated ceilings, floors

and walls. The contractor shall furnish detailed shop drawings of all firestopping details to be used for both piping and ductwork. All firestopping details shall be U.L. listed and subject to approval by the Authority having jurisdiction.

PART 3 – EXECUTION

3.1 INSPECTION AND PREPARATION:

A. Substrate Examination: The Installer of each element of the mechanical work must examine the condition of the substrate to receive the work, and the conditions under which the work will be performed, and must notify the Contractor in writing of conditions detrimental to the proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Do not proceed with the installation of sleeves, anchors, hangers, roof penetrations and similar work until mechanical coordination drawings have been processed and released for construction. Where work must be installed prior to that time in order to avoid a project delay, review proposed installation in a project coordination meeting including all parties involved with the interfacing of the work.

3.2 CUTTING AND PATCHING:

A. Structural Limitations: Do not cut structural framing, walls, floors, decks and other members intended to withstand stress, except with the Architect's or Engineer's written authorization.

B. Where authorized, cut opening through concrete (for pipe penetrations and similar services) by core drilling or sawing. Do not cut by hammer-driven chisel or drill.

C. Other work: Do not endanger or damage other work through the procedures and processes of cutting to accommodate mechanical work. Review the proposed cutting with the Installer of the work to be cut, and comply with his recommendations to minimize damage. Where necessary, engage the original Installer or other specialists to execute the cutting in the recommended manner.

D. Where patching is required to restore other work, because of either cutting or other damage inflicted during the installation of mechanical work, execute the patching in the manner recommended by the original Installer. Restore the other work in every respect, including the elimination of visual defects in exposed finishes, as judged by the Architect. Engage the original Installer to complete patching of the following categories of work:

1. Exposed concrete finishes and exposed masonry.
2. Waterproofing and vapor barriers.
3. Roofing, flashing and accessories.
4. Interior exposed finishes and casework, where judged by the Architect to be difficult to achieve an acceptable match by other means.

3.3 COORDINATION OF MECHANICAL INSTALLATION:

A. General: Sequence, coordinate and integrate the various elements of mechanical work so that the mechanical plant will perform as indicated and be in harmony with the other work of the building. The Architect/Engineer will not supervise the coordination, which is the exclusive responsibility of the Contractor. Comply with the following requirements:

1. Install piping, ductwork and similar services straight and true, aligned with other work and with overhead structures and allowing for insulation. Conceal where possible.
2. Arrange work to facilitate maintenance and repair or replacement of equipment. Locate services requiring maintenance on valves and similar units in front of services requiring less maintenance. Connect equipment for ease of disconnecting, with minimum of interference with other work.
3. Equipment located above ceilings shall be installed in a position and elevation which allows complete and adequate maintenance access through the ceiling grid or access panel while standing safely on a ladder. If this is not possible, a suitable maintenance platform must be provided per IMC.
4. Give the right-of way to piping systems required to slope for drainage (over other service lines). Piping shall be located to avoid interference with ductwork and light fixtures.
5. Store materials off the ground and protected from standing water and weather.

B. Drawings: Conform with the arrangement indicated by the contract documents to the greatest extent possible, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, comply with the Architect's decision on resolution of the conflict.

C. Electrical Work: Coordinate the mechanical work with electrical work, and properly interface with the electrical service. In general, and except as otherwise indicated, install mechanical equipment ready for electrical connection. Refer to electrical sections of the specifications for electrical connection of mechanical equipment.

D. Duct Smoke Detectors: All HVAC duct smoke detectors, including smoke detectors for smoke dampers, shall be furnished by Division 26 and installed by Division 23. In buildings equipped with a fire alarm system, all duct smoke detectors must be compatible with the fire alarm system and must be connected to the fire alarm system for notification. All fire alarm wiring and associated devices shall be furnished and installed by the fire alarm system installer. In buildings not equipped with a fire alarm system, each duct smoke detector must have a remote device where actuation of the duct smoke detector shall activate a visible and an audible signal in an approved location. Duct smoke detector trouble conditions shall activate a visible or audible signal in an approved location and shall be identified as “Air Duct Detector Trouble.” Each smoke detector shall be wired into the respective fan control circuit to automatically shut down the fan upon sensing products of combustion.

E. Utility Connections: Coordinate the connection of mechanical systems with exterior underground utilities and services. Comply with the requirements of governing regulations, franchised service companies and controlling agencies. Provide a single connection for each service except where multiple connections are indicated.

3.4 COORDINATION OF MECHANICAL START-UP:

A. Seasonal Requirements: Adjust and coordinate the timing of mechanical system start-ups with seasonal variations, so that demonstration and testing of specified performance can be observed and recorded. Exercise proper care in off-season start-ups to ensure that systems and equipment will not be damaged by the operation.

B. Painting and Air Distribution: Coordinate the initial cleaning and start-up of the air distribution system, to occur prior to preparatory cleaning and general interior painting and decorating on the project. The HVAC system should not be operated until drywall work is completed. Drywall dust must not be allowed to contaminate the interior of air handing units and ductwork. Use high efficiency temporary filters until project closeout.

END OF SECTION 23 0210

SECTION 23 0220 – MECHANICAL SUBMITTALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUBMITTAL FORMS AND PROCEDURES:

A. The purpose of submittals is to demonstrate to the Architect/Engineer that the Contractor understands the design concept. The Architect/Engineer's review of such drawings, schedules, or cuts shall not relieve the Contractor from responsibility for deviation from drawings or specifications unless he has, in writing, called the Architect/Engineer's attention to such deviations at the time of submission, and has received from the Architect/Engineer, in writing, permission for such deviations. All submittals must be completely checked by the Contractor prior to submission for review.

B. Hard Copy Submittals: Submittal data shall be placed in one or more hard-back 3-ring binders, arranged and labeled according to specification section. Each binder shall contain a title page and table of contents. Provide separator tabs, and label by specification section. Make note in the table of contents, any drawings that accompany the submittal. Title page shall contain Project Name, Contractor’s Name, Division 23 Superintendent’s name, Suppliers and point of contact for each, and date. Except as otherwise indicated in other sections, submit 5 complete copies. Quantity indicated does not include copies required for regulatory agencies.

C. Electronic Submittals: If the Architect agrees to allow electronic submittals via an on-line information management product such as “Submittal Exchange,” etc., all electronic submittal files shall be organized to match the bid documents for specification section and name. Each submittal file shall be complete for each specification section. Multiple partial submittals per specification section will be rejected. Make note in the table of contents, any drawings that accompany the submittal. Title page shall contain Project Name, Contractor’s Name, Division 23 Superintendent’s name, Suppliers and point of contact for each, and date.

D. Submittals shall be made for all items contained in the following specification sections:

1. Mechanical Coordination
2. Mechanical Identification
3. Ductwork and Accessories
4. Air Distribution
5. Fans
6. Air Treatment Systems
7. Heat Pumps
8. Energy Management Control System
9. Mechanical Sound, Vibration, Wind and Seismic Control

10. Mechanical Testing, Adjusting, Balancing

E. Response to Submittals: A Submittal Review Report shall be issued by the Architect/Engineer with the following classifications for each item:

1. **"No Exceptions Taken"**: No corrections, no marks. Contractor shall submit copies for distribution.
2. **"Make Corrections Noted"**: A few minor corrections. Items may be ordered as marked up without further resubmission. Submit copies for distribution.
3. **"Revise and Resubmit"**: Minor corrections. Item may be ordered at the Contractor's option. Contractor shall resubmit drawings with corrections noted.
4. **"Rejected"**: Major corrections or not in accordance with the contract documents. No items shall be ordered. Contractor shall correct and resubmit drawings.

PART 2 – PRODUCTS

2.1 SUBMITTAL REQUIREMENTS:

A. General: Each specification section shall list the required submittal items. All submittal items shall conform to the requirements listed below. For each major section of submittal data, include a summary page which lists items and model numbers for each piece of equipment.

B. Shop Drawings: Prepare mechanical shop drawings to accurate scale except where diagrammatic representations are specifically indicated. Show clearance dimensions of critical locations, and show dimensions of spaces required for operation and maintenance of equipment. Show piping connections and other service connections, and show interface with other work including structural support. Indicate by note, the portions of mechanical work shown on the shop drawings which deviated from the indication of work in the contract documents, and explain the reasons for the deviations. Show how such deviations coordinate with interfacing deviations on shop drawings for other portions of the work, currently or previously submitted.

C. Manufacturer's Data: Where pre-printed data is submitted for more than one distinct product, size, type, material, trim, accessory group or other variation, mark submitted copy with black pen to indicate which of the variations is to be provided. Delete or mark-out significant portions of preprinted data which are not applicable. Where operating ranges are shown, mark data to show portion of range required for project application. Expansion or elaboration of standard data to describe a non-standard product must be processed as a shop drawing submittal. For each product include the manufacturer's production specifications, installation or fabrication instructions, nearest source of supply (including telephone number), sizes, weights, speeds, operating capacities, piping and service line connection sizes and locations, statements of compliance with required standards and governing regulation (include manufacturer's signed statements if not covered in printed data), performance data (where applicable) and similar information needed to confirm compliance with the requirements.

D. Certifications: Where specifically indicated, submit with notarized execution.

E. Test Reports: Submit test reports which have been signed and dated by the firm performing the test and prepared in the manner specified in the standard or regulation governing the test procedures as indicated.

F. Manufacturer's Product Warranties: Where pre-printed and published warranty includes substantial deviation from required warranty (as judged by the Architect or Engineer), product is automatically disqualified from use on the project, except where manufacturer prepares and issues a specific product warranty on the product, stating that it is in lieu of the published warranty, and is executed by an authorized officer, and complies with the requirements. Warranties shall comply with the requirements of individual specification section where those requirements exceed the manufacturer's standard warranty.

PART 3 – EXECUTION

3.1 CLOSEOUT REQUIREMENTS:

A. Operating Instructions: Submit manufacturer's operating instructions for each item of mechanical equipment and supplement with additional project application instructions where necessary. Prepare and submit specific operating instructions for charging, start-up, control or sequencing of operation, phase or seasonal variations, shut-down, safety and similar operational instructions. Prepare in typewritten form in completely explained and easily understood English language.

B. Maintenance Manuals: Organize each copy of the required system maintenance manuals to include an index followed by thumb-tab marked sections for each of the following:

1. System operating instructions.
2. Emergency instructions including addresses and telephone numbers of service sources.
3. Regular system maintenance procedures including lubrication.
4. Spare parts listing and stocking recommendations.
5. Inspection, adjusting, rebalancing, cleaning, parts replacement, and similar maintenance instructions and recommendations, including the proper use of tools and accessories.
6. Valve schedule and control diagram for each system.
7. Manufacturer's data for each operating item in each system.
8. Manufacturer's product warranties and guarantees relating to the system and equipment items in the system.
9. Corrected or approved issues of submittal items relating to the system.
10. Bind each maintenance manual in one or more vinyl-covered, 2", 3-ring binder, plus pocket-folder type binders for folded drawings, and mark the back spine of each binder with system identification and volume number.

C. Maintenance Materials: Deliver to Owner’s representative at the location as directed, in containers or packages suitable for storage and fully identified.

D. Guarantees: Where indicated as "Certified", provide guarantee which, in addition to execution by an authorized officer of each guarantor, is attested to by the Secretary of each guarantor and bears the corporate seal.

END OF SECTION 23 0220

SECTION 23 0230 – MECHANICAL IDENTIFICATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in the manufacture of identification systems required for this product.

B. Submittals: Submit manufacturer's data on materials and submit a sample of each type required.

PART 2 – PRODUCTS

2.1 MECHANICAL IDENTIFICATION MATERIALS:

A. Engraved Plastic-Laminate Signs:

1. General: Provide engraving stock melamine plastic laminated, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core, letter color, except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
2. Thickness: 1/16 inch, except as otherwise indicated.
3. Fasteners: Self-tapping stainless steel screws, except contact type permanent adhesive where screws cannot or should not penetrate the substrate.

2.2 LETTERING AND GRAPHICS:

A. General: Coordinate names, abbreviations and other designations used in the mechanical identification work, with the corresponding designations shown, specified or scheduled. Provide numbers, lettering recommended by manufacturers or as required for proper identifications and operation/maintenance of the mechanical systems and equipment.

B. Multiple Systems: Where multiple systems of the same generic name are shown and specified, provide identification which indicates the individual system number as well as the service; as examples, Heat Pump No. HP-1, Exhaust Fan No. EF-1.

PART 3 – EXECUTION

3.1 APPLICATION AND INSTALLATION:

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting and other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering or painting.

B. Mechanical Equipment Identification: Install an engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for all major items of mechanical equipment.

END OF SECTION 23 0230

SECTION 23 0240 – MECHANICAL WORK CLOSEOUT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DOCUMENTATION PROCEDURES:

A. Signed Commitments: Do not proceed with transfer of mechanical plant to the Owner for operation until warranties, performance certifications and similar commitments to be signed by Contractor and other entities have been executed and transmitted to Architect (for Owner's records).

1.3 RECORD DRAWINGS:

A. Explanation: Except where otherwise indicated, mechanical drawings (contract drawings) prepared by Architect/Engineer, contract/drawings, are diagrammatic in nature and may not show locations accurately for various components of mechanical systems. Shop drawings, including coordination drawings, prepared by Contractor shall show certain portions of work more accurately to scale and location, and in greater detail.

B. General Recording Procedure: Maintain a white-print set, blue-line or black-line, of mechanical contract drawings and shop drawings in clean, undamaged condition, for mark-up of actual installations which vary substantially from the work as shown. Mark-up whatever drawings are most capable of showing the installed conditions accurately; however, where shop drawings are marked, record a reference note on appropriate contract drawing. Mark with erasable pencil and use multiple colors to aid in the distinction between work of separate mechanical systems. In general, record every substantive installation of mechanical work which previously is either not shown or shown inaccurately, but in any case record the following:

1. Underground and aboveground piping, both exterior and interior, drawn to scale and fully dimensioned.
2. *"Mechanical Project Record"* shall be maintained as part of the *"Project Record"* specified in Division 1.

PART 2 – PRODUCTS

2.1 NOT APPLICABLE:

PART 3 – EXECUTION

3.1 CLOSEOUT PROCEDURES:

A. General Coordination: Sequence closeout procedures properly, so that work will not be endangered or damaged, and so that every required performance will be fully tested and demonstrated.

B. System Performance Test Run: At the time of mechanical work closeout, check each item in each system to determine that it is set for proper operation. With Owner's representative and Architect/Engineer present, operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During or following test runs, make final corrections or adjustments of system to refine and improve performances wherever possible, including noise and vibration reductions, elimination of hazards, better response of controls, signals and alarms, and similar system performance improvements. Provide testing or inspection devices as may be requested for Architect's/Engineer's observation of actual system performances. Demonstrate that controls and items requiring service or maintenance are accessible. Test run shall be scheduled to coincide with Engineer's final inspection of the mechanical work.

C. Cleaning and Lubrication: After final performance test run of each mechanical system, clean system both externally and internally. Clean dirt and debris from air handling systems and install new filters. Flush piping system by operating drains and similar means, and clean strainers and traps. Lubricate both power and hand operated equipment and remove excess lubrication. Touch-up minor damage to factory painted finishes and other painting specified as mechanical work; refinish work where damage is extensive.

D. General Operating Instructions: In addition to specified training of Owner's operating personnel specified in individual mechanical sections, and in addition to preparation of written operating instructions and compiled maintenance manuals specified, provide general operating instructions for the total mechanical plant. Conduct a walk-through explanation and demonstration for orientation and education of Owner's personnel to be involved in continued operation of building and its mechanical plant.

1. Describe each basic mechanical system and how its control system functions, including flow adjustments, temperature control and similar operations.
2. Explain and point out identification system, displayed diagrams, signals, alarms and similar provisions of the work.
3. Describe basic sequencing requirements and interlock provisions for system start-up, phasing, coast-down, shut-down and seasonal operations.
4. Emphasize emergency procedures and safety provisions for protection of equipment and safety of occupants during equipment malfunction, disasters, power failures and similar unusual circumstances, and describe system limitations and precautions including weather adjustments.
5. Outline basic maintenance procedures.

E. Demonstrate what adjustments have been made and can continue to be made to reduce noise and vibration, improve system output, decrease energy consumption and similar performance improvements.

F. Point out operational security provisions, safety, unavoidable hazards and similar operator limitations. Display and conduct a "thumb-through" explanation of maintenance manuals, record drawings, meter readings and similar service items.

G. Construction Equipment: After completion of performance testing and Owner's operating instructions and demonstrations, remove installers tools, test facilities, construction equipment and similar devices and materials used in execution of the work but not incorporated in the work.

3.2 CONTINUED SYSTEM OPERATIONS:

A. Final Acceptance: At time of substantial completion of mechanical work, Owner's operating personnel will take over operation of mechanical systems. However, until time of final acceptance, respond promptly with consultation and services on whatever operation or maintenance problems may remain or arise in continued operation of mechanical plant.

END OF SECTION 23 0240

SECTION 23 2110 – DUCTWORK AND ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Industry Standards:

1. Comply with SMACNA *(Sheet Metal and Air Conditioning Contractor's National Association)* recommendations for fabrication, construction and details and installation procedures, except as otherwise indicated.
2. Comply with ASHRAE *(American Society of Heating, Refrigerating and Air Conditioning Engineers)* recommendations, except as otherwise indicated.
3. Provide composite ductwork insulation (insulation, coverings, sealers, mastics and adhesives) with flame-spread rating of 25 or less and a smoke-developed rating of 50 or less, as tested by ASTM E84 (NFPA 255) method.
4. Provide duct connectors which comply with applicable portion of UL 181 and bear label of *Underwriter's Laboratories*.

1.3 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties as applicable for all items.

PART 2 – PRODUCTS

2.1 ABOVE GROUND DUCTWORK:

A. General: Galvanized steel ductwork shall be used for all supply, return, exhaust, and ventilation ducts except as indicated otherwise by the contract documents. **[**Black steel ductwork shall be used for kitchen hood exhaust.**] [**Stainless steel duct shall be used for...**]** Preinsulated flexible duct shall be used to make final concealed connections to diffusers, registers, and grilles. Length of flexible duct shall not exceed five feet.

B. Galvanized Steel Ductwork: Ducts shall be fabricated from G90 galvanized sheet steel complying with ASTM A527 and A525, lockforming quality. Concealed round ducts **s**hall be the spiral seam type or snap-lock type with matching fittings.

C. Flexible Ducts: Flexible ducts shall be U.L. Listed as Class 1 Flexible Air Duct Material and shall comply with NFPA Standards 90A and 90B. Duct shall be a factory fabricated

assembly composed of a polymeric liner duct bonded permanently to a coated spring steel wire helix and supporting a fiberglass insulating blanket with a minimum R-value of 4.2. Low permeability outer vapor barrier of fiberglass reinforced film laminate shall complete the assembly. Duct shall be suitable for low and medium pressure systems and shall carry a full 5-year warranty. For all flexible duct connections to diffusers, registers and grilles, provide rigid elbow brace accessory with one duct diameter centerline radius. Acceptable manufacturers are *Atco, Flexmaster, Genflex* and *Thermaflex*.

2.2 DUCTWORK ACCESSORIES:

A. General: Except as otherwise indicated for each ductwork accessory, provide metal type, gauge, weight, construction and reinforcing as required by size limitations, and applicable SMACNA standards, including fittings, supports and appurtenances.

B. Flexible Connectors: Provide flexible connectors between supply and return duct connections to equipment and as otherwise indicated on the drawings. Flexible connector shall be constructed of neoprene permanently attached to 3 inch wide metal bands. Connector shall be UL listed and shall be as manufactured by *Durodyne*, *Ventfabrics* or *Young Regulator*.

C. Balancing Dampers: Provide single blade dampers for round ducts and rectangular ducts less than 12" as indicated on the drawings. Dampers shall be constructed of galvanized steel. Damper shall be installed complete with locking quadrants. For rectangular ducts 12" and wider, provide opposed-blade type dampers constructed of galvanized steel mounted in a galvanized steel channel frame. Blade spacing shall not exceed 6" and the top and bottom edges of the blades shall be crimped to stiffen the blades. Damper blades shall be interconnected by rods and linkages to provide simultaneous operation of all blades. Damper shall be provided with an extended rod to permit installation of a damper regulator. Dampers shall be as manufactured by *Air Balance*, *Arrow*, *Dowco*, *Jer-Air*, *National Controlled Air*, *Ruskin, Phillips-Aire, Safe-Air* and *United*.

D. Round Take-Offs: Round take-offs shall be made using collars constructed of galvanized steel equipped gasket flange and manual balancing damper with 2 inch handle standoff. Do not furnish extractors or air scoops. Takeoffs from medium pressure ducts to air terminal units shall have a conical entry. Take-offs from low pressure rectangular trunk ducts shall have 45 degree entry. Takeoffs shall be by *Celcon, Crown, Flexmaster, Jer-Air, Metalcraft, Sheet Metal Connectors, Thermaflex* and *United*.

E. Rectangular Take-Offs: Rectangular take-offs shall be made using collars constructed of galvanized steel equipped with gasket flange and manual balancing damper with 2 inch handle standoff. Do not furnish extractors or air scoops. All takeoffs shall have 45 degree entry. Takeoffs shall be by *Celcon, Crown, Flexmaster, Jer-Air, Metalcraft, Sheet Metal Connectors, Thermaflex* and *United*.

2.3 DUCTWORK INSULATION:

A. General: Refer to the mechanical plans for duct insulation types and locations. Insulation shall be as manufactured by *Certainteed, Knauf, Manville* and *Owens Corning*.

B. Duct Wrap: Type “A” Duct wrap shall be 2” thick, 0.75 pcf density, blanket type fiberglass insulation with vapor barrier and minimum R-Value of 6.7.

C. Duct Liner: Type “A” Duct liner shall be 1” thick, 1.5 pcf density, flexible black fiberglass with minimum R-Value of 3.6.

D. Ductwork Insulation Accessories: Provide mechanical fasteners as recommended by the insulation manufacturer.

E. Ductwork Insulation Compounds: Provide cement, adhesives, coatings, sealers, protective finishes, and similar compounds as recommended by the insulation manufacturer for the applications indicated.

2.4 MISCELLANEOUS MATERIALS:

A. General: Provide miscellaneous materials and products of the types and sizes indicated and where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

B. Duct Sealant: Duct Sealant for above ground ductwork shall be a mastic suitable for the pressure classification in accordance with SMACNA *HVAC Duct Construction Standard*". All joints and seams shall be sealed.

C. Ductwork Support Materials: Provide hot-dipped galvanized steel rods, fasteners, anchors, straps, angles and trim for support of ductwork. Wires shall not be acceptable. Ductwork installed above a roof shall be supported on pre-fabricated, non-penetrating supports by *Pipe Pier* or approved equal. Provide matching adjustable elevation kits.

2.5 DUCT FABRICATION:

A. Shop fabricate ductwork in 4, 8, 10, or 12 foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble in the shop to the greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to the extent necessary for shipping and handling. Match-mark sections for re-assembly and coordinated installation.

B. Fabricate ductwork with joints, seams and reinforcements as required in the latest edition of SMACNA *HVAC Duct Construction Standards*, 2” static pressure rating.

C. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Elbows shall be either the curved radius type or the square type with turning vanes. Curved radius elbows shall have a centerline radius equal to 1.5 times the duct width. Curved radius elbows with square throats shall not be acceptable.

D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Where ducts are specified to lined, make allowances for the thickness of the liner. Duct sizes shown on the drawings are clear, inside dimensions.

PART 3 – EXECUTION

3.1 INSTALLATION OF DUCTWORK:

A. General: Assemble and install ductwork in accordance with the latest edition of SMACNA *HVAC Duct Construction Standards* and with recognized industry practices which will achieve air tight noiseless systems, capable of performing each indicated service. Install each run with a minimum of joints. Align ductwork accurately at connections, and with internal and external surface smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of the type which will hold ducts true-to-shape and prevent buckling. Hanger locations shall be coordinated with the building structure and finish conditions.

B. Complete fabrication of work at the project as necessary to match shop fabricated work and accommodate installation requirements.

C. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by plans, diagrams, details and notations or, if not otherwise indicated, run ductwork in the shortest route which does not obstruct usable space or block access for servicing the building and its equipment. Coordinate the layout with piping, lighting layouts and similar finished work and plumbing risers. Duct layouts shown are diagrammatic and actual location of duct shall be field verified and coordinated by the duct fabricator prior to beginning fabrication of duct systems.

D. Duct collars shall be provided where ducts pass through walls and partitions which extend full height to the underside of the roof structure. Collars shall be fabricated from 22 gauge galvanized steel sheet. Duct collars shall be provided on both sides of walls and partitions, except collar shall be omitted on that side of the wall where registers and grilles are installed. Flanges shall be installed tight against the wall. The space between the duct and the wall shall be packed with mineral wool.

E. Coordinate duct installations with installation of accessories, dampers, equipment, controls and other associated work of the ductwork system.

3.2 INSTALLATION OF INSULATION:

A. Duct Wrap: Wrap shall be wrapped around duct work with all circumferential joints butted and longitudinal joints overlapped a minimum of 2”. Adhere insulation to duct with 4” strips of fire resistant adhesive at 8” on centers. On circumferential joints, the 2” flange on the facing shall be taped with minimum of 3” wide foil reinforced *Kraft* tape. On longitudinal joints the overlap shall be taped with a minimum 3” wide foil reinforced Kraft tape. On ends of insulation use 3” wide foil reinforced *Kraft* tape to fasten insulation ends to duct. For duct widths 24” and greater, provide additional mechanical fasteners on 18” centers on the bottom of the duct to prevent sagging. Insulate that part of the supply diffusers above the ceiling so that there is no uncovered metal surface subject to condensation. Provide taped-on 12”x12” squares of insulation over damper regulators located above ceilings.

B. Duct Liner: Liner shall be applied to the flat sheet with 100% coverage of fire resistant adhesive. The duct liner shall be cut to assure snug corner closing joints. The black surface

of the liner shall face the air stream. On horizontal runs, tops of ducts over 12" in width and sides over 16" in height shall be additionally secured with welded pins and speed clips or gripnails spaced on a maximum of 16" pin centers. On vertical runs, welded pins and speed clips or gripnails shall be spaced on maximum 16 inch pin centers on all widths over 12". Pins shall start within 2" of the leading edge of each section. Pins shall be cut close to the speed clip. Clips shall be drawn flush only and not so as to compress the liner. Coat all exposed edges and the leading edge of all cross joints with fire resistant sealant.

3.3 CLEANING AND PROTECTION:

A. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of the metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

B. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at the time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent the entrance of dust and debris.

END OF SECTION 23 2110

SECTION 23 2210 – AIR DISTRIBUTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. *Titus* is the Basis of Design manufacturer for grilles, registers and diffusers. Equivalent equipment by *Carnes, Krueger, Metalaire, Nailor* and *Price* that meets performance, capacity, space and other requirements of the design documents shall be acceptable.

B. *Greenheck* is the Basis of Design manufacturer for louvers. Equivalent equipment by *Arrow, Penn, Louvers And Dampers, Ruskin* and *United Enertech* that meets performance, capacity, space and other requirements of the design documents shall be acceptable.

C. Industry Standards: Comply with *National Fire Protection Association* Standard No. 90A, as applicable to construction and installation of required devices.

1.3 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties for all items as applicable.

PART 2 – PRODUCTS

2.1 GRILLES, REGISTERS, AND DIFFUSERS:

A. Ceiling Diffusers: T-bar lay-in style diffusers shall be the full 2x2 face type with round neck, three or four cones, and one-way, two-way, three-way, or four-way throw as indicated. Diffusers shall be of stamped aluminum construction with white finish. Do not furnish dampers.

B. Ceiling Return/Exhaust Grilles: Eggcrate grilles shall be all aluminum construction with ½" square eggcrate louvers, 1" deep, with white finish. All 1'x2', 2'x2', and 2'x4' grilles in lay-in ceilings shall be the lay-in type. All other sizes shall have a flanged frame.

C. Sidewall Return/Exhaust Grilles: Heavy duty grilles shall have minimum 18 gauge steel frames and 1/8 inch face bars at 40 degree deflection with white finish.

2.2 LOUVERS:

A. Stationary Louvers: Louvers shall be the drainable-blade type of minimum 0.081" thick extruded aluminum construction, 6" deep, with a full jamb section and channel frame. Blades shall be set at 40E on 5 inch centers. Provide a removable aluminum insect screen on the inside face of the louver. Finish shall be a factory applied primer suitable for field painting. Louvers shall be suitable for 120 MPH wind-borne debris zone and rated in accordance with the Florida Building Code.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. General: Install devices as detailed on the drawings and in accordance with manufacturer's written instructions and in accordance with recognized industry practices.

B. Coordinate with other work, including ductwork and ductwork accessories and ceiling system as necessary to interface installation of grilles and diffusers properly with other work.

C. Ceiling mounted devices to be installed in lay-in tile ceilings shall be compatible with 24"x24" or 24"x48" T-bar grid as applicable. Refer to Architectural Reflected Ceiling Plans for exact locations of grilles, registers and diffusers. For flush mounted devices in T-bar ceilings, special care shall be taken to install devices in the center of ceiling tiles. Sagging will not be permitted. Provide rear sheet metal angle bracing.

END OF SECTION 23 2210

SECTION 23 2310 – FANS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. *Greenheck* is the Basis of Design manufacturer. Equivalent equipment manufactured by *Acme, Carnes, Cook, Penn, Stanley and Twin City* that meets performance, capacity, space and other requirements of the design documents shall be acceptable.

B. Industry Standards:

1. Provide fans which bear *Air Movement and Control Association* (AMCA) certified performance rating seals.
2. Provide fan components which have been listed and labeled by *Underwriters' Laboratories.*
3. Comply with applicable portion of *National Electrical Manufacturer's Association* standards for motors.

1.3 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties on all items.

PART 2 – PRODUCTS

2.1 CEILING EXHAUST FANS:

A. Provide ceiling exhaust fans, in types and sizes indicated; locate where shown. Provide direct-driven fans with permanently lubricated, continuous duty, thermally protected, ball bearing motor. Construct fan housing of sheet steel with enamel finish, lined with sound absorbing acoustical insulation securely fastened to walls of housing. Provide a true centrifugal wheel with air outlet perpendicular to inlet and with statically and dynamically balanced wheel. Provide a white ceiling grille. Equip motor with integral thermal overload protection and with terminal box mounted on housing with cord, plug and receptacle inside housing. Provide ECM motor where available.

2.2 ROOF MOUNTED CENTRIFUGAL EXHAUST FANS:

A. Provide roof mounted centrifugal fans of the size and type as scheduled on the drawings. Fans shall be constructed with watertight housing capable of resisting 130 MPH winds and shall be direct or belt-driven as indicated. Motor shall be in a compartment out of the air stream. Housings shall be minimum 16 gauge spun aluminum. Fan wheel shall be of aluminum, dynamically and statically balanced, non-overloading backward-curved blades mounted on steel shaft. Equip with self-aligning heavy-duty bearings designed for end thrust and lubricated for a minimum of 10 years usage at operating temperatures of -65 to 100 degrees F. Provide vibrationless lubricated ball bearing motor with integral thermal overload protection and electrical disconnect switch under ventilator cap. Provide ECM motor where available. Provide aluminum bird screen, backdraft dampers, and matching roof curb.

PART 3 – EXECUTION

3.1 INSTALLATION OF FANS:

A. General: Except as otherwise shown or specified, install fans in accordance with manufacturer's written instructions and in accordance with National Electrical Code (NEC) and recognized industry practices.

B. The mounting height of each wall mounted thermostat or temperature sensor shall comply with ADA for maximum side reach. The thermostat or sensor shall be at 48” maximum above the floor.

3.2 TESTING:

A. After installation of fans has been completed, test each unit to demonstrate proper operation at performance requirements specified, including, but not limited to, proper rotation of impeller. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION 23 2310

SECTION 23 4320 – AIR TREATMENT SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE

A. *Global Plasma Solutions* is the Basis of Design manufacturer. Equivalent systems manufactured by *Aerisa, AtmosAir, BioClimatic* or *Plasma Air* that meets performance, capacity, space and other requirements of the design documents shall be acceptable.

B. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twelve months after shipment or eighteen months from owner acceptance, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor

1.3 SUBMITTALS

A. Provide manufacturer's data, test reports, and product warranties. The following information shall be included in the submittal:

1. Schedule of air treatment systems indicating unit designation and number of each type required for each unit/application.
2. Data sheet for each type of air treatment systems and accessories furnished indicating construction, sizes, and mounting details.
3. Performance data for each type of air treatment system furnished.
4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1 to validate acceptable indoor air quality at the quantity of outside air scheduled.
5. Product drawings detailing all physical, electrical and control requirements.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT:

A. General: Air treatment systems shall be the needle-point, bi-polar ionization type. Provide an air treatment system for every HVAC unit scheduled on the plans unless noted otherwise on the plans.

B. The Bi-Polar Ionization system shall be capable of:

1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
3. Capable of reducing static space charges.
4. Increasing the interior ion levels, both positive and negative, to a minimum of 1000 ions/cm^3

C. The air treatment system shall be designed such that it may fit into any scheduled mounting configuration including ductless mini-split units. If the ionization device is to be mounted in the ductless mini-split units, the air treatment system shall be powered from the ductless mini-split control board without having to require revised fusing in ductless mini-split device.

D. The air treatment system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable. Air exchange rates may vary through the full operating range of a constant volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air treatment system. The air treatment system shall not have a maximum velocity profile.

E. Air treatment systems shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100% shall not cause damage, deterioration or dangerous conditions within the air treatment system. Air treatment systems shall be capable of wash down duty.

F. Each air treatment system with bi-polar ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity per the manufacturer’s recommendations.

G. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Internal circuitry shall be provided to sense airflow across the electrode output.

H. HVAC Equipment Mounted Units: Mount the air treatment system(s) at the supply fan inlet and wire it to equipment control power (24VAC) as instructed by the air treatment manufacturer’s instructions. Each unit shall be designed with a stainless steel casing; integral illuminated on/off switch, two 2.5mm DC power jacks, high voltage output indication light and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the air treatment system is working properly and may be daisy chained in series such that only one dry contact per equipment is required to interface to the EMCS.

I. Ionization Requirements: Air treatment systems with bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above. The air treatment system shall consist of bi-polar plasma generator and power supply. The air treatment system shall be installed where indicated on the plans or specified to be installed. The device shall be capable of being powered by DC power or 24VAC or 94VAC to 264VAC without the use of an external transformer. Air treatment systems requiring isolation transformers shall not be acceptable. The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable. Ionization output from each electrode shall be a minimum of 5 million ions/sec when tested at 2”from the ionization generator.

J. Ozone Generation: The operation of the electrodes or bi-polar ionization units shall conform to ASHRAE Standard 62.1 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.

K. Electrical Requirements: Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma generator shall accept an electrical service of 24 VAC or 100 VAC to 240VAC, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.

L. Control Requirements:

1. All air treatment systems shall have internal short circuit protection, overload protection, and automatic fault reset.
2. Integral airflow sensing shall modulate the plasma output as the airflow varies or stops.
3. Follow all manufacturer IOM instructions during installation.
4. All air treatment systems shall have a means to interface with the EMCS. Either a 0-10VDC output or dry contacts shall be acceptable to prove operation.

PART 3 – EXECUTION

3.1 GENERAL:

A. The Contractor shall be responsible for maintaining all air treatment systems until the Owner accepts the building.

3.2 INSTALLATION:

A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and engineer.

B. Any material damaged by handling, the mechanical contractor, at no cost to the owner, shall replace water or moisture.

C. All equipment shall be protected from dust and damage on a daily basis throughout construction.

3.3 TESTING

A. Upon completion of installation of equipment and system, start-up and operate system to demonstrate compliance with design requirements.

B. A qualified representative from the manufacturer shall inspect the installation of the air treatment system to ensure installation in accordance with manufacturer's recommendation.

C. Perform a test of ion production in all HVAC systems equipped with air treatment devices. Conduct tests in spaces served by HVAC systems equipped with air treatment devices. Test

must show ion levels with air treatment systems ‘off’ and ‘on.’ Submit a typed report prior to system commissioning.

3.4 TRAINING

A. A manufacturer's authorized representative shall provide training of Owner's personnel in the proper operation and maintenance of all equipment.

END OF SECTION 23 4320

SECTION 23 6110 – HEAT PUMPS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. Manufacturers:

1. *Bard* is the Basis of Design manufacturer for Wall Mount Heat Pumps. Equivalent name brand equipment manufactured by *Marvaire* or *Sun* that meets performance, capacity, space and other requirements of the design documents shall be acceptable.
2. *Mitsubishi* is the Basis manufacturer for Ductless Heat Pumps. Equivalent equipment manufactured by *Daikin* or *Toshiba* that meets performance, capacity, space and other requirements of the design documents shall be acceptable.

B. Industry Standards:

1. Comply with applicable provisions of NFPA Standard 90A pertaining to construction and installation of air conditioning units.
2. Provide units which shall comply with applicable portions of UL 465, and with electrical components that bear UL labels.
3. Units shall be rated and certified in accordance with ARI Standard 240, 270 or 380 as applicable.
4. Comply with installation requirements of ANSI/ASHRAE 15; *Safety Code for Mechanical Refrigeration*.

C. Extended Warranty: In addition to the standard one-year warranty on all components, compressors shall bear an additional four-year manufacturer's warranty against material and design defects.

1.3 SUBMITTALS:

A. Provide manufacturer's data, test reports, and product warranties for all items as applicable.

PART 2 – PRODUCTS

2.1 WALL MOUNT HEAT PUMPS:

A. General: Each unit shall be a self-contained, packaged unit complete with precharged

refrigerant circuits and ready to operate as a year-round HVAC system. Units shall be complete with compressor, evaporator coil, condenser coil, hot gas reheat coil, electric heat, fans, internal filters and commercial room ventilator module for ventilation air.

B. Cabinet construction shall be a single, enclosed, weatherproof casing constructed of 20 gauge galvanized steel. Unit base is constructed of 16 gauge galvanized steel. Each exterior casing panel shall be bonderized and finished with baked-on exterior polyester enamel paint prior to assembly. The finish color shall be a selected by the Architect. Cooling and heating section shall be fully insulated with 1 inch foil-faced fiberglass. Remaining sections shall be insulated with matt-faced fiberglass. Openings shall be provided for electric power connections. Access openings appropriate for outside structure to all fan motors and compressor for making repairs and for removing internal components without removing unit from its permanent installation. Fresh air intake and outdoor coil shall be protected from intrusions by a sturdy metal grating with less than 1/2 inch openings. Sloped top shall be factory installed. If unit does not include sloped top, field supplied sloped rain hood painted to match unit shall be provided. Unit shall be provided with field-installed rain flashing. Provide integral full length side mounting brackets and a bottom mounting bracket. Drain pan shall be 20 gauge galvanized steel, bonderized and finished with baked-on exterior polyester enamel paint. Provide a filter rack and 2 inch pleated MERV 6 filters.

C. Refrigeration system shall use a welded hermetic scroll type compressor with internal vibration isolation, suction and discharge gauge ports, and built in thermal and over-current protection. The refrigeration circuit shall be equipped with factory installed high-pressure controls. High and low pressure switches are standard and shall be auto reset. Liquid line filter dryer shall be provided. Refrigeration shall be R-410A. Coils shall be of copper construction with aluminum fins mechanically expanded and bonded to the tubes. Coils shall be factory charged with refrigerant and pretested. Factory installed capillary tubes shall provide refrigerant control. Condenser coils shall have a factory-applied corrosion protection coating.

D. The indoor blower system shall be twin wheels with forward curve blades, direct driven. Motor shall be ECM type if available. Indoor blower system shall easily slide out for service or replacement. The condenser fan, motor and shroud shall be of slide out configuration for easy access.

E. The heat pump shall have a factory installed electric resistance heater. Heater shall include automatic limit safety controls.

F. The Commercial Room Ventilator (CRV) is internally mounted and allows outside ventilation air, up to 50% of the total air flow rating of the unit, to be introduced through the air inlet openings. It includes a built-in exhaust air damper. The damper can be easily adjusted to control the amount of fresh air supplied into the building. CRV shall be easily removable for service or cleaning. CRV can be controlled by indoor blower operation or field controlled based on room occupancy using CO2 controller.

G. The Dehumidification (DEHUM) circuit including independent heat exchanger coil shall be located in supply air stream and controlled by a separate space humidistat. When space relative humidity rises above set point (60% RH), the compressor circuit and 3-way valve shall be energized. The energized 3-way valve directs hot refrigerant discharge gas into the separate desuperheating condenser circuit, reheating cold supply air before it enters the space. The refrigerant gas is then routed back to the condenser coil for further heat transfer. A back

drain orifice is inserted between the reheat coil return line and suction line to prevent liquid from accumulating in the reheat coil when inactive. Revert to normal operation when room relative humidity falls below 55% RH.

H. Electrical components are easily accessible for routine inspection and maintenance through access panel. Circuit breaker is standard on all models. Circuit breaker access is through lockable access panel. Electrical knockouts shall be provided on the side of the cabinet. Access panels shall be readily removable for service functions.

I. The internal control circuit shall consist of a current limiting 24VAC type 75VA transformer with 208/230V primary taps. Refrigerant circuit shall include factory installed compressor control module, and high-pressure and low pressure switches. Provide low ambient control. A solid-state blower control shall provide one-minute delay before stopping blower, once the cooling cycle has been completed to maximize the unit operating efficiency. In the heating mode, there shall be a thirty second on-delay, and a two-minute off-delay. The defrost circuit shall consist of a solid-state electronic heat pump control. A 30-minute timer shall inflate a defrost cycle if the outdoor coil temperature indicates the possibility of an iced condition. The thermistor sensor, speed-up terminal, and a ten-minute defrost override shall be standard on the electronic heat pump control. To prevent rapid compressor short cycling, a five-minute time delay circuit shall be factory installed. A low-pressure bypass shall be factory installed to prevent nuisance tripping during low temperature start-up. All units with 3-phase power shall include factory mounted phase rotation monitor. This device shall protect scroll compressor from reverse rotation and also protect unit from phase failure. If 3-phase power is incorrectly connected at the field power connections, the phase monitor shall lock out the unit and a red light will illuminate indicating incorrect phase. Also if a power leg is lost, the phase monitor will lock out the unit due to phase imbalance. Once the condition is corrected, turning the power off at the circuit breaker or disconnect will reset the phase monitor. Unit controls shall be factory wired and located in a readily accessible location.

J. Provide matching acoustical sound curb designed to offset the return air wall opening for return air sound attenuation. Sound curb construction, insulation and finish shall match the wall mount air conditioner. Curb shall mount between the exterior wall and the unit and shall be 9-5/16 inches deep.

K. See Section 238110 for additional control information.

2.2 DUCTLESS HEAT PUMPS:

A. General: Indoor and outdoor units shall be a matched pair of one manufacturer rated for operation together by the manufacturer's published literature. The system shall be furnished complete with packaged indoor unit, packaged outdoor unit, refrigerant lines and all necessary controls and accessories for a complete, operational system.

B. Outdoor units shall consist of hermetic scroll compressors(s) with crankcase heaters, automatically reversible oil pump, internal and external motor protection, outdoor fan(s) of the propeller type with direct drive factory lubricated motor(s) and outdoor coil all housed in a heavy duty steel casing with baked enamel factory-applied finish. Indoor units (air handlers) shall be the horizontal wall mounted type complete with statically and dynamically balanced centrifugal direct drive fan, indoor coil, electric heater, standard filters, expansion valves and relays, and controls all housed in a factory-fabricated and insulated steel housing

with baked enamel finish. Provide single point power connection. Outdoor units shall receive an additional spray-on corrosion protection coating.

C. Unit controls and protective devices shall include high pressure stat, loss of charge pressure stat, suction line accumulator and pressure relief device. Motor compressors shall have a thermal and current sensitive overload device. The outdoor unit shall have short cycle protection and safety lock-out compressor protection. Automatic defrost controls shall be provided. Factory charge with HFC refrigerant.

D. Refrigerant piping shall be hard drawn seamless copper tubing suitable for a working pressure of 300 psig. Fittings shall be wrought copper or brass suitable for use with high temperature solder and designed for 300 psig working pressure. Suction line insulation shall be closed cell foam plastic insulation. Provide copper plated band type clevis hangers.

E. HVAC drain piping shall be Schedule 40 PVC pipe with socket type fittings and solvent cement joints. Insulate with 1 inch thick fiberglass with vapor barrier. Provide clevis type hangers.

F. Thermostats shall be the manufacturer's digital wall mounted thermostat.

G. See section 23 8310 for more information.

PART 3 – EXECUTION

3.1 INSPECTION:

A. Installer must examine areas and conditions under which heat pumps are to be installed and notify the Contractor in writing of conditions detrimental to the proper completion of the work. Do not proceed with the work until the unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF HEAT PUMPS:

A. Install heat pumps where shown, in accordance with equipment manufacturer's written instructions and recognized industry practices, to insure that units comply with requirements and serve intended purposes.

B. Coordinate with other work, including structural, ductwork, piping and electrical work, as necessary to interface installation of heat pumps with other work. Control wiring and devices for complete, operable systems shall be provided and installed under the Mechanical specifications. Wiring shall be installed in conduit provided and installed under the Electrical specifications.

3.3 TESTING:

A. Upon completion of installation of heat pumps and connection to the completed air

distribution system, start-up and test equipment in accordance with the manufacturer's recommendations. Operate units to demonstrate capability and compliance with requirements. Where possible, field-correct malfunctioning units, then retest to demonstrate compliance.

END OF SECTION 23 6110

SECTION 238310 – ENERGY MANAGEMENT CONTROL SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 OVERVIEW:

A. The system shall provide an extension of the existing Glynn County *Automated Logic Controls* WebCTRL Direct Digital Control (DDC), Energy Management Control System (EMCS) for the air conditioning, heating and ventilating systems as specified herein. Contact *Automated Logic Controls,* 529 Stephenson Avenue, Savannah, GA. 31405, (912)577-1214.

1.3.1 SCOPE OF WORK:

A. Contractor's Responsibilities: The Contractor shall furnish and install all necessary software and hardware, wiring, and computing equipment to accomplish the control sequences listed in this specification.

B. Contractor shall update all central site graphics to include the new buildings and associated HVAC systems.

C. Warranty: The Contractor shall warrant, from the date of final acceptance**,** that all systems, subsystems, component parts, and software are fully free from defective design, materials, and workmanship for a period of two (2) years.

1.4 SUBMITTALS, DOCUMENTATION, ACCEPTANCE AND TRAINING:

A. Submittals:

1. Shop Drawings: Provide a complete list of equipment, materials, manufacturer's technical literature, cut-sheets, and installation instructions. Drawings shall contain proposed layout, complete wiring, routing, schematic diagrams, tag number of devices, software descriptions, calculations, installation details, and any other details required to demonstrate that the system will function properly.
2. Graphical Programming Documentation: The Contractor shall provide a printout of all Graphical Programs, identifying the specific HVAC or mechanical subsystem being controlled.
3. Drawing Approval: Shop drawings shall be approved before any equipment is installed. Controls contractor shall allow a minimum of fourteen (14) days for drawing approval.
4. As Built Drawings: All drawings shall be reviewed after the final system checkout and updated or corrected to provide 'as-built' drawings to show exact installation. All shop drawings will be acknowledged in writing before installation is started and again after the final

checkout of the system. The system will not be considered complete until the 'as-built' drawings have received their final approval. The Contractor shall deliver six (6) sets of 'as-built' drawings.

B. Acceptance Test:

1. Acceptance Testing: Upon completion of the installation, the Contractor shall start up the system and perform all necessary calibration, testing, and debugging operations. The Contractor in the presence of the Owner's representative shall perform an acceptance test.

2. Notice of Completion: When the system performance is deemed satisfactory, the system parts will be accepted for beneficial use and placed under warranty. At this time, a "notice of completion" shall be issued and the warranty period shall start.

C. System Training:

1. System Use Instructions: Controls Contractor shall provide (4) Hours of onsite training for designated personnel in the operation, maintenance, and programming of the system.

2. Provide Audio Visual Training CDs.

PART 2 – PRODUCTS

2.1 FIELD INSTALLED CONTROLLERS, DEVICES AND WIRING:

A. Field installed controllers, devices and wiring shall be selected by the controls contractor for compatibility.

2.2 CONTROL PANELS:

A. Furnish formed sheet metal control panels as required with locking door and hinges. All necessary relays, switches and peripheral devices shall be located inside panels. All multi-equipment main panels shall have a laminated control point diagram identifying all control points and monitoring points associated with the control module(s) contained within the panel. Each panel shall be identified with an attached identifying phenolic tag. All electric devices shall be connected to numbered terminal strips. All control panels shall be centrally located.

PART 3 – EXECUTION

3.1 HARDWARE INSTALLATION:

A. Utility Company Equipment: Owner shall arrange installation of electric billing meters with demand signal pulses, as indicated.

B. Wiring:

1. The Contractor shall install wires for the room temperature sensors (from sensor to the appropriate control module).

2. The Contractor shall install all sensing devices and the wiring to modules.

3. The Contractor shall install all control and monitoring wiring in Mechanical Rooms.

4. Low voltage wire shall be not less than 18 AWG. All line voltage wire shall be THHN/TFFN, 600 volt rated.

5. Control and interlock wiring and installation shall comply with national and local electrical codes, Division 26, and manufacturer's recommendations.
6. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC and Division 16.
7. Low-voltage wiring shall meet NEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.
8. NEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.
9. Install wiring in raceway where subject to mechanical damage and all exposed locations such as mechanical, electrical, or service rooms.
10. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.
11. Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 6 ft. intervals.
12. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.
13. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.
14. Size raceway and select wire size and type in accordance with manufacturer's recommendations and NEC requirements.
15. Include one pull string in each raceway 1 in. or larger.
16. Use color-coded conductors throughout.
17. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 6 in. between raceway and high-temperature equipment such as steam pipes or flues.
18. Adhere to requirements in Division 26 where raceway crosses building expansion joints.
19. Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.
20. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.
21. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 18 inches in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture.
22. Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.
23. Communication wiring shall be low-voltage Class 2 wiring.
24. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

25. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.
26. Verify entire network's integrity following cable installation using appropriate tests for each cable.
27. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.
28. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.
29. Label communication wiring to indicate origination and destination.
30. Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.2 SMOKE DETECTORS:

A. Smoke detectors approved for duct installation shall be provided by Division 27 for air systems where as indicated on the drawings to automatically shut down the supply fan and close all associated system smoke dampers (as required). Each detector shall have an integral relay.

B. Smoke detectors shall be furnished by Division 27 and installed under Division 23. All wiring between detector and fire alarm system shall be provided and installed under Division 27.

PART 4 – SEQUENCE OF OPERATION:

4.1 WALL MOUNT HEAT PUMPS (WHP):

A. Wall Mount Heat Pumps shall be controlled by space temperature and relative humidity sensors. During occupied hours, supply fans shall run continuously, outside air dampers shall be open, and DX cooling /heating modes shall cycle as needed to maintain space temperature setpoint. During unoccupied hours, supply fans shall run intermittently and outside air dampers shall be closed. Units shall operate in dehumidification mode whenever indoor relative humidity exceeds 60% (adjustable) and force the unit into full cooling until the indoor relative humidity falls below 55% (adjustable). During dehumidification mode, DX hot gas reheat heat shall operate to maintain the indoor setpoint. Provide full DDC control. Provide EMCS contact for associated air treatment system.

4.2 DUCTLESS HEAT PUMPS (DHP/DAH):

A. Ductless Heat Pumps shall be controlled by matching thermostats. EMCS shall monitor space air temperature and discharge air temperature.

4.3 FANS:

A. EF-3 and EF-4 shall run continuously during Occupied Mode and be shut down during Unoccupied Mode. EMCS will provide a start/stop signal. EMCS will provide remote monitoring and alarm for fan status.

B. EF-1 and EF-2 shall be interlocked with the lights. Fans shall not be connected to EMCS.

4.4 SPACE TEMPERATURE CONTROL:

A. Space Temperature Measurement: There shall be two space temperature setpoints, one for cooling and one for heating, separated by a dead band. Only one of the two setpoints shall be operative at any time.

C. The cooling setpoint is operative if the actual space temperature has more recently been equal to or greater that the cooling setpoint. The heating setpoint is operative if the actual space temperature has more recently been equal to or less than the heating setpoint.

D. There are two modes of operation for the setpoints, one for the occupied mode (example: heating = 72 degrees F, cooling = 76 degrees F) and one for the unoccupied mode (example: heating = 55 degrees F, cooling = 90 degrees F).

END OF SECTION 238310

SECTION 23 9110 – MECHANICAL SOUND, VIBRATION, WIND AND SEISMIC CONTROL

PART 1 – GENERAL

1.1 SCOPE OF WORK:

A. Furnish all labor, materials, tools and equipment and perform all work necessary to complete the installation of the mechanical sound, vibration, wind and seismic control systems required by these specifications and as detailed on the drawings.

B. All foundations and supports required for the installation of Division 23 equipment shall be furnished by the Division 23 contractor shall unless specifically specified otherwise.

C. The following criteria applies to all mechanical systems and components:

1. Wind Pressure Velocity: 130 MPH
2. Seismic Design Category: C
3. Importance Factor: 1.0

D. Based on the criteria listed above, no seismic restraints are required.

1.2 RELATED DOCUMENTS:

A. The drawings and general provisions of this division of the Contract, including the General and Special Conditions and Division 1 Specifications, apply to this Section.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: The installation of the mechanical systems shall be installed in accordance with the following codes and standards. All seismic restraint systems such as sway bracing, cable restraints, seismic snubbers, seismic restraints, and vibration isolators shall also meet the requirements as set forth in the following standards and codes:

1. *2012 International Building Code* (IBC)
2. ASHRAE

B. The mechanical sound, vibration, wind and seismic control equipment and products shall be sized and provided by one of the manufacturers listed below. The manufacturer shall have tested all seismic products provided for the specific intended use and installation.

C. *Kinetics Noise Control* is the Basis of Design manufacturer. Equivalent equipment by *AeroSonics, Mason, Vibration Eliminator, Vibro-Acoustics* and *Vibration Mountings and Controls* that meets performance, capacity, space and other requirements of the design documents shall be acceptable.

D. The manufacturer and/or his representative shall select all vibration isolation products in-accordance with the Vibration Isolation Schedule listed in these specifications. All products shall provide the specified deflection as indicated based on the actual equipment weights and installation requirements of the approved equipment. The manufacturer shall provide installation instructions for all provided isolators, wind restraints and seismic restraints and bracing. Locations of vibration isolation products shall be coordinated with equipment details shown on the drawings and also as specified in these specifications for maximum support locations for piping and other equipment.

E. Submittals:

1. The contractor shall submit for approval by the engineer all products intended to be used to meet the requirements of these specifications. Submittal data shall include a proposed schedule for vibration isolation products, manufacturer's data and cut sheets of the specific vibration isolation, seismic control or sound barrier materials. Proposed vibration isolation schedule shall list all equipment specified to be isolated, the equipment weight, proposed isolator type or base type, number of isolators required, spring or isolator color, and deflection of the spring or vibration isolator based on the equipment weight.
2. The contractor shall submit for approval by the engineer, wind anchorage requirements for all equipment and curbs. Anchorage calculations shall be prepared by a registered engineer in the state where the project will be constructed. The engineer shall stamp calculations. Wind anchorage requirements shall be submitted for all curb mounted equipment and roof mounted equipment. Forces due to a 130 MPH wind speed in accordance with the IBC 2012 edition shall be calculated. Fasteners shall be selected and detailed for curb connections to the building structure and also for equipment connections to the curb. Calculations shall be based on the approved equipment for the project.

PART 2 – PRODUCTS

A. Not applicable,

PART 3 – EXECUTION

3.1 GENERAL:

A. If the equipment provided is not furnished with integral structural steel supports, mounting feet or lifting lugs, the contractor shall provide miscellaneous steel shapes as required to install or suspend the equipment and attach the vibration isolation or seismic restraints as specified herein.

B. Support steel shall include but not be limited to rails, brackets, angles, channels, and similar components.

C. All equipment specified to be isolated shall be installed and isolators shall be attached to the building structure or floor and the vibration isolators shall be adjusted and leveled so that the vibration isolators are performing properly.

D. All vibration isolation products, seismic restraint products, flexible pipe connectors and sound control products shall be installed as outlined in the manufacturer's printed installation instructions.

E. For equipment scheduled to receive external vibration isolation, all factory-installed internal vibration isolation shall be locked down.

END OF SECTION 23 9110

SECTION 23 9210 – MECHANICAL TESTING, ADJUSTING, BALANCING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 QUALITY ASSURANCE:

A. General: An independent test agency shall perform the TAB work as described herein. The agency shall have a minimum of 3 years of successful TAB experience on projects of similar size and scope. The name of the test agency and proof of satisfactory performance on 5 previous projects in the form of projects referenced shall be submitted to the Architect for approval within 30 days after receipt of the construction contract.

B. Test Agency: A firm with membership in the *Associated Air Balance Council* (AABC) or certified by the *National Environmental Balancing Bureau* (NEBB) in those testing and balancing disciplines similar to those required for this project, who is not the Installer of the system to be tested, and is otherwise independent of the project.

C. Compliance: Comply with AABC standards or NEBB's *Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems* as applicable to mechanical air systems and associated equipment apparatus.

D. Industry Standards: Comply with ASHRAE (*American Society for Heating, Refrigeration and Air Conditioning Engineers, Inc.*) recommendations pertaining to measurements, instruments, and testing, adjusting, and balancing except as otherwise indicated.

1.3 SUBMITTALS:

A. Submit 5 copies of a certified test report signed by the TAB supervisor who performed the TAB work. Test reports shall be submitted prior to the final inspection of mechanical work.

B. Include identification and types of instruments used and their most recent calibration date with submission of final test report.

C. In addition to Air Balance and operational data required to be submitted, the report shall include any observation of unusual noise or vibration observed and any malfunction of adjustable devices encountered during the TAB work.

1.4 JOB CONDITIONS:

A. Do not proceed with testing, adjusting and balancing work until the work to be TAB'ed has

been completed and is operable. Do not proceed until work scheduled for TAB'ing is clean and free from debris, dirt, and discarded building materials.

PART 2 – PRODUCTS

2.1 PATCHING MATERIALS:

A. Except as otherwise indicated, use the same products as used by original Installer for patching holes in insulation, ductwork and housing which may have been cut or drilled for test purposes, including access for test instruments, attaching jigs and similar purposes.

2.2 TEST INSTRUMENTS:

A. Utilize test instruments and equipment for the TAB work required, of the type, precision and capacity as recommended in AABC standards or NEBB's Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems.

PART 3 – EXECUTION

3.1 TESTING:

A. Tester must examine the installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Notify the Contractor in writing of conditions detrimental to the proper completion of the test-adjusting-balancing work. Do not proceed with the TAB work until unsatisfactory conditions have been corrected in a manner acceptable to Tester.

B. Test, adjust, and balance mechanical air systems and water systems. At a minimum, the report shall document the following:

1. CFM for all diffusers, grilles and registers.
2. CFM for all fans including static pressure setpoints.
3. Entering air / leaving air temperatures (DB/WB) for all cooling coils.
4. Calculated cooling coil capacities.
5. Entering air / leaving air temperatures for all heating coils.
6. Calculated heating coil capacities.

C. Airflows shown on drawings are provided as a guide to achieve uniform room temperature throughout the building. Field correct as required to suite room condition. Any substantial alteration shall be called to the engineer's attention.

D. Prepare a report of test results, including instrumentation calibration reports, in the form recommended by the applicable standards.

E. Patch holes in insulation, ductwork and housing, which have been cut or drilled for test

purposes, in a manner recommended by the original Installer.

F. Mark equipment settings, including manual damper control positions, and similar controls and devices, to show final settings at completion of TAB work. Provide marking with paint or other suitable permanent identification materials.

END OF SECTION 23 9210

SECTION 26 0100 – GENERAL PROVISIONS - ELECTRICAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 IMPOSED REGULATIONS:

A. Applicable provisions of the State and Local Codes and of the following codes and standards are hereby imposed on a general basis for electrical work:

1. NEC, National Electrical Code (NFPA No. 70), with Georgia Amendments.
2. The Life Safety Code (NFPA No. 101), with Georgia Amendments.
3. State of Georgia ADA Accessibility Guidelines for Building and Facilities.
4. The Standard Building Code, with Georgia Amendments.
5. The National Electrical Safety Code (ANSI C2.)
6. U.L. Fire Resistance Directory.
7. U.L. Electrical Construction Materials Directory.
8. U.L. Electrical Appliance and Utilization Equipment Directory.

1.3 SCOPE OF WORK:

A. Provide all labor, materials, equipment and supervision to construct complete and operable electrical systems as indicated on the drawings and specified herein. All materials and equipment used shall be new, undamaged and free from any defects.

1.4 COORDINATION:

A. Coordinate work provided under this division of the specifications with work provided under other divisions of the specifications and work provided by owner, where applicable.

1.5 PROJECT STAFFING:

A. Superintendent:

1. Provide a superintendent to plan, layout, supervise and coordinate the work provided by all organizations providing work under Division 26. The superintendent shall be at the job site at any time work is being performed.
2. The superintendent shall have a minimum of 5 years experience in educational projects of similar size and scope. The superintendent shall have a State of Georgia unrestricted electrical contractor’s license.

B. Organizations Furnishing and Installing Electrical Systems:

1. Traditional electrical systems work shall be furnished and installed by organizations who have successfully completed work of similar size and scope, and who have been in business for at least 3 years.
2. Electricians, 600V and below:
   a. Electricians assigned to the project shall have proof of having completed a formal training program which certifies that they are qualified to perform electrical work of the type encountered on this project and are familiar with the building codes which apply to this project. For the purposes of this project, workers not possessing these qualifications shall be considered helpers and shall not be allowed to perform electrical work.

C. Submit resumes for review and approval by the Architect prior to proceeding with any work on the project. Fill out Attachment 2, Section 260120 for each firm providing work under Division 26.

1.6 UTILITY CONNECTIONS:

A. The approximate point of origination for electric, telephone and television utilities is shown on the drawings. However, the contractor shall confirm the location with the respective utility prior to ordering materials or beginning any trenching. The Contractor’s bid shall allow for the service point to be shifted by the utility, 25' feet in any direction from that shown.

1.7 PERMITS AND TEST; ELECTRICAL WORK:

A. Submit a record copy (for Owner's records) of electrical work notices, permits, licenses, inspection or test reports, and similar items obtained in response to governing and imposed codes, regulations and standards.

1.8 ELECTRICAL DRAWINGS:

A. Do not scale the electrical drawings. Obtain all dimensions from the Architect's dimensioned drawings, field measurements and shop drawings.

B. Electrical contract drawings are diagrammatic and indicate the general arrangement and connection of equipment and devices. Review product data sheets, wiring diagrams, manufacturer’s installation instructions, etc. and provide the connections required to place equipment into service. Do not rely solely on the conductor counts shown on the drawings.

C. Discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions shall be brought to the attention of the Architect. **The specifications do not override the drawings or vice-versa.**

1.9 EQUIPMENT REQUIRING ELECTRICAL SERVICE:

A. Provide connections for all electrically driven equipment, in accordance with the electrical drawings and the Division of the specifications in which the equipment is specified.

1. Connection shall include circuit breaker, wiring, control and disconnecting means (where applicable) and final connection.
2. Prior to ordering materials, review approved shop drawings of equipment that will be ordered and verify the connections shown. Fill out and submit the Coordination Affidavit required by Section 260120.
3. Where connection is required by other Divisions, but no connection is shown on the electrical drawings, provide connection to nearest panel of same voltage and phase based on the characteristics shown on other drawings. All added connections shall be brought to the attention of the Architect.
4. Provide 120 volt, 1 phase, 20 ampere power connection for all Division 23 control panels, whether indicated on the project drawings or not. Circuit from nearest 120/240 volt, panelboard from available 20 amp, single-pole spares. Revise panelboard schedules accordingly. Document and coordinate control panel requirements and locations during preparation of the Coordination Affidavit, Attachment No. 1.

1.10 SYSTEMS REQUIRING ROUGH-IN:

A. Rough-in shall consist of all outlet boxes and covers/raceway systems/supports and sleeves required for the installation of cables/devices specified by other Divisions and by the Using Agency.

B. Review shop drawings to determine rough-in requirements; do not rely solely on the information shown on the drawings. Keep a copy of these shop drawings at the project site throughout the course of construction.

C. Systems requiring rough-in shall include, but not be limited to the following:

1. Mechanical equipment as shown in Divisions 22 and 23
2. Building equipment as shown
3. Equipment furnished by the Using Agency as shown on plans

D. Rough-in requirements are further defined in Section 261010. Prior to performing any rough-in, meet with the designated representative of the trade involved to confirm device locations, mounting heights, trim ring type and orientation.

1.11 RECORD DOCUMENTS:

A. The electrical superintendent shall maintain a white set (blue-line or black-line) of contract documents in clean, undamaged condition, for mark-up of actual installations which vary substantially from the work as shown. Mark-up whatever drawings are most capable of showing installed conditions accurately. These documents shall be used for no other purpose. As a minimum, record the following:

1. Post all addenda prior to beginning work.

2. Post all changes in the work.
3. Document actual feeder conduit routes, both interior and exterior. For lines run below grade or slab, dimension lines off of fixed surfaces.
4. Scope of each change order (C.O.), noting C.O. number.
5. Mark up all branch circuit connections.

1.12 RECORD MANUALS: (CLOSEOUT REQUIREMENTS)

Record manuals shall include the following:

A. Manufacturer's operation and maintenance manuals for:

1. Lighting Fixtures
2. Panelboards and circuit breakers

B. Two sets of the manufacturer's fabrication drawings for each surface mounted raceway and each lab service outlet assembly. Fabrication drawings shall be keyed to the floor plans to denote the specific location in which the raceway was installed.

C. Shop drawings, revised to reflect all review comments, *supplemented with the installation instructions shipped with equipment.*

D. One copy of all panelboard directories plus CD/RW with electronic spreadsheets containing directories.

E. All test results listed by specification section.

F. All required keys, tools, and spare parts.

Submit record manuals in quantities and in the format prescribed in the Division specifications, plus one copy for the Engineer.

1.13 TRAINING OF OWNERS FORCES:

A. Train Owner's personnel on the operation and maintenance of the following systems :

1. Tour of Facility - 2 hours

B. The "tour of facility" shall consist of the walk-thru of at least one space of each type. The Division 26 Superintendent shall demonstrate operation of all lighting controls, emergency shut off controls, use of receptacles, etc. The tour shall be conducted jointly with Division 27.

C. Training shall not be conducted until system has been tested by the Contractor and is 100% operational. Training shall be conducted at the project site.

D. As a minimum, the following materials shall be reviewed during the training session:

1. Owner's operation and maintenance manual.

2. Corrected shop drawings and as-built system drawings.
3. Hands-on demonstration of system features and operation.

E. Schedule the training at least two weeks in advance. At that time, provide a detailed outline of the training session.

F. Training shall be conducted by authorized representatives of the system manufacturer and the Division 27 superintendent.

1.14 REVIEW OF THE WORK BY THE ARCHITECT:

A. During the course of the project, the work will be reviewed by a representative of the Architect. Upon each visit, the Contractor shall also demonstrate that the record documents and shop drawing files are being kept current. The Division 26 Superintendent shall accompany the Architect on all reviews and shall provide all personnel, tools, ladders, etc. necessary to conduct the review.

B. Prior to reviewing of work in progress, or at the final inspection, the Contractor shall submit a letter describing the specific work to be reviewed, along with a punch-list of items that are incomplete or which require correction, based on observations made by the supervisor of the given trade. Reviews will not be scheduled until this information is submitted. The Contractor shall bear the burden of any resulting delays.

C. Construction review reports will be issued by the Architect for every review trip. Within five working days from the date of review, the Contractor shall submit a letter which addresses when corrections will be made for each deficiency in the report. Prior to subsequent review of the work, the Contractor shall submit a letter confirming that the work required by all comments on the report has been completed.

PART 2 – PRODUCTS

2.1 GENERAL:

A. Refer to the drawings and individual specification sections for requirements.

B. All equipment shall be suitable for the environment in which it is installed. Such considerations shall include, but not be limited to characteristics of this specific project such as wet/damp/dry locations, ambient temperature / humidity, spaces used as air plenums and hazardous locations. It shall be the responsibility of the contractor to review the contract documents and order equipment based on intended use.

2.2 MATERIALS:

A. All materials and equipment used shall be new, undamaged and free from any defects.

B. Provide materials and equipment that are U.L. listed, unless listing is unavailable.

C. All equipment of the same type or of the same product category shall be the product of a single manufacturer.

D. It is the responsibility of the Contractor to determine the shipping splits for large equipment.

E. Where product is specified by catalog number, such specification is intended only to convey general characteristics. Actual product selection shall be based on catalog number, other references on the drawings / specifications and intended use. Products not listed in these specifications or shown on drawings shall not be used.

2.3 ACCEPTABLE MANUFACTURERS:

A. Provide equipment and materials which are products of the manufacturers listed on the drawings and in the specifications. Requests for substitution of other manufacturers shall comply with Division 1 and the paragraph "B" below.

B. Requests for prior approval (i.e. before the bid opening) must contain all information listed for the specific item in Section 260120, including any applicable dimensioned layout drawings. Requests must be sent by mail or express delivery such that they are received in the Architect's office no later than ten working days prior to the opening of bids. **Requests that are incomplete or are sent by facsimile will not be reviewed.**

PART 3 – EXECUTION

3.1 ROLE OF THE SUPERINTENDENT:

A. The Division 26 Superintendent's duties shall include, but not be limited to the following:

1. Preparation of submittals.
2. Planning and layout of the work.
3. Coordination with other trades and the local utility company.
4. Posting addenda and changes in the work to maintain the Record Documents and to ensure that Division 26 personnel are working from up-to-date drawings and specifications.
5. Supervision of all Division 26 personnel.
6. Ongoing review of work in place to ensure compliance with the Contract Documents.
7. Administrative duties as required to fulfill the requirements of the General Conditions, Special Conditions and Division 1 specifications.
8. Training of the Owner's personnel.

3.2 PROTECTION OF THE WORK:

A. Protect the work during the course of construction. Do not install any equipment or materials until the proper environmental conditions have been established.

B. Store materials in the manner recommended by the manufacturer until materials are installed. Materials rated for indoor use shall not be stored outdoors regardless of the packaging in which the materials are shipped.

C. Maintain temporary protective covers over equipment enclosures, outlet boxes and similar items after interiors, conductors, devices, etc. are installed, to prevent the entry of construction debris and to protect the installation during finish work performed by others. Do not install device plates, equipment covers or trims until finish work is complete.

D. Install temporary protective covers over equipment mounted on the building exterior to prevent corrosion damage during cleaning of the building exterior, by others.

E. Clean all equipment, inside and out, upon completion of the work. Scratched or marred surfaces shall be touched-up with touch-up paint furnished by the equipment manufacturer.

F. Equipment or materials that are improperly stored or are installed before the proper environmental conditions are achieved will be removed and replaced with new, at no cost to the Owner. The Contractor shall bear all consequences from any resulting delays.

G. All equipment and materials that become damaged will be removed and replaced with new, at no additional cost to the Owner.

3.3 INTERFACE OF ELECTRICAL WORK WITH OTHER TRADES:

A. Where electrical work must connect to or be incorporated into work installed by other trades, engage the services of the other trade to interface the work. Under no circumstances shall the installer performing work under this Division of the specifications modify or alter work installed by others. Such work includes, but is not limited to:

1. Roof Penetrations.
2. Any attachments to roofing system.
3. Penetrations in Vapor Barriers.
4. Exterior Insulation and Finish Systems (EIFS).

END OF SECTION 26 0100

SECTION 26 0110 – DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE:

A. Building Site:

1. The extent of demolition is indicated on the drawings.
2. Demolition of raceway systems for existing communications systems is work of this Division. Removal of Using Agency alarm and communications equipment and conductors is work of Division 27; removal of utility cables will be done by the respective Local Utility.

B. Building:

1. Remove all power and lighting equipment and wiring systems. The extent of work shall be determined by field investigation prior to submitting bids.
2. Demolition shall include the removal of the associated outlet box, supports, conduits, fittings and conductors. Existing devices that are embedded in concrete may be abandoned in place and provided with blank cover plate, of the same type specified in Section 261010.
3. Demolition of raceway systems for existing alarm and communications systems is work of this Division. Removal of alarm and communications equipment and conductors is work of Division 27.

C. Services that pass through the areas being renovated, but serve areas outside of the scope of work, shall be maintained.

1.3 SITE INVESTIGATION:

A. Prior to submitting bids on the project, visit the site to become familiar with conditions which may affect the cost of the work.

PART 2 – PRODUCTS

2.1 Not applicable:

PART 3 – EXECUTION

3.1 LOCATION AND PROTECTION OF EXISTING UNDERGROUND UTILITIES:

A. The approximate location of known existing underground utilities are shown on the drawings. Prior to commencing any site work, the contractor shall locate and mark these lines (horizontally and vertically), in their entirety, within the project boundary. Maintain markings throughout the course of construction.

B. Refer to the Civil drawings for the approximate location of existing and new non-electrical underground lines.

C. The contractor shall meet with the Using Agency then proceed to locate all of these cable systems, within the areas that trenching and backfilling will be done.

D. Protect all lines from damage.

3.2 EXISTING UTILITIES DAMAGED BY THE CONTRACTOR:

A. Notify the Using Agency immediately if any existing utilities are damaged. Utilities will repaired by the Using Agency, at the Contractor’s expense.

3.3 INTERRUPTIONS TO ELECTRICAL POWER SERVICES:

A. All outages shall be scheduled with the Using Agency. Refer to the Special Conditions for permitted outages.

B. All switching of the campus 15kV system shall be done by the Using Agency.

3.4 INCIDENTAL WORK:

A. It is anticipated that existing conduits to remain may impede the installation of new ductwork or piping systems. The contractor shall include in his bid, sufficient costs to identify and relocate these conduits as may be required.

B. It is anticipated that demolition of existing branch circuits may interrupt power to devices in areas outside of the area of work. Prior to removing existing circuits trace all circuits that extend beyond the project limits and will be affected by the new work. The contractor shall include in his bid, sufficient costs to identify and reconnect these areas to spare circuits in existing panels, in a manner acceptable to the Using Agency.

3.5 MATERIALS REMOVED:

A. Prior to beginning the demolition, meet with the Using Agency's designated representative to

identify any items the Using Agency may want to keep. The Contractor shall submit to the Architect, in letter form, a record of the meeting, with a list of the disposition of items to be removed.

B. Items to be retained by the Using Agency shall be delivered to Owner's Representative, by the Contractor. All other items shall become the property of the Contractor and shall be removed from the project site.

3.6 REUSE OF EXISTING MATERIALS:

A. The reuse of existing materials is not permitted.

3.7 CUTTING AND PATCHING:

A. Structural Limitations: Do not cut structural framing, walls, floors, decks, and other members intended to withstand stress, except with the Architect's written authorization. Authorization will be granted only when there is no other reasonable method for completing the electrical work, and where the proposed cutting clearly does not materially weaken the structure.

B. Cutting Concrete: Where authorized, cut openings through concrete (for conduit penetrations and similar services) by core drilling or sawing. Do not cut by hammer-driven chisel or drill.

C. Other Work: Do not endanger or damage other work through the procedures and process of cutting to accommodate electrical work. Review the proposed cutting with the Installer of the work to be cut, and comply with his recommendations to minimize damage. Where necessary, engage the original Installer or other specialists to execute the cutting in the recommended manner.

D. Patching: Where patching is required to restore other work, because of cutting or other damage inflicted during the installation of electrical work, execute the patching in the manner recommended by the original Installer. Restore the other work in every respect, including the elimination of visual defects in exposed finished, as judged by the Architect. Engage the original Installer to complete patching of various categories of work including: concrete and masonry finishing, waterproofing and roofing, exposed wall finishes, etc.

END OF SECTION 26 0110

SECTION 26 0120 – ELECTRICAL SUBMITTALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 GENERAL:

A. Submit for review by the Architect a schedule with engineering data of materials and equipment to be incorporated in the work.

1. Submittals shall be supported by descriptive materials, i.e., catalog sheets, product data sheets, diagrams, performance curves and charts published by the manufacturer, to show conformance to Specifications and Plan requirements; model numbers alone shall not be acceptable.
2. Data submitted for review shall contain all information to indicate compliance with Contract Documents. Complete electrical characteristics shall be provided for all equipment.
3. Submittals for lighting fixtures shall include Photometric Data.
4. The Architect reserves the rights to require samples of any equipment to be submitted for review.

B. Prepare submittals, including the necessary inter-division planning and coordination in accordance with the approved project schedule. Note that certain Division 26 submittals cannot be prepared until approved submittals are available from other Divisions of the work.

C. Submittal material shall be assembled and checked by the Division 26 superintendent.

D. All layout drawings shall be prepared under the supervision of, and checked by the Division 26 superintendent.

E. Hard Copy Submittals: Submittal data shall be placed in one or more hard-back 3-ring binders arranged and labeled according to specification section. Each binder shall contain a title page and table of contents. Provide separator tabs, and label by specification section. Make note in the table of contents, any drawings that accompany the submittal. Title page shall contain Project Name, Contractor’s Name, Division 26 Superintendent’s name, Suppliers and point of contact for each, and date. Except as otherwise indicated in other sections, submit 5 complete copies. Quantity indicated does not include copies required for regulatory agencies.

F. Electronic Submittals: If the Architect agrees to allow electronic submittals via an on-line information management product such as “Submittal Exchange, etc., all electronic submittal files shall be organized to match the bid documents for specification section and name. Each submittal file shall be complete for each specification section. Multiple partial submittals per

specification section will be rejected. Make note in the table of contents, any drawings that accompany the submittal. Title page shall contain Project Name, Contractor's Name, Division 26 Superintendent's name, Suppliers and point of contact for each, and date.

G. The fault current calculation required by Section 26 2042-Panelboards shall be provided after service has been installed and inspected by the Authority Having Jurisdiction.

1.3 RESPONSE TO SUBMITTALS:

A. Shop drawings shall be evaluated by the Architect in accordance with the following classifications:

1. **"No Exceptions Taken"**: No corrections, no marks. Items may be ordered.
2. **"Make Corrections Noted"**: A few minor corrections. Items may be ordered as marked up without further resubmission.
3. **"Revise and Resubmit"**: Minor correction. Item may be ordered at the Contractor's option. Contractor shall resubmit drawings with corrections noted.
4. **"Rejected"**: Major corrections or not in accordance with the contract documents. No items shall be ordered. Contractor shall correct and resubmit drawings.

B. Whether resubmittals are required or not, all shop drawings shall be corrected for the record manuals specified in Section 26 0100.

1.4 SUBMITTAL GROUPING:

A. Submittals shall be made in no more than 2 groups.

B. All submittals for a given system shall be submitted at the same time. For example, wiring diagrams and other detailed layout information must be submitted with equipment data sheets.

C. Submittals that do not comply with these requirements or that are deemed by the Architect to be incorrect shall be returned without review. The Contractor shall bear the burden of any resulting delays.

1.5 EQUIPMENT AND MATERIALS REQUIRING SUBMITTALS:

A. Section 26 0100 - General Provisions

1. Superintendent's resume
2. Electricians' qualifications

B. Section 26 0110 - Demolition

1. List of Materials to remain property of the Using Agency.

C. Section 26 0120 - Electrical Submittals

1. Attachment 1

D. Section 26 1010 - Raceway Systems

1. Raceways and Fittings
2. Expansion Fittings
3. Wall Boxes and Covers
4. Ceiling Boxes and Covers
5. Surface Mounted Raceway System components
6. Firestopping Materials and Installation Drawings
7. Letter advising Architect when firestop site demonstration will be conducted.
8. Corrosion Protection

E. Section 26 2010 - Wires and Cables

1. Conductors
2. Connectors
3. Splices

F. Section 26 2020 - Wiring Devices

1. Receptacles
2. GFCI Receptacles
3. Weather Resistant Rated GFCI Receptacles
4. Switches
5. Occupancy/Vacancy Sensors & switches
6. Occupancy/Vacancy Sensor layout drawings
7. Photo-sensors
8. Pushbutton Stations
9. Weatherproof Covers
10. Device Plates
11. Temporary Protective Covers

G. Section 26 2021 - Safety and Disconnect Switches

1. Safety Switches
2. Motor Rated Switches
3. Equipment List
4. Arc Flash Warning Labels
5. Nameplates

H. Section 26 2030 - Lighting Fixtures

1. Lighting Fixtures
2. Emergency Drivers

I. Section 26 2042 - Panelboards

1. Enclosures

2. Dimensional Data
3. Locks
4. Directory
5. Circuit Breakers
6. Bussing Diagrams
7. Metering
8. Arc Flash Warning Labels
9. Nameplates

J. Section 26 2049 - Surge Suppression / EHF Filter System

1. Data sheets
2. Dimensions for each suppressor type indicating mounting arrangement and required accessory hardware. Statement that maximum lead length required to connect suppressor will not increase clamping voltages from published values.
3. Manufacturer's letter certifying compliance with listed guidelines and standards.

K. Section 26 2080 - Electrical Grounding, 600V and Below

1. Ground Rods
2. Conductors
3. Connectors
4. Bonding Bushings
5. Ground Rod Enclosures

L. Section 26 8010 - Intelligent Fire Alarm System

1. Draft copy of NFPA 72 Certification
2. Proof of Coordination with other trades.
3. Fire Alarm Control Panel
4. Remote annunciator / Remote trouble station
5. Power Supplies
6. Batteries
7. Calculations - Power Supply, Battery Sizing, and Wire Sizing
8. Pull Stations
9. Audible and audible/visible signaling devices
10. Door Holders
11. Monitor and control modules
12. Detectors and detector bases / housings
13. Cables
14. System specific drawings, per 26 0120, plus interlock diagrams which shall include, as a minimum:
    a. Air handler shutdown.

PART 2 – PRODUCTS

2.1 NOT APPLICABLE:

PART 3 – EXECUTION

3.1 MANUFACTURER'S DATA:

A. Include the manufacturer's comprehensive product data sheet and installation instructions.

B. Where operating ranges are shown, mark data to show portion of range required for project application.

C. Where pre-printed data sheet covers more than one distinct product-size, type, material, trim, accessory group or other variations, delete or mark-out portions of the pre-printed data which are not applicable.

3.2 EQUIPMENT LIST:

A. Where more than one type of a product is being used (i.e. starters, disconnects, breakers, etc.) provide a list with each submittal correlating the type and size of product to the load served.

3.3 TEST REPORTS:

A. Submit test reports which have been signed and dated by the firm performing the tests, and prepare in the manner specified in the standard or regulation governing the tests procedure as indicated.

3.4 ELECTRICAL LAYOUT AND COORDINATION DRAWINGS:

A. Panel and Equipment Feeders, 60A or more: The routing of feeders is not shown on the drawings. Actual routing shall be determined by the contractor in accordance with the specifications and shall be coordinated with work by other trades. For feeders of 60A or higher rating, provide layout drawings showing proposed routes.

B. System specific drawings - Include the following:

1. Floor plans:
   a. Show all system equipment, devices and interconnecting cabling. Provide a legend to define all devices and cable runs.
2. Details:
   a. Show the rough-in requirements and mounting height for every component Include all requirements such as outlet box size/trim/alignment and raceway requirements.
   b. Prepare in sufficient detail such that these drawings can be used to provide the required rough-in.
3. Point-to-point installation wiring diagrams of the entire system:
   a. Provide terminal diagram for every control panel.
   b. Provide wiring diagram for every device. Key these diagrams to the system diagrams.
   c. Provide wiring diagram depicting all interlocks of specific systems with other systems.

d. Spare and unused terminals shall be marked as such. Indicate the size, type and color code of all conductors.
e. The use of generic wiring diagrams is not acceptable. Wiring diagrams shall be prepared for this specific project.

4. Elevations:
   a. Provide an elevation drawing of the headend equipment / control panel / backboard, showing the location of all components.
   b. Indicate enclosure sizes and space available for future expansion.

C. Drawing Format:

1. Drawings shall be prepared at the following scales:
   a. Floor plans: 1/8" = 1'-0".
   b. Electrical Rooms: 1/4" = 1'-0".
   c. Feeder routes: 1/16 " = 1'-0".
   d. Layout drawings for pendant mounted lighting fixtures: 1/2" = 1'-0".

2. The scales defined above are for plan views. Device assembly drawings, wiring diagrams, etc. may be prepared “not to scale”.

3. Drawings shall be titled to define Project Name, Drawing subject, date prepared and designer’s name and seal. All revisions shall be marked and dated.

4. Drawings shall include all room names and numbers.

5. Submit only one copy of each drawing, in reproducible format. The Architect will mark review comments on the reproducible drawing so that the contractor can make as many copies as may be required.

3.5 ATTACHMENT NO. 1:

A. The intent of Attachment Number 1 is to insure that the electrical requirements for equipment have been reviewed and coordinated by the Contractor. No electrical equipment shall be ordered, nor shall rough-in begin, before this coordination has taken place. This document shall be returned appropriately marked whether or not any changes are deemed to be necessary by the contractor.

END OF SECTION 26 0120

ATTACHMENT NO. 1

SHOP DRAWING COORDINATION AFFIDAVIT

I, the Division 26 Superintendent, certify that I have reviewed the equipment shop drawings for electrically driven equipment and that the accompanying electrical shop drawings reflect the requirements of the actual equipment to be furnished for use on this project. The following deviations from design drawings were required to serve the furnished equipment:

ITEM	CKT. DESIG.	BKR.SIZE		CONDUIT/WIRE		DISC.SIZE		STARTER	
		New	Old	New	Old	New	Old	New	Old

NOTE: If no deviations are required please indicate by circling the appropriate answer above your signature.

PROJECT: _____ DEVIATIONS: Yes / No

COMPANY:_____

TITLE: _____ SIGNATURE: _____

TELEPHONE: _____DATE:_____

FAILURE TO PERFORM THE WORK REQUIRED BY THIS AFFIDAVIT, PRIOR TO ORDERING MATERIALS OR ROUGHING-IN, MAY RESULT IN IMPROPER CONNECTIONS BEING PROVIDED. THE EXPENSE OF CORRECTIVE MEASURES, IF REQUIRED, SHALL BE BORNE BY THE CONTRACTOR.

SECTION 26 1010 – RACEWAY SYSTEMS AND SUPPORTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE OF WORK:

A. The requirements of this section apply to all electrical raceway systems and supporting devices, installed under this contract, except for concrete encased duct banks. Electrical raceway system is defined to include, but not be limited to, all electrical raceways, boxes, fittings and similar components necessary for a continuous pathway for the installation of cables or conductors. Supports are any devices or components used to support raceways or electrical equipment.

1.3 QUALITY ASSURANCE:

A. Submittals: Refer to Section 260120 for requirements.

PART 2 – PRODUCTS

2.1 METAL-CLAD CABLE:

A. MC cable shall be U.L. listed manufactured cable assembly consisting of insulated copper conductors with a metallic outer cover and an interior ground wire.

B. The cable shall only be utilized for interior lighting and power circuits 20 amps or less.

C. Homerun conductors shall be routed in electrical metallic tubing (EMT).

D. MC cable shall only be used in concealed locations in walls or above ceilings. MC cable shall not be used in exposed ceiling areas such as the gymnasium. EMT conduit shall be utilized in exposed ceiling areas.

2.2 ELECTRICAL METALLIC TUBING (EMT):

A. Uses permitted:

1. Indoors concealed in walls or ceiling.
2. Concealed in slabs above grade.
3. Exposed horizontal runs installed at least 7' above finished floor.

2.3 INTERMEDIATE METAL CONDUIT (IMC) OR RIGID GALVANIZED STEEL CONDUIT (RGS):

A. Uses permitted:

1. Indoors concealed or exposed.
2. Transition from below grade nonmetallic raceway system to above grade metallic raceway system.
3. Vertical drops serving equipment.

2.4 RIGID NON-METALLIC CONDUIT (SCHEDULE 40 PVC):

A. Uses permitted:

1. Below grade installations.
2. Grounding electrode conductor raceway.

2.5 FLEXIBLE METAL CONDUIT:

A. Uses permitted:

1. Final connection to lighting fixtures.
2. Final connection to other than Division 23 equipment located in indoor, dry locations.

2.6 LIQUID-TIGHT FLEXIBLE METAL CONDUIT:

A. Uses permitted:

1. Final connection to equipment in indoor or outdoor locations.

2.7 CABLE RUNWAY:

A. Installed where shown to support cables specified under Division 27, limited to use at backboards and above equipment cabinets. This product is not the same as the Cable Trays specified in Section 261020.

B. Material: ASTM A36 steel bar:

1.	Stringers:	3/8" x 2"
2.	Rungs:	½" x 1" steel channel welded, @ 9" on centers
3.	Runway width:	12"

C. Finish: Baked polyester powder coat, telephone gray.

D. Provide hanger kits, corner kits and other accessory fittings needed to install in the configurations specified.

E. Cable runways and accessories shall be the product of B-Line, Kindorf or Cope.

2.8 INNERDUCTS:

A. Innerducts shall be used where specifically indicated.

B. Innerducts shall be solid wall (ribbed) suitable for the use intended.

C. Provide metered tape and pull cord in all innerducts.

D. When installed within conduits, terminate conduit runs with non-metallic, corrosion-proof, water/air/gas tight triplex or quadruplex duct plugs, for the number of innerducts installed. Additionally, provide duct plugs of the same type in all runs in which conductors are not installed.

2.9 SURFACE MOUNTED NON-METALLIC RACEWAY SYSTEMS:

A. Use only on existing walls where new wiring cannot be concealed in walls, and for extension to existing flush mounted device.

B. Individual Devices:

1. Raceway shall be Panduit PD6 series or equivalent by Wiremold or Hubbell.
2. System shall consist of concealed, screw-type base, snap-on cover, wire retainers, couplings, outlet boxes, fittings and other accessories required for complete raceway system installation.
3. All fittings shall be of the type specifically intended for use with raceway system.
4. Color shall be selected by the Architect.

C. Multiple Devices:

1. Raceway shall be Wiremold Access 5000 series or equivalent by Panduit or Hubbell.
2. System shall consist of base, cover, divider wall, connector clips, wire retainers, outlet boxes, fittings and other accessories required for complete raceway system installation.
3. All fittings shall be of the type specifically intended for use with raceway system.
4. Color shall be selected by the Architect.

2.10 SLEEVES:

A. Conduit sleeves shall be RGS unless otherwise required by the through penetration firestop system selected.

B. Sleeves shall be minimum 1" and maximum 4" diameter, provided in quantities necessary to install cable systems specified in Divisions 23 and 27.

C. The contractor shall take special note that sleeve fill will be limited by the specific through penetration firestop system used. ***In no case shall the fill exceed 40%***.

2.11 CONNECTORS/COUPLINGS:

A. Connectors/couplings for use with EMT conduit shall be steel compression type, except that steel, set screw type will be acceptable for EMT conduits sizes 2-1/2" and larger.

B. Connectors/couplings for use with IMC and RGS conduit shall be threaded type.

C. All connectors shall be insulated throat type.

D. Locknuts shall be of the same material as connectors.

E. All fittings shall be raintight. Fittings encased in concrete shall be concrete-tight.

2.12 CONDUIT BODIES:

A. Provide galvanized steel or cast metal conduit bodies constructed with threaded conduit ends, removable cover, and corrosion resistant screws.

2.13 CEILING OUTLET BOXES:

A. Provide 4" octagon, galvanized steel interior outlet boxes constructed with stamped knockouts in back and sides and with threaded holes with screws for securing box covers or wiring devices.

2.14 WALL OUTLET BOXES:

A. Recessed:

1. Boxes shall be galvanized steel constructed with stamped knockouts in back and sides and with threaded holes with screws for securing box covers or wiring devices.
2. Minimum box size shall be 4" square by 1-1/2" deep.
3. Boxes for GFCI outlets, Division 22, Division 23, and Division 27 devices and other locations deemed necessary, shall be 4-11/16" square by 2 1/8" deep.
4. Boxes shall have square edge tile type covers.
5. Where devices are ganged, use gang-type boxes with gang box covers.
6. The use of gangable type outlet or switchboxes is not acceptable unless required by specific device manufacturer.
7. Use masonry type boxes of equal or greater volume to those specified above, in masonry walls.

B. Surface:

1. Use cast aluminum box with threaded hubs in conjunction with metallic conduit systems.

C. Special Conditions:

1. Where box type specified herein conflicts with requirements of equipment to be installed, equipment manufacturer's requirements shall govern.

2.15 SUPPORTS:

A. Supporting devices shall be the products of manufacturers' specifically intended for supporting electrical raceways, devices and equipment. Makeshift supports are not acceptable. Where channel type supports are used, select complete assemblies based on the weight of the raceway(s) or equipment being supported.

B. The use of tie wire or tie wraps as a means of support for electrical raceways, devices and equipment is not permitted.

C. Plywood backboards shown in Communications Rooms or otherwise for the support of low-voltage cabling systems and/or mounting of equipment shall be fire resistant, Type AC rated. The plywood shall be painted with gray, fire resistant coating. Ensure that the plywood rating seal is left exposed after painting.

2.16 FIRESTOPPING:

A. A through-penetration firestop system shall be used to seal penetrations of electrical conduits and cables through fire-rated partitions per NEC 300-21 and NEC 800-3. The firestop system shall be qualified by formal performance testing in accordance with ASTM E-814, or UL 1479.

B. The firestop system shall consist of a fire-rated caulk type substance and a high temperature fiber insulation. It shall be permanently flexible, water-proof, non-toxic, smoke and gas tight and have a high adhesion to all solids so damming is not required. Only metal conduit shall be used in conjunction with this system to penetrate fire rated partitions. Install in strict compliance with manufacturer's recommendations. 3M, Metacaulk or Nelson.

C. **Submit installation drawings for conduit penetration, cable in metal sleeve penetration and blank metal sleeve penetration for each type of wall/floor construction encountered.**

D. Schedule a representative of the manufacturer to conduct a product demonstration / training session for each through-penetration firestop system to be used on this project. The session shall be held at the project site. Submit a letter to the Architect stating when the demonstration will be conducted.

PART 3 – EXECUTION

3.1 RACEWAY INSTALLATION - GENERAL:

A. Wherever possible, install horizontal raceway runs above water and drain piping. Give the right-of-way in confined spaces to piping which must slope for drainage and to larger HVAC duct work and similar services which are less conformable than electrical services. *However, ensure that all junction boxes and other points of access in raceway systems are located such that they are not rendered inaccessible.*

B. Complete the installation of electrical raceways before starting installation of cables within raceways.

C. All above grade conduits shall be routed parallel or perpendicular to the building structure.

D. **Raceways shall not be installed exposed in finished spaces or on the exterior of the building.** Install concealed in walls, ceilings, below slab-on-grade or embedded in slabs above grade. *Where raceway system serves surface mounted* equipment (i.e. safety switch), mount equipment over recessed outlet box.

E. All exposed raceway systems shall be painted to match the surface to which it is attached. All components of the raceway system shall be painted, i.e. conduits, boxes, supports, etc. Painting is specified under other divisions of the work.

F. Provide 200 lb. nylon pull cord in all conduits installed for cable systems specified under Division 23 and Division 27; and where conduits will be left empty for future use. Cap open ends and mark location of opposite end with black indelible marker pen.

G. Seal the inside of all conduits entering the building from outside, whether they connect to enclosures or not.

H. Do not run raceways atop the roof deck.

3.2 BELOW SLAB AND IN-SLAB INSTALLATIONS: (within the building footprint)

A. *Do not install conduits in slabs on-grade.* Raceways shall be routed under the first floor building slab. Conduits shall be routed such that the top of the conduit is a minimum of six inches below the slab.

B. All 90 degree elbows and all stub-ups through the floor slab for all size conduits shall be corrosion protected RGS or corrosion protected IMC.

C. Raceways in slabs above grade shall be totally embedded in the slab. They shall be placed above the lower reinforcing and below the upper reinforcing. The outer edge in no case shall be less than 1" from the surface of the slab. The corners of raceways at turnups into walls shall not be exposed at the wall/floor junction.

D. Raceways for Division 27 systems shall not be installed in or below slabs unless specifically indicated.

3.3 BELOW GRADE INSTALLATIONS: (outside the building footprint)

A. Perform all excavating, trenching and backfilling to install work of this project in accordance with applicable sections of Division 2 of the specifications and ANSI C2. Bottom of trenches shall be smooth and level to provide uniform bearing for conduits.

B. Secure conduits in trench to eliminate unnecessary curvature and to prevent movement of conduits while backfilling.

C. Maintain 6" vertical separation between conduits installed one above the other. Backfill and compact each layer separately. The minimum cover requirements specified herein shall be referenced to the uppermost layer of conduits.

D. Maintain minimum 12" horizontal and 6" vertical separation between conduits of different systems and between other underground utilities.

A. Do not backfill until installed electrical work has been tested and accepted, wherever testing is indicated.

B. Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to the required densities. Do not backfill with frozen soil materials.

C. Backfill simultaneously on opposite sides of electrical work, and compact simultaneously; do not dislocate the work from installed positions.

D. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM Standard Proctor), using power-driven hand-operated compaction equipment.

1. Lawn/Landscaped Areas: 90%
2. Roadways: 95%
3. Paved Area, Other than Roadways: 95%

E. Backfill to elevations matching adjacent grades, at the time of backfilling excavations for mechanical work.

F. Where compaction tests indicate lower densities of backfill than specified, continue compaction (and re-excavation and backfilling where necessary) and provide additional testing as directed by the Architect/Engineer.

E. Minimum cover requirements:

1. Telephone service conduits: 24".
2. Service entrance and feeder conduits, 600V and below: 24".

F. Secondary service entrance conduits:

1. Install conduits using base, intermediate and top spacers specifically intended for non-concrete encasement. Install spacers every 5'.
2. Backfill to top of conduits with river sand to ensure that compaction around spacers is

achieved.

3.4 SURFACE MOUNTED NON-METALLIC RACEWAY SYSTEMS:

A. Use Access 5000 series system to serve receptacle and communication devices located in classrooms, offices, meeting rooms, library, and break rooms. Access 5000 series raceway shall be installed as follows:

1. Raceway shall wrap entire room. There shall be no uncovered wall.

2. Raceway shall be installed at floor level. This raceway shall be installed in such a manner that it will act as the baseboard molding for the space.

3. There shall be only one vertical raceway per space. This vertical raceway shall be installed at the hinge side of the door in each space.

B. PD6 series raceway shall be used to serve all devices not covered in note G above.

C. Engage the services of a carpenter to cut raceways / covers, and to install raceways on the walls. Raceways shall be installed level and all joints shall be true.

D. All supports shall be concealed type. Attachment screws shall have countersunk heads and shall not protrude into the raceway system.

E. Provide covers or couplings over all joints.

F. Provide end caps on all dead-end runs.

G. Provide trim plate at ceiling penetration.

H. Miter-cut surface raceway to create flat 90 degree fittings if they are not available from manufacturer.

I. Prior to ordering materials, review raceway layouts with the Architect and the Using Agency in one of each type space.

3.5 MOISTURE PROTECTION:

A. Conduits entering refrigerated spaces - Provide sealing fitting at accessible location outside the refrigerated space. Seal raceway to prevent the entry of moisture.

B. Where conduits pass from a conditioned space to a non-conditioned space, apply insulating electrical putty inside conduit, at an accessible location, to prevent the entry of moisture.

C. Conduits and boxes installed in exterior walls shall not penetrate the vapor barrier.

D. Boxes installed on the building exterior shall have gasketed covers. All conduits entering box shall be sealed with insulating electrical putty.

3.6 CORROSION PROTECTION:

A. Corrosion protection for conduits passing through concrete slabs shall be by one of the following means:

1. Field-wrap conduits with tape, using with a 50 percent overlay. Tape shall be premium 7-mil, flame retardant, weather resistant tape. Resists temperature and moisture for splicing. Meets requirements of UL 510, HHI-595, and CSA 22.2.
2. Conduits shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating.

B. All supporting materials installed exposed on the building exterior shall be hot-dipped galvanized after fabrication or provide an equivalent level of corrosion protection. Protect exterior raceway systems from damage while the building exterior is cleaned. Replace any portions of the system showing signs of rust at the time of final inspection.

3.7 GROUNDING:

A. Metallic raceway systems shall be made electrically continuous to provide a low impedance path to ground for faults, as required by the NEC.

3.8 RACEWAY BENDS:

A. Bend radius shall comply with the NEC and the requirements of the specific cabling system installed. For television and telephone service entrance conduits, consult with the local utility.

B. All field bends shall be made with a tool specifically intended for the purpose.

C. Tools using open flames are not acceptable for bending PVC conduit. Any section of conduit discolored or deformed in any way shall be cut out and replaced.

3.9 FLEXIBLE CONNECTIONS:

A. Final connections to light fixtures may be made using 3/8" diameter flexible metal conduit not exceeding 6 feet in length.

B. ½" diameter flexible metallic conduit may be used to fish existing walls, within the limits of NFPA 70.

C. Final connections to motors and to other electrical equipment subject to movement and vibration shall be made using Liquid-tight flexible metal conduit not more than 24" long.

3.10 SLEEVES:

A. Provide sleeves of the size and quantity required to install cabling systems specified under Division 23 and Division 27. Where multiple sleeves are required, install in a rectangular array.

B. Make and seal all penetrations to maintain fire rating of member penetrated. Pay particular attention to the annular space required around the inside and outside of the penetrating item. Sealing compounds shall be re-enterable type.

C. Coordinate the exact placement of sleeves with other trades to ensure they are readily accessible and are not obstructed by pipes, ductwork, etc.

D. Sleeves shall be flush with both sides of the member penetrated unless otherwise required by the through penetration firestop system selected.

3.11 RACEWAY LAYOUT:

A. Unless noted otherwise, the layout of all raceway systems is the responsibility of the Contractor.

B. Provide pull points as required by the NEC and ensure that all such points are readily accessible and not blocked by ducts, pipes, etc.

3.12 WALL OUTLET LAYOUT:

A. The location of devices shown on the drawings is schematic. Prior to roughing-in, review the Architectural interior elevations and millwork shop drawings, to ensure that outlets will not be installed behind cabinets or otherwise inaccessible. Ensure that there is sufficient space from door jamb, cabinets, etc. to install without trimming device cover.

B. Outlets installed below countertops shall be centered in the kneespace.

C. All outlets shall be installed vertically except where space above counter back splash and other features does not permit, and when installed in baseboards. In such cases, outlets shall be installed horizontally.

D. Maintain uniform spacing of outlets shown to be side-by-side on the plans. Spacing shall not exceed 2" in framed walls. For masonry walls, install outlets in adjacent cells.

E. Gang mount switches shown in the same location, unless noted otherwise. Provide metal barrier in boxes between switches, when switches are connected to opposite phases of systems exceeding 150V to ground.

F. Mark the branch circuit identification on the cover of all outlet boxes.

G. Provide separate outlet boxes and flexible final connections for fixtures provided with both normal and emergency power connections.

3.13 SUPPORTS:

A. Raceways:

1. Support all components of the electrical raceway system using wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; by machine screws, welded threaded studs, or spring-tension clamps on steel work.
2. Support individual raceways with conduit straps or clips. Support multiple runs using trapeze-type hangers. Trapeze hangers shall consist of 1-1/2" x 1-1/2" gage steel channels, 1/2" diameter threaded steel rods and conduit clamps. Attach rods to the building structure or to 1-1/2" x 1-1/2" gage steel channels span between adjacent structural members.
3. Support conduits at distances required by the National Electrical Code. *Additional supports shall be provided at the points of tangency of all bends.*
4. Joints in conduit systems shall coincide with point of support.
5. Provide expansion joints in all raceway systems in either of the following conditions:
   a. In accordance with manufacturer's literature, based on length of run and temperature differential that will be encountered.
   b. When raceways cross expansion joints.

B. Outlet Boxes:

1. Ceiling outlet boxes shall be supported by lightweight channel attached to structure with (2)-1/4" threaded rods and braced to prevent lateral movement. Boxes used to support ceiling paddle fans shall be listed for the purpose.
2. Masonry walls:
   a. Install outlet boxes in sawcut openings.
   b. Outlet boxes shall be grouted in place, back and sides. There shall no reveals around the perimeter of the box.
3. Framed walls:
   a. Non-rated walls - Outlet boxes shall be attached to intermediate horizontal supports between vertical framing members. *Do not attach boxes to vertical members.*
   b. Framed walls rated 1-hr or 2-hr, boxes 16 square inches or less - Compartmentalize each outlet box (top, bottom and sides) using same material as wall framing. All penetrations in framing members shall be sealed. Where penetrations exceed 100 square inches per 100 square feet of wall space, install in accordance with subparagraph "c" below.
   c. Framed walls rated 1-hr or 2-hr, boxes exceeding 16 square inches - Compartmentalize boxes as specified above. Additionally, Boxes shall be covered back, top, bottom and all sides with drywall such that the rating is carried around the box. All penetrations in this envelope shall be sealed.
4. Boxes shall not be installed in walls rated more than 2-hr.
5. Do not install outlets back-to-back. Maintain 24" offset in rated walls and with no overlap in non-rated walls. Where groups of outlets are shown back-to-back, each group of outlets shall be shifted to accommodate the installation. *Exceptions: (1- Outlet boxes in non-rated masonry walls, may be installed back-to-back. Do not break webbing or connect boxes back-to-back. The use of thru-wall outlet boxes is not permitted. 2- The 24" offset may be eliminated in 1-hr and 2-hr walls when U.L. listed moldable putty is installed around box, in accordance with the U.L. Fire Resistance Directory.*)
6. Outlet boxes mounted in STC rated walls shall be sealed in accordance with Gypsum Association Document GA-600 "Fire Resistance Design Manual, Sound Control".
7. Cover of outlets installed flush mounted in walls shall be set back no more than 1/8" from

face of wall.

3.14 ROUGH-IN FOR DIVISION 27 SYSTEMS AND USING AGENCY PROVIDED TELECOMMUNICATIONS SYSTEMS:

A. Provide all outlet and junction boxes, sleeves and raceways to form an accessible pathway from each wall or floor mounted device, and ceiling mounted devices to the IDF or MDF or headend equipment location in which the cable terminates, as specified herein and as indicated on the drawings. Cable trays are specified in Section 261020.

B. Conduit sizes shall conform to the following:

1.	Voice / Data / Video outlet:	2-1"
2.	Voice / Data outlet:	2-1"
3.	Video outlet:	3/4"
4.	Fire alarm outlet:	3/4"
5.	Other:	3/4"

C. Raceways shall be labeled to the extent necessary to allow easy identification by the cable system installers.

D. Outlet box mounting height, cover type, and alignment shall be governed by Division 27.

E. Refer to Section 27 90 10 for additional requirements. Pay particular attention to the requirement that the fire alarm system wiring shall be installed in a complete raceway system.

3.15 ROUGH-IN FOR DIVISION 23 CONTROL WIRING:

A. Provide all outlet and junction boxes, sleeves and raceways to form an accessible pathway from each wall mounted device to the associated control equipment. Rough-in details shall be similar to that shown for Division 27 devices.

3.16 SPECIAL PROVISIONS FOR DEVICES INSTALLED IN MILLWORK:

A. The millwork shall be provided with openings to accommodate device outlet boxes.

3.17 FIRESTOPPING:

A. Do not proceed with firestopping until the field demonstration has been conducted.

B. Seal all penetrations based on rating / element being penetrated. Penetrations in non-rated walls shall be rated 1–hour.

END OF SECTION 26 1010

SECTION 26 2010 – WIRES AND CABLES, 600V AND BELOW

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE OF WORK:

A. The requirements of this section apply to the wire and cable work installed under this contract.

1.3 QUALITY ASSURANCE:

A. Acceptable Manufacturers: Provide wires and cables from manufacturers who have been in business for a minimum of five years.

B. Submittals: Refer to Section 260120 for requirements.

PART 2 – PRODUCTS

2.1 GENERAL:

A. Wires and cables manufactured more than 12 months prior to date of delivery to the site shall not be used.

B. Color Coding

1. Color shall be **green** for grounding conductors and **green with yellow stripe** for isolated grounding conductors.

2. The color of the circuit conductors shall be as follows:

120/208 volt, 3-phase	Phase A - Black
or	Phase B -Red
120/240 volt, 3-phase:	Phase C - Blue
	Neutrals – White (with stripes as specified below)
	(High leg - Orange)
120/240 volt, single phase:	Phase A - Black
	Phase B – Red

Neutrals – White (with stripes as specified below)

C. All conductors shall be 600V copper, with 75 degrees C, THWN/THHN insulation. Minimum size shall be No. 12 AWG. Conductors within three inches of fixture ballasts shall be rated 90 degrees C. Sizes up to No. 10 AWG may be stranded; sizes No. 8 AWG and larger shall be concentric-lay-stranded. All control conductors shall be concentric-lay-stranded.

PART 3 – EXECUTION

3.1 INSTALLATION GENERAL:

A. No more than three phase conductors, each of opposite phases for a three phase WYE system, shall be combined in a single raceway without written permission from the Architect.

B. For each ungrounded conductor, provide a dedicated neutral conductor, with stripe color to match ungrounded conductor insulation color.

C. No more than two phase conductors, each of opposite phases for a single phase, delta system, shall be combined in a single raceway without written permission from the Architect.

D. For each electrical connection/termination, provide a complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other materials necessary to complete splices and terminations. Torque all connections according to installation instructions.

E. Motor connections shall be made with compression connectors forming a bolted in-line or stub-type connection. Connections shall be insulated with Raychem MCK motor connection kit.

F. Splicing of feeder conductors shall not be acceptable, unless specifically indicated on the drawing. Where splicing of feeder conductors is indicated, splices shall be made using Raychem RVS splice kit and compression type butt splice

G. Numbers 10 and 12 AWG stranded conductors shall not be directly terminated to screw-type terminals. The use of Stacon type compression connectors is required.

H. All conductors shall be installed in raceways.

I. Make connections to wiring devices using "pigtails" within outlet boxes. *Direct connection (loop) to devices is not acceptable.*

3.2 DISTANCE LIMITATIONS FOR 20A BRANCH CIRCUITS:

A. All 120 volt, 20 amp branch circuits exceeding 90 feet in length shall consist of No. 10 AWG circuit conductors. Increase conduit size accordingly.

END OF SECTION 26 2010

SECTION 26 2020 – WIRING DEVICES

PART 1 –GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE OF WORK:

A. The requirements of this section apply to all wiring devices installed under this contract.

1.3 QUALITY ASSURANCE:

A. Acceptable Manufacturers:

1. Provide devices by manufacturers listed for each item.

B. Occupancy/Vacancy sensor catalog numbers and locations shown on plans and specifications are for representation purposes only. Exact models and mounting locations shall be provided by sensor manufacturer. System drawings including device layout, device type, and wiring details shall be submitted for review in shop drawing phase prior to ordering. **All sensors shall be dual technology.**

C. Submittals: Refer to Section 260120 for requirements.

PART 2 – PRODUCTS

2.1 GENERAL:

A. Provide factory-fabricated wiring devices, in type, color and electrical rating for the service indicated. Where type and grade are not indicated, provide proper selection as determined by Installer to fulfill the wiring requirements, and complying with NEC and NEMA standards for wiring devices.

B. Device colors shall be selected by the Architect on an area-by-area basis.

2.2 GENERAL USE RECEPTACLES:

A. Standard (Specification Grade): Hubbell 5352, Cooper 5352, Pass & Seymour 5362, or Leviton 5362.

B. Ground-Fault Receptacles and Devices: Hubbell: GF5352, Pass & Seymour 2095, or Leviton 6899.

C. Receptacles shall be 2-pole, 3-wire, grounding type, rated 20A/125V.

D. Provide weather resistant receptacles in all outdoor locations.

2.3 SPECIAL PURPOSE RECEPTACLES:

A. Provide heavy-duty type of the NEMA configuration indicated on the drawings, as manufactured by Hubbell, Pass & Seymour or Leviton

2.4 SWITCHES:

A. Toggle (Specification Grade): Hubbell HBL1221, Leviton 1221, or Pass & Seymour 20AC1. Provide single-pole, three-way and four-way switches as indicated. Catalog numbers listed herein are for single pole units. Other configurations shall be from the same product family.

B. Narrow-body switches for installation in door-jambs shall not be used.

C. Switches shall have ground screw.

2.5 OCCUPANCY SENSORS:

A. Corner Mounted: Dual technology (Ultrasonic & Infrared), ceiling or wall bracket mounted. Select based on size of space. Provide power pack and mounting hardware; suitable for switching 120 volt loads. Watt-Stopper DT-200 series, Hubbell LODT series, or equivalent by Cooper or Sensor Switch.

B. Ceiling Mounted: Dual technology (Ultrasonic & Infrared), ceiling mounted. Select based on size of space. Provide power pack and mounting hardware; suitable for switching 120 volt loads. Watt-Stopper DT-300 series, Hubbell OMNIDT series, or equivalent by Cooper or Sensor Switch.

C. Wall Mounted: Dual technology (Ultrasonic & Infrared), wall bracket mounted. Select based on size of space. Suitable for switching 120 volt loads. Watt-Stopper DW-100 series, Hubbell LHMTS1 series, or equivalent by Cooper or Sensor Switch.

D. The triggering of only one technology shall keep the fixtures on.

E. Power packs for sensors shall be rated for control of fractional horsepower motor loads in conjunction with the respective lighting load. Low-voltage multi-conductor cable between sensors and power packs shall be plenum rated, 22 AWG.

F. Provide low voltage momentary pushbutton switch(es) for manual control in configuration shown on plans. Multiple switching zones shall be grouped in the least number of multi-pushbutton switches possible.

G. Provide auxiliary contacts in sensors where shown on the project drawings, or as otherwise required for the functionality specified in the particular building space.

2.6 WIRING DEVICE ACCESSORIES:

A. Wall Plates: Provide one piece wall plates for wiring devices, with ganging and cutouts as indicated. Provide blank plates for all unused outlet boxes. Provide with metal screws for securing plates to devices, screw heads colored to match finish of plate, and wall plates possessing the following additional construction features:

1. Material and Finish: Type 302 stainless steel in finished spaces and stamped steel in unfinished spaces..
2. Wall plates for surface raceway boxes shall be of the same width as the surface raceway boxes.
3. All plates shall be jumbo size.

B. Weatherproof Covers: All devices installed outdoors shall be provided with weather proof covers. Covers shall be Intermatic die-cast WP series (or equivalent), single or two gang type. The assembly shall be U.L. listed for wet locations, when in use.

PART 3 – EXECUTION

3.1 INSTALLATION OF WIRING DEVICES:

A. General:

1. Devices of the same type shown side-by-side shall be gang-mounted and installed under a common plate unless specifically noted.
2. Do not install receptacles within 6" of the edge of sinks.
3. Provide weatherproof covers for all devices installed outdoors.
4. All receptacles installed outdoors, all kitchen receptacles, and receptacles within six feet of sinks and other interior receptacles specifically indicated shall be GFCI type.
5. Coordinate location of electric water cooler receptacles with cooler manufacturer’s recommendations.

B. Connections:

1. Make connections to side terminals only. Wrap side of device with two complete turns of 600V electrical tape, to cover the exposed terminals.
2. See Section 262010 for conductor requirements.

C. Labeling:

1. Provide engraved device plates where indicated. Use 1/8" high black letters.
2. Device plates for receptacles in patient care areas shall have circuit designation engraved in 1/8" high black letters.

3. Mark the branch circuit to which the device is connected on the back of each device plate, using an indelible marker pen.

3.2 OCCUPANCY SENSORS:

A. Corner mounted sensors shall be ceiling bracket mounted where ceiling is present and no higher than 12’ AFF. Where space has no ceiling or ceiling is higher than 12’ AFF, the corner mounted sensor shall be mounted 10’ AFF on a manufacturer-supplied wall bracket.

B. Sensors shall be installed in locations shown on manufacturer submitted shop drawings.

C. Connect low voltage momentary pushbutton switch(es) to sensor power-pack to achieve manual-on/automatic-off operation in the configuration shown on plans. Switch(es) shall allow manual-off operation as well.

D. Wall mounted sensors shall also be configured to operate manual-on/automatic-off, in configuration shown on plans.

E. Manual switches are not required in corridors, or multiple occupant restrooms. Sensors shall be automatic-on/automatic-off in these spaces.

F. Low-voltage sensor cable shall be supported by j-hooks attached to structural members, and shall be run at right angles with respect to building structure.

G. Adjust time-off delay to a minimum of fifteen minutes

H. Test all sensors to insure that they are operating properly.

3.3 TESTING:

A. Test all devices to ensure proper polarity and grounding.

3.4 PROTECTION:

A. If painting and other finish work occurs after device installation, protect device and conductors by installing and maintaining temporary cover:

END OF SECTION 26 2020

SECTION 26 2021 – SAFETY AND DISCONNECT SWITCHES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE OF WORK:

A. The requirements of this section apply to all safety and disconnect switches installed under this contract.

1.3 QUALITY ASSURANCE:

A. Manufacturers: Provide products produced by one of the following (for each type of switch):

1. General Electric Company
2. Square D Company
3. Eaton/Cutler Hammer
4. Siemens

B. Submittals: Refer to Section 260120 for requirements.

PART 2 – PRODUCTS

2.1 SAFETY AND DISCONNECT SWITCHES:

A. Switches shall be 240V heavy duty type, sheet steel enclosed safety switches, incorporating quick-break type switches, constructed so switch blades are visible in "OFF" position with the door open. Switches shall be equipped with operating handles which are an integral part of the enclosure base and whose positions are easily recognizable. Switches shall be pad-lockable in the "OFF" position. All current carrying parts shall be constructed of high-conductivity copper and silver-tungsten type switch contact. All switches shall be UL listed. Switches shall have engraved plastic nameplates indicating the load served, load rating and the branch circuit number.

Example – (not actual disconnect on project): HP-1
35.5A, 1ph, 240V
Fed from HA-2

B. Switches shall be non-fused type unless indicated otherwise or unless required by the manufacturer of the driven equipment. Where fuses are required, provide fuses of the type

recommended by the equipment manufacturer.

C. **Nameplates shall be screwed and glued to the enclosure.**

D. Enclosures: NEMA 1 general purpose enclosures indoors, NEMA 3R enclosures where noted or shown on drawings or exposed to weather.

2.2 MOTOR RATED SWITCHES:

A. Switches shall be toggle-type, without overload protection, rated for the applied voltage and motor load.

B. Label same as specified for disconnect switches, except install label on wall adjacent to switch.

2.3 ARC FLASH WARNING LABELS:

A. All safety and disconnect switches shall have arc flash warning labels field affixed to their enclosures that comply with the requirements of NFPA 70 and NFPA 70E.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Coordinate safety and disconnect switch installation with surrounding equipment to provide clearance and workspace based on the voltage encountered, and to insure that the switch is within sight of the controller or driven equipment.

B. Group and lace conductors within enclosure with nylon tie straps.

C. **Location of safety switches shall be coordinated with the equipment installer.** Do not proceed with rough-in until location has been established.

D. All switches associated with outdoor equipment shall be located as close to the equipment as possible (when equipment is in a service yard, switches shall also be in the service yard) and mounted such that the top of the switch is no more than 3'-0" above grade. All switches associated with equipment mounted above a lay-in ceiling shall also be located above the lay-in ceiling.

END OF SECTION 26 2021

SECTION 26 2030 – LIGHTING FIXTURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DESCRIPTION:

A. This section of the specifications is applicable to all lighting fixtures and fixture accessories.

B. Fixtures shall be furnished with ballasts installed. Lamps shall be furnished separately, from the lamp manufacturer.

1.3 QUALITY ASSURANCE:

A. CBM Label: Provide ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM mark on the label.

B. Acceptable Manufacturer's:

1. Lighting fixtures - see fixture schedule on drawings.
2. Ballasts - Magnetek-Universal or equivalent by Motorola or OSRAM Sylvania.
3. Dimming Ballasts – Lutron, Advance, Universal (10-100% dimming range).
4. Lamps - General Electric, Phillips or OSRAM Sylvania.

C. Submittals: Refer to Paragraph 3.05 and Section 260120.

PART 2 – PRODUCTS

2.1 LIGHTING FIXTURES:

A. Provide lighting fixture assemblies complete with all hardware and accessories needed to install and connect, as indicated on the drawings and this section of the specifications.

B. The Contractor shall select the voltage, frame type, ballast temperature rating and number of ballasts, based on the use shown, on an area-by-area basis. These modifiers are not included in catalog numbers. (i.e. A given fixture may be required for use on more than one voltage. Determine voltage by circuit to which fixture is connected.)

C. Any fixtures that are defective or damaged shall be replaced with new. This includes, but is not limited to scratches, dents, inconsistent finishes, etc. The Architect's opinion shall be

final in making the determination.

D. Lampholders and sockets shall be compatible with lamp / ballast combinations used.

2.2 BALLASTS:

A. General:

1. Provide the number of ballasts in each fixture to achieve the switching operations indicated. Ballasts shall serve only the lamps within the same fixture; master / slave wiring is not acceptable. This does not preclude the sharing of ballasts for fixtures installed in continuous rows.
2. Ballasts shall have a minimum starting temperature of 0^{o} F and be rated for a maximum ambient temperature of 105^{o} F.
3. Ballasts shall have a 5-year warranty and shall include replacement ballast assembly and reasonable replacement labor costs.
4. Ballasts shall be used only with lamps listed to produce published results.

2.3 LED Fixtures:

A. LED:

1. LED driver shall have a 5 year warranty or longer.
2. LED fixtures shall have a L70 rated life of 50,000 hours or longer.

2.4 EMERGENCY BALLASTS:

A. LED Emergency drivers shall be IOTA ILB-CP10 or equal by Bodine. LED emergency driver shall provide a minimum of 10W of power through constant power technology for 90 minutes. Driver shall have a 5-year warranty.

2.5 FRAMES AND HOUSINGS:

A. Fixture catalog numbers indicate style of fixture required. Provide fixtures with proper frames for ceiling types indicated on the reflected ceiling plan.

B. Fixtures installed in inaccessible ceilings shall be U.L. approved for through wiring and all components shall be accessible from below.

2.6 COLORS AND FINISHES :

A. The color / finish of all surface and pendant mounted fixtures and all suspension assemblies, canopies and accessories shall be selected by the Architect, from the manufacturer’s premium color / finish group. Submittals shall include color charts of the colors / finishes available.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. General:

1. Do not use permanent fixtures to provide temporary construction lighting. No fixture shall be installed until the interior of the building is enclosed, conditioned, clean and free of dust.
2. Install lighting fixtures in accordance with the fixture manufacturer's written instructions
3. Fasten fixtures securely to the indicated structural support members of the building; and check to ensure that solid pendant fixtures are plumb.
4. Lay-in fixtures shall be supported independently of the suspended ceiling framing members by at least two tie wires located on opposite corners of each fixture.
5. Fixtures other than lay-in type shall be securely fastened in accordance with NEC Article No. 410-36 (B).
6. Fixtures installed in rated ceilings shall comply with the U.L. Fire Resistance Directory for the ceiling design encountered.

B. Layout:

1. Locate fixtures as indicated on the reflected ceiling plans.

C. Recessed Fixtures:

1. It is anticipated that piping and ductwork systems will be installed prior to the installation of ceiling systems and lighting fixtures. Coordinate recess depth of fixtures, on an area-by-area basis, with other trades, to ensure that sufficient recess depth is maintained.
2. Maintain clearance from thermal insulation and combustible materials as required by the NEC.

D. Emergency fixtures:

1. Where emergency fixtures with integral emergency drivers are shown to be switched, pull an unswitched phase conductor to emergency ballast.

2. Do not switch exit lights.

3.2 AIMING:

A. Aim adjustable fixtures to provide a uniform wash of the surface or area to be illuminated.

3.3 CLEANING:

A. Prior to final inspection, clean lighting fixtures in a manner recommended and approved by the manufacturer.

B. Replace any components that are damaged.

C. Specific attention is directed to the appearance of pendant mounted fixtures. Field touch-up of the finish will only be acceptable when:

1. The level of damage to the finish does not require replacement of the product, in the sole opinion of the Architect.

   AND

2. The Contractor ordered and took delivery of touch-up paint, as well as the manufacturer's recommendations on touch-up, at the time the product was ordered.

   AND

3. The touch-up is acceptable to the Architect.

3.4 SPARE PARTS:

A. Provide **2** spare exit lights and 25' of associated raceway and conductors to connect to nearest un-switched lighting circuit. Spare signs shall be added in locations where Authority Having Jurisdiction requires.

B. Provide **3** spare emergency drivers for LED fixtures. Spare drivers shall be installed in already placed fixtures where Authority Having Jurisdiction requires.

C. If spare equipment listed above are not needed for installation, turn over to Owner.

3.5 TESTING:

A. Test all fixtures for proper operation. Replace lamps and ballasts that are not working properly.

B. Test the emergency lighting system by opening the main circuit breaker serving the facility.
   1. Schedule the test with all trades to ensure the tests will not have adverse effects on other equipment and to make sure that other systems properly shut-down and restart.
   2. The test shall be conducted at night, in the presence of the Architect, Using Agency and State Fire Marshal.
   3. The assembled persons will walk the project to:
      a. Verify operation of equipment installed.
      b. Review lighting levels on an area-by-area basis.

END OF SECTION 26 2030

SECTION 26 2042 – PANELBOARDS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE OF WORK:

A. Provide panelboards as indicated on the drawings and as specified herein.

1.3 QUALITY ASSURANCE:

A. Manufacturers: Provide products by one of the following (for each type of panelboard and enclosure).

1. General Electric Company
2. Square D Co.
3. Eaton/Cutler Hammer
4. Siemens

B. Compliance / Labels:

1. Equipment shall comply with the latest applicable standards of NEMA PB-1 and UL 67.
2. Where panelboards are used as service entrance equipment, they shall comply with all NEC and UL requirements for service entrance and a UL service entrance label shall be provided.

C. Submittals: Refer to Section 260120 for requirements.

PART 2 – PRODUCTS

2.1 ENCLOSURES:

A. Enclosure shall be constructed of code gauge steel constructed **without** knock-outs. Provide manufacturer's standard light gray finish.

B. Provide double hinged door with flush metal latch/lock on inner door. Inner door shall provide access to circuit breaker operating handles only, not to energized parts. Outer continuous piano hinged door shall be mounted to the panelboard box with factory screws and shall provide access to energized parts; metal latch/lock is not permissible on outer door. Both inner and outer doors shall open in same direction.

C. All locks shall be keyed alike.

D. Provide metal or lexan interior circuit directory frame with card and clear plastic covering.

E. Panelboard enclosures shall be NEMA 1 unless shown to be installed in damp or wet locations. In such locations, enclosures shall be NEMA 3R or 4X.

2.2 CONSTRUCTION:

A. Provide dead-front safety type panelboards of either Power and Distribution type or Lighting and Appliance type as defined by the NEC.

1. Power and Distribution type panelboards shall be a minimum of 32” wide by 9” deep and a maximum of 44” wide by 12" deep.
2. Lighting and Appliance type panelboards shall be a maximum of 20 inches wide by 5-3/4 inches deep.

B. Panels shall be equipped with copper bus bars, full-sized neutral bar and an equipment ground bus.

C. Each panel shall be equipped with main lugs or main breaker, as indicated.

D. Provide with laminated plastic nameplate engraved with name of panel, voltage, ampere rating/type fault current rating, date, and feeder origination. Nameplate shall be screwed and glued to panel. Nameplates shall be black in color with white lettering. Nameplates shall have beveled edges.

Example (not actual panel on project): Panelboard DP
120/240V, 3 phase, 4W
225A Main Lugs
14,000 AIC
Fed from MDP
9/2008

2.3 CIRCUIT BREAKERS:

A. Provide bolt-in type, heavy duty, quick-make, quick-break, thermal, magnetic molded case circuit breakers. **Multi-pole breakers shall be common trip, with a single handle**.

B. Main circuit breakers shall be large frame type, individually mounted, connected directly to the bus. The use of backfed breakers is not acceptable.

C. Provisions for future breakers shall be fully bussed complete with all necessary mounting hardware.

D. Devices which achieve the level of fault protection indicated by means of "series" or "integrated" rating shall not be acceptable unless specifically indicated on the drawings.

E. Breakers serving HVAC equipment shall be HACR type.

F. Circuit breakers serving fire alarm equipment shall be provided with a lock tab, red in color.

2.4 BRANCH CIRCUIT IDENTIFICATION:

A. All panelboards shall have a legend permanently posted to their exterior frontal enclosure identifying phasing and the color scheme of all ungrounded conductors in accordance with NFPA 70, Article 210.5.

2.5 METERING:

A. On panelboards used as service equipment, provide Siemens 9330, complete with current transformers and interconnecting wiring, all rated for 1% accuracy. Unit shall be factory installed and tested. Flush mount meter in termination compartment. Equivalent metering by Westinghouse, G.E. or Square D is acceptable.

2.6 WARNING LABELS:

A. All panelboards shall have arc flash warning labels field affixed to their enclosures that comply with the requirements of NFPA 70 and NFPA 70E.

B. Where panelboards are used as service equipment, provide separate label to show the maximum available fault current. Label shall have blank fields to handwrite the calculated available fault current and the date calculated. After service is installed and ready to be inspected by the Authority Having Jurisdiction, Contractor shall submit to the Electrical Engineer the fault calculation (at the service entrance only).

PART 3 – EXECUTION

3.1 GENERAL:

A. Provide circuit directory upon completion of work. Identify load served and location (by room name and number) assigned by user, not by room numbers on floor plans. Note spares and spaces as such. Create directory using electronic spreadsheet and print in 8-1/2" x 11" format using as many pages as necessary. Fold and place in directory holder.

B. Do not splice conductors in panelboard enclosure.

C. Only one conductor shall be connected to each terminal or lug.

D. Connect circuits 1 and 2 to phase A; 3 and 4 to phase B; 5 and 6 to phase C., etc. Conductors shall be color coded in accordance with Section 262010.

E. Group and lace conductors within panel enclosure with nylon tie straps.

3.2 GROUNDING:

A. Ground all panels in accordance with details on the drawings and Section 262080.

B. Do not bond neutral and equipment grounding conductors within panelboard unless panel is used as service equipment or are a separately derived system.

3.3 ADJUST AND CLEAN:

A. Adjust operating mechanism for free mechanical movement.

B. Touch-up scratched or marred surfaces to match original finish.

C. Clean all debris from panel interiors.

D. Clearance and Workspace: Maintain workspace and clearances as required by the NEC for the voltage encountered. No pipes or ducts shall pass above the outline of the panelboard. It shall be the responsibility of this Contractor to make sure that other trades do not encroach on this space.

END OF SECTION 26 2042

SECTION 26 2049 – SURGE PROTECTION DEVICES (SPD)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE OF WORK:

A. Provide SPD units connected in parallel with power distribution equipment, as indicated. SPD units shall be mounted *external* to power distribution equipment. *The use of SS/EHF units integral with power distribution equipment is not acceptable.*

1.3 COORDINATION:

A. Work under this section shall be closely coordinated with power distribution equipment specified under other sections.

1.4 REFERENCE STANDARDS AND PUBLICATIONS:

A. Suppressors shall be designed, manufactured, tested and installed in accordance with the latest edition of the following guidelines and standards:

1. ANSI/IEEE C62.41.1 & C62.41.2
2. ANSI/IEEE C62.45.
3. UL 1449 Third Edition

B. Provide certification that product performance has been verified by a nationally recognized third party testing laboratory.

1.5 SUBMITTAL:

A. Refer to Section 260120 for requirements.

1.6 ACCEPTABLE MANUFACTURERS:

A. This specification is based on the following:

1. Square D
2. Surge Suppression, Inc.
3. Current Technologies
4. Advanced Protection Technologies
5. Eaton
6. Liebert

PART 2 – PRODUCTS

2.1 GENERAL:

A. SPD for service equipment:

1. Type 2 device.
2. Voltage: 120/240, 3PH, 4W, 60 Hz.
3. Modes: L-L, L-N, L-G.
4. Single pulse surge capacity per mode: 150,000 amps.
5. Clamping Voltage: Manufacturer's rating per the distribution system's voltage.
6. Noise Attenuation: 100KHz - 100MHz.
7. Nominal Discharge Current (In) shall be a minimum of 20kA.

2.2 FEATURES:

A. All units shall have the following features:

1. Phase LED indicator lights.
2. Disturbance counter.
3. 10-year repair / replacement warranty from manufacturer in the name of the Owner.

2.3 ENCLOSURES:

A. SPD enclosures shall be NEMA 1 unless shown to be installed in damp or wet locations. In such locations, enclosures shall be NEMA 3R or 4X.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Provide a SPD unit on each piece of service entrance equipment.

B. Install adjacent to electrical equipment, ensuring that lead lengths are as short as possible to achieve the level of protection specified herein. Lead lengths longer than 12" is unacceptable. Where field conditions make this requirement impossible, contact Architect during shop drawing phase before electrical room drawings are submitted.

C. Connect to circuit breaker in electrical equipment as shown on the manufacturer's wiring diagrams.

END OF SECTION 26 2049

SECTION 26 2080 – ELECTRICAL GROUNDING, 600V AND BELOW

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DESCRIPTION OF WORK:

A. Provide grounding and bonding of systems and equipment as shown on the drawings, specified herein and as required by Article 250 of the NEC.

B. The grounding electrode system shall consist of:

1. Ground rods.
2. Underground metal water supply pipe, outside the building.
3. Concrete encased electrode

C. The following items shall be bonded to the grounding system:

1. Structural steel frame of the building.
2. Interior metal piping systems.
3. Equipment enclosures.
4. Device terminals.
5. Equipment grounding conductors.

1.3 RELATED WORK:

A. Grounding and bonding for Lightning Protection Systems is specified in Section 265000.

1.4 QUALITY ASSURANCE:

A. Acceptable Manufacturers: Use products of manufacturer’s regularly engaged in the production of grounding systems products.

B. Standards: IEEE Green Book - Grounding.

C. Compliance / Labels: All materials shall be U.L. listed for grounding and bonding systems.

D. Submittals: Refer to Section 260120 for requirements.

PART 2 – PRODUCTS

2.1 GENERAL:

A. Where more than one type meets indicated requirements, selection is Installer's option. Where material or component is not otherwise indicated, provide products complying with U.L., NEC, and established industry standards.

2.2 GROUND RODS:

A. Rods shall be 3/4" diameter x 10' long copper-clad steel.

2.3 CONDUCTORS:

A. Grounding Electrode conductors: Bare, stranded copper electrical grounding conductors, sized as shown. When no size is shown, select from Table 250-66 of the NEC.

B. Bonding Jumper Braid: Copper braided type, sized for application.

C. Equipment Grounding conductors: Insulated, stranded copper electrical grounding conductors complying with Section 262010, sized as shown. When no size is shown, select from Table 250-122 of the NEC.

2.4 CONNECTORS:

A. Connectors to rod or reinforcing steel bar electrodes shall be exothermic weld type. The use of wire ties to make rebar continuous is not acceptable.

B. Connections to pipe electrodes shall be pressure or clamp type.

C. Connections to items specified to be bonded to the grounding system may be by any U.L. listed product suitable for the application.

2.5 CAUTION TAGS:

A. Tags shall be weatherproof, custom-printed plastic type, 3-1/4" wide x 5-5/8" high, with stainless steel eye and nylon self-locking tie.

B. Tags shall be two-sided and shall have yellow background with black letters. The word “CAUTION” shall be machine-printed in boldface type at the top, with the custom message machine-printed below.

C. Provide the number of tags required, plus six spare.

D. Tags shall be Seton #12584, or equivalent. (Seton: 1-800-243-6624)

PART 3 – EXECUTION

3.1 GENERAL:

A. Ensure that metal-to-metal contact is made between grounding connectors and painted or coated surfaces of equipment enclosures, piping systems, etc.

B. Where concrete penetration is necessary, non-metallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground wire and the opening shall be sealed with a suitable compound after installation of the ground wire.

C. Metallic raceway systems shall be made electrically continuous to provide a low impedance path to ground for faults, as required by the NEC.

3.2 GROUNDING ROD ELECTRODES:

A. Install ground rods in the approximate location shown. Drive three, 10-feet rods into the earth in a triangular pattern with the rods 10 feet on center. Install rods such that the top of each rod is 8" below finished grade.

B. Install an enclosure for each ground rod, similar to a Quasite “PC” style, open bottom box, with nominal dimensions of 17" long x 11" wide x 12" deep. Box cover shall be locking type and have the logo “GROUND”.

C. The rod and exothermic connection to the grounding electrode conductor shall be accessible from within enclosure. Fill the lower 2" of enclosure with crushed rocks. Top of enclosure shall be flush with finished grade.

D. Install boxes in accordance with the manufacturers’ instructions for the loading indicated. Note that full vehicular traffic rating requires the box to be encased in concrete and use of steel cover.

3.3 BUILDING PERIMETER GROUNDING ELECTRODE:

A. Make bottom rebar in concrete footing around the perimeter of the building electrically continuous. Ensure minimum of 2” of concrete encasement between earth and rebar. Ensure that the concrete footing is in direct contact with the earth. Where vapor barrier, insulation, films, or similar items are below footer, paragraph B below shall be followed instead.

3.4 UNDERGROUND METAL WATER PIPE ELECTRODE:

A. Make connection to “street” side of water meter.

B. Install braided type bonding jumper between “street” side and “house” side piping such that removal of water meter will not interrupt ground path.

C. The connection shall be accessible.

3.5 EQUIPMENT GROUNDING CONDUCTORS:

A. Install an equipment grounding conductor in all branch circuit and feeder raceways, sized in accordance with Article 250 of NFPA 70.

B. Branch circuits serving isolated ground receptacles shall be provided with an isolated equipment grounding conductor in addition to the equipment grounding conductor.

3.6 BONDING:

A. Bond the structural steel frame of the building to the service equipment ground bus. The connection shall be accessible.

B. Bond column anchor bolts of structural steel building to building perimeter grounding electrode no less than every 100’.

C. Bond interior metal piping systems to the service equipment ground bus. The connections shall be accessible.

D. Bond metallic equipment enclosures to a lug installed within the enclosure, which is connected to an equipment grounding conductor.

E. Bond standard device grounding terminals to metallic outlet box and to equipment grounding conductor.

F. Bond equipment grounding conductor to metallic boxes where splices are made.

3.7 BONDING BUSHINGS AND LOCKNUTS:

A. Bushings and locknuts shall be required:

1. Service entrance conduit stub-ups. Interconnect with No. **2/0** AWG (bare) and bond to ground bus in the service equipment.
2. When required by the NEC for voltages in excess of 250V. Bonding conductor shall be sized per the NEC.
3. When terminating conduits in concentric or eccentric knockouts. Bonding conductor shall be sized per the NEC.
4. For all connectors that are **not** U.L. listed as suitable for grounding.

B. Bushings shall be connected to the respective enclosure by an equipment grounding

conductor sized in accordance with Article 250 of the NEC.

3.8 LABELING:

A. Provide a waterproof “CAUTION” tag at the point of connection to each grounding electrode, which reads: “ELECTRICAL SYSTEM GROUNDING ELECTRODE - DO NOT REMOVE THIS CONNECTION. NOTIFY BUILDING MANAGEMENT IF DAMAGED OR DISCONNECTED.”

B. Provide a “CAUTION” tag as specified above within the electrical service equipment where the grounding electrode conductor is terminated.

3.9 TESTING:

A. Upon completion of installation of electrical grounding system, test resistance of each ground rod installation using the "Fall of Potential" method. Ground resistance shall be measured in normally dry conditions not less than 48 hours after rainfall. Where tests show resistance to ground is over 25 ohms, take appropriate action to reduce resistance to 25 ohms or less by driving additional sections of ground rods and/or by chemically treating soil encircling ground rod; then retest to demonstrate compliance. Provide forms to record the data as the tests are conducted. Forms shall be signed by the person conducting the test.

END OF SECTION 26 2080

SECTION 26 8010 – INTELLIGENT FIRE ALARM SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DESCRIPTION:

A. The work required under this section of the specifications consists of an analog, addressable fire and voice alarm system.

B. *This is a performance-based specification*. The system specified herein shall be designed by the manufacturer or an authorized representative of the manufacturer who is either a registered Fire Protection Engineer or a NICET Certified Engineering Technologist.

C. Work of this section requires coordination with the following trades:

1. Duct work installer.
2. Electrical system installer.
3. Fire water service installer.
4. Sprinkler installer.
5. Electronic card access and door hardware installer(s).

D. Proof of this coordination shall be submitted with the shop drawings.

1.3 QUALITY ASSURANCE:

A. All components shall be U.L listed for their intended use as part of the Intelligent Fire Alarm System. Non-listed equipment shall not be used.

B. No equipment shall be installed nor auxiliary connections made that will inhibit proper operation or use of the system and its components, in accordance with the U.L. listings.

C. Acceptable manufacturers:

1. Notifier
2. Edwards EST
3. Simplex

D. Submittals: Refer to Section 270120 for requirements. A draft copy of the certification required by NFPA 72 shall be submitted with the shop drawings. Fill-in as much information as possible. Submittals made without this information will be rejected.

1.4 COORDINATION:

A. Coordinate control, supervisory and auxiliary functions with work provided under other Divisions.

1.5 PERFORMANCE CRITERIA:

A. When installed, the system shall comply with the requirements of the State of Georgia ADA, NFPA 72, 2013 and NFPA101.
B. All NFPA 72 2013 edition, "Paragraph 7.2.3 All fire alarm drawings **shall** use symbols described in NFPA170, Standard for Fire Safety and Emergency Symbols".
C. NFPA 170 2012 edition is part of the Performance Criteria.

PART 2 – PRODUCTS

2.1 GENERAL:

A. All equipment, components and software shall be new and the manufacturer's current model. Beta versions are not acceptable.

B. Provide and activate all standard alarm, trouble, control and supervisory functions. Provide special functions as specified herein.

2.2 FIRE ALARM CONTROL PANEL:
The fire alarm control panel shall comply with the manufacturer's standard design, materials, components for an **intelligent** fire alarm system with **addressable** devices, plus the following accessories:

A. A digital communicator for transmitting alarm and trouble conditions over the telephone line to a central station receiver. Provide surge suppression on all telephone lines connecting to the digital communicator. The device shall be compatible with the existing central station receiver. Provide 1 voice line and 1 internet data drop adjacent to the control panel.
B. A dedicated supervisory service LED and a dedicated supervisory service acknowledge switch, for the building sprinkler system.

2.3 REMOTE ANNUNCIATOR:

A. The annunciator panel shall be recess mounted at location noted on the drawings and shall have an LCD readout. Each alarm initiating device (pull station, smoke detector, duct detector, and sprinkler system flow switch) shall be identified on the readout.

2.4 POWER SUPPLIES:

A. Provide power supplies in the quantity and size required to operate the devices connected to the system. Do not load any power supply more than 75% of its rating.

B. Group devices of the same type to the same power supply.

A. Remote power supplies are permitted providing:

1. Location is approved by the Architect.
2. A separate 20A / 120V circuit is installed to operate each remote supply.
3. Backup battery system is installed at the location of each remote power supply.

2.5 BACKUP BATTERY SYSTEM:

A. An automatic battery back-up and recharging system with volt meter and ammeter for supporting the entire system for a period of 24 hours under normal conditions with five minutes of alarm time at the end of the 24-hour period, shall be provided for the control panel and all remote power supplies.

B. Install batteries in a separate cabinet adjacent to the control panel / remote power supply.

2.6 SIGNALING LINE CIRCUITS:

A. Circuits shall be Class B, Style 4.

2.7 NOTIFICATION APPLIANCE CIRCUITS:

A. Circuits shall be Class B, Style Y.

2.8 SYSTEM OPERATION:

A. The system shall be designed, installed and connected to receive and process signals in accordance with NFPA 72.

B. Control actions upon receipt of fire alarm signal:

1. Doors in fire walls, held open by magnetic devices, shall close, via interface with control module.
2. All doors locked by the electronic card entry/control system shall be unlocked, via interface with control module. The electronic card entry/control system is being provided by the Owner. It shall be the responsibility of the contractor to meet with the Owner’s designated representative and determine the requirements.
3. Air handling units equipped with smoke detectors shall be de-energized, via interface with control module.
4. Smoke dampers in duct work shall close, via interface with control module.

C. Supervisory Functions:

1. Sprinkler system flow and tamper switches - per NFPA 72, via interface with monitor module.
2. Fire service post indicator valve - per NFPA 72, via interface with monitor module.

D. Auxiliary Functions:

1. Upon receiving a signal from the electronic card entry/control system, release doors held open during the day, but closed and operated by card access at night, via interface with control module.

2.9 NON-ADDRESSABLE DEVICES:

A. Audible Alarm Indicating Appliances:

1. Audible signals shall be manufacturer's standard horn or speaker, as indicated, and shall be suitable for surface mounting on the wall.
2. Horns shall have field-selectable "standard" and "high" settings.
3. Speakers shall have field-selectable taps from 1/8W to 8W.
4. Enclosure shall be red.

B. Visual Alarm Indicating Appliances:

1. Visual signals shall be manufacturer's standard, suitable for surface mounting on the wall.
2. Devices shall have field-selectable candela settings of 15, 30, 75 or 100 cd.
3. Enclosure shall be red. Lens shall be vandal resistant.

C. Audio/Visual Alarm Indicating Appliances:

1. Combination audible / visible signals shall be manufacturers' standard, the same as defined for individual devices.

D. Door Holders:

1. Magnetic door holders shall be manufacturer's standard and shall have an approximate holding force of 35 lbs.
2. The door portion shall have a stainless steel pivotal mounted armature with shock absorbing nylon bearing. Wall unit shall be semi-flush mounted over recessed outlet box.
3. Door holders shall be 24V dc and shall be powered from the control panel.
4. Door holders shall be wall mounted type unless floor mounted type is required. Door holders shall be compatible with Architectural building features and doors specified.

E. Thermal Detector Head:

1. Detectors will be a combination rate-of-rise and fixed temperature (200ºF) type, automatically restorable. These devices shall be used only in spaces where high ambient temperatures prohibit the use of addressable devices. Unless noted otherwise, each of these devices shall be used in conjunction with a monitor module, such that point

identification is maintained.

F. Waterflow Switches:

1. Flow switches are furnished and installed under Division 15 and connected under this Division.

G. Sprinkler Valve Tamper Switches:

1. Tamper switches are furnished and installed under Division 15 and connected under this Division.

2.10 ADDRESSABLE DEVICES:

A. Pull Stations:

1. Pull stations shall contain electronics that communicate the station's status to the control panel over two wires. Station address shall be field-selectable.
2. Stations shall be double-action type.
3. Enclosure shall be red, high-impact, vandal-resistant type.
4. Station address shall be field-selectable.

B. Thermal Detector Head:

1. They will be combination rate-of-rise and fixed temperature (135ºF) type, automatically restorable.
2. Station address shall be field-selectable.

C. Smoke Sensors:

1. Smoke sensors shall be of the photoelectric or ionization type and shall communicate actual smoke chamber values to the system control panel. Sensors installed in elevator shafts or pits shall be suitable for the environment.
2. Sensors shall be low profile.
3. Station address shall be field-selectable.
4. Set points shall be field-selectable from the control panel.
5. Sensor shall have integral test switch.
6. Sensor heads shall be photoelectric or ionization type, as determined by the manufacturer to best suit the environment in which the device is to be installed.

D. Addressable Duct Smoke Detector:

1. Addressable Duct Smoke Detectors shall be of the photoelectric type specified above, for mounting outside of the air stream.
2. Provide housing to allow installation on the side of air duct.
3. Provide sampling tubes.
4. Provide and install an externally mounted addressable control module for each duct mounted smoke detector shown on Division 15 plans and/or details and program system as necessary for required automatic shut-down.

5. For each duct detector location provide one remote indicator / test switch unit. The unit shall provide status of the detector (normal, alarm, and trouble). Flush mount in wall near entrance to room in which air unit is installed.

E. Addressable Monitor Modules:

1. Addressable monitor modules shall provide point-monitoring capabilities of individual non-addressable devices. Provide a separate module for each such device.
2. Locate within three feet of the device to be monitored.

F. Addressable Control Module:

1. Addressable control modules shall be used to initiate control actions and supervise initiating functions. A separate control module shall be provided for each control point. Initiation of control functions from auxiliary contacts in devices is prohibited.
2. Locate within three feet of the device to be controlled.
3. If the power requirements of the device being controlled exceed the contact rating of control module, provide a general purpose relay, controlled by the module, with the required contact rating to support the load.

2.11 REMOTE COMMUNICATION DEVICES:

A. Provide active RS-232 port for connection of printer.

B. Provide remote LCD annunciator (non-control type) in location shown on plans.

PART 3 – EXECUTION

3.1 WIRING:

A. Refer to Section 279010, Wiring Methods for Communications Systems.

B. Label each piece of equipment and each cable, using NFPA 72 requirements/ recommendations. Label each end of all cables. Labels shall be of same type as specified in Section 272011.

C. Provide all wiring required to make system operable, as specified. Leave 25% spare capacity on each circuit for the future addition of devices and appliances. Voltage drop calculations shall substantiate initial load and load that can be added.

D. Install wires and cables without splices. Make connections at terminal strips in cabinets or at equipment/device terminals.

3.2 CONDUCTORS:

A. Provide cable type construction, listed and approved for fire alarm usage.

B. Cables shall comply with NEC Article 760, be red in color and be identified in all enclosures.

C. ***All cables shall be installed in a metallic conduit system***, in accordance with Section 261010. Minimum conduit size shall be 3/4". All junction boxes shall be painted red.

3.3 DEVICES:

A. The location of devices shown is approximate. The exact location of all devices shall be determined by the system designer.

B. It shall be the responsibility of the contractor to provide suitable mounts for the projected beam detectors, to guard against movement which would prevent nuisance alarms, to the greatest degree possible.

3.4 DISCONNECT LABELING:

A. The panel and circuit number serving the control panel shall be marked with an indelible marker pen on the inside door of the control panel.

3.5 NOTIFICATION APPLIANCES:

A. The sound level and light intensity setting of notification devices shall be determined by the system designer.

3.6 DUCT MOUNTED DETECTORS:

A. Refer to the Division 23 drawings for the quantity and location of duct mounted smoke detectors.

B. The duct work installer shall determine the method of mounting the detector housing and shall also provide an access door in the duct work on the side opposite of the detector, for inspection of the sampling tubes.

3.7 PRELIMINARY TESTS:

A. Upon completion of the installation, test the entire system for proper operation. Make all adjustments and corrections necessary. Retest until proper operation is achieved.

3.8 CUSTOMIZATION:

A. Schedule on-site meeting (allow a minimum of 4 hours) with Owner's designated representative and review system operation to:

1. Determine custom labels.
2. Customize software programming for initiation, notification and control circuits.
3. Review all adjustable features and determine setpoints.
4. Determine access levels and assign passwords.
5. Implement customization based on meeting with Owner. Document all settings and provide hard copy.

3.9 FINAL TEST:

A. After customizing system, perform an acceptance test of the system as required by NFPA 72. Upon completion of tests, print alarm history log to verify tests.

B. Upon successful completion of tests, provide written certification per NFPA 72. Submit form with record documents.

C. Review test results with Owner and Architect. Demonstrate system operation as directed.

D. Arrange final inspection with the Fire Marshal and Owner's Insurance representative. Present copy of final test alarm log and NFPA certification to each. Demonstrate operation of system as directed.

E. Any changes made to the system after or as a result of the test shall require re-acceptance testing as required by NFPA 72.

3.10 SPARE PARTS:

A. Provide spare parts as follows:

1.	Sensor heads:	2 of each type
2.	Sensor bases:	2 of each type
3.	Manual stations:	2
4.	Notification appliances:	2 of each type
5.	Control and monitor modules:	2 of each type

Deliver in unopened factory cartons at time of training. Submit receipt, signed by Owner's representative.

END OF SECTION 26 8010