

SECTION 22 00 05

PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install potable water, sanitary drainage, storm drainage and gas piping systems complete and operational with accessories.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the plumbing Work.
2. Notify other contractors in advance of the installation of the plumbing Work to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the plumbing Work.

C. Related Sections:

1. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:

1. ANSI A21.1, Practice Manual, Computation Strength, Thickness.
2. ANSI A21.4, Cement-Mortar Lining/Cast and Ductile Iron Pipe and Fittings.
3. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2 thru 48 in. Water.
4. ANSI A21.11, Rubber Gasket Joints Cast and Ductile Iron Pressure Pipe.
5. ANSI A21.51, Ductile-Iron Pipe Centrifugal Cast, in Metal Molds.
6. ANSI A112.19.2M, Vitreous China Plumbing Fixtures.
7. ANSI A117.1, Accessible and Usable Buildings and Facilities.
8. ANSI B16.9, Factory-Made Wrought Buttwelding Fittings.
9. ANSI B16.12, Cast-Iron Threaded Drainage Fittings.
10. ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
11. ANSI B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings. (ASME B16.22).
12. ANSI B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150 and 300 lbs. (ASME B16.24).
13. ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
14. ANSI B16.33, Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 PSI (Sizes NPS 1/2 through NPS 2). (ASME B16.33).
15. ANSI B16.39, Malleable Iron Threaded Pipe Unions.
16. ANSI B16.42, Ductile Iron Pipe Flanges and Flanged Fittings.
17. ANSI B40.1, Gages-Pressure Indicating Dial Type-Elastic Element.

18. ANSI B125.2, Black and Hot-Dipped Zinc-Coated Welded and Seamless Pipe, (ASTM A 120).
19. ANSI H23.1, Seamless Copper Water Tube, (ASTM B 88).
20. American Society of Sanitary Engineering (ASSE), ASSE 1013, Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
21. ASTM A 53/A 53M, Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless Pipe.
22. ASTM A 74, Specification for Cast-Iron Soil Pipe and Fittings.
23. ASTM A 106/A 106M, Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
24. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
25. ASTM A 888, Specification for Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
26. ASTM B 32, Specification for Solder Metal.
27. ASTM B 88, Specification for Seamless Copper Water Tube.
28. ASTM C 564, Specification for Rubber Gaskets for Cast-Iron Soil Pipe and Fittings.
29. ASTM D 1330, Specification for Rubber Sheet Gaskets.
30. AWWA C511, Reduced-Pressure Principle Backflow Prevention Assembly.
31. CISPI 310, Specification for Coupling for use in Connection with Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
32. CISPI HSN, Specification for Neoprene Rubber Gaskets for Hub and Spigot Cast 300N Soil Pipe and Fittings.
33. FS O-F-506, Flux, Soldering: Paste and Liquid.
34. FS WW-H-171, Hangers and Supports, Pipe.
35. FS QQ-C-40, Calking Lead Wool and Lead Pig.
36. FS WW-P-541/1, Plumbing Fixtures (Water Closet).
37. FS WW-U-516, Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections.
38. FS WW-U-531, Unions, Pipe, Steel or Malleable Iron; Threaded Connection.
39. Manufacturers Standardization Society (MSS), MSS SP 69, Pipe Hangers and Supports – Selection and Application.
40. NFPA 54, Nation Fuel Gas Code.

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:

1. Engage installer regularly engaged in plumbing piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.
2. Engage installers for the entire plumbing piping systems with undivided responsibility for performance and other requirements.

- B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. National Electrical Code, (NEC).
 - 2. Local and State Building Codes and Ordinances.
- C. Component Supply and Compatibility:
 - 1. Obtain all equipment included in this Section regardless of the component manufacturer from a single plumbing manufacturer.
 - 2. The plumbing manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
 - 3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the plumbing manufacturer.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Shop Drawings:
 - a. 1/4-inch scale piping layouts, dimensioned to show length of piping runs, pipe sizes, support spacing and expansion provisions.
 - b. Details of installation, including piping supports.
 - c. Submit pipe schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
 - 2. Product Data:
 - a. Manufacturer's literature, illustrations, specifications and engineering data.
 - b. Flexible connections.
 - c. Additional technical data related to the specified material and equipment as requested by Engineer.
 - d. Gasket material.
- B. Informational Submittals: Submit the following:
 - 1. Qualifications Statements:
 - a. Installer's qualifications.
- C. Closeout Submittals: Submit the following:
 - 1. Record Documentation:
 - a. During progress of the Work keep an up-to-date set of the Drawings showing field and Shop Drawing modifications. Immediately upon completion of piping Work, submit CADD drawings showing the actual in place installation of all piping and equipment installed under this Section, at a scale satisfactory to the Owner. The drawings shall reflect all of the piping Work on plans and in sections, with all reference dimensions and elevations required for complete Record Drawings of the piping systems. Two paper prints shall also be furnished. The prints

and electronic copies of the CADD files shall be furnished no later than 30 days after completion of the Contract and prior to final payment.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading:
 - 1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.
- B. Storage and Protection:
 - 1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
 - 2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.
- C. Acceptance at Site:
 - 1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions

1.6 GENERAL REQUIREMENTS

- A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.
- B. The Drawings show an indication of the arrangement of equipment, ducts, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, ducts, etc., found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.
- C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case, adequately provide for expansion and perfect circulation and minimize the amount of space required for the same.
- D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems, Contractor, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the Engineer.

- E. The Drawings do not show all offsets, fittings, accessories and details, which may be required. Contractor shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work “by others”, to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 HOT AND COLD WATER PIPING

A. Copper Water Tube:

1. Tube:
 - a. Reference: ANSI H23.1, ASTM B 88.
 - b. Type: K or L.
 - c. Temper: Hard-drawn or soft-annealed.
2. Fittings:
 - a. Reference: ANSI B16.22.
 - b. Reference: ANSI B16.26.
 - c. Reference: ANSI B16.18.
3. Joints:
 - a. Sweat:
 - 1) Solder Metal: ASTM B 32, Type 95-5TA.
 - 2) Flux: FS O-F-506, Type 1.
 - b. Flanged:
 - 1) Flanges: ANSI B16.24, 150 lb. class.
 - 2) Gaskets: Red rubber, ASTM D 1330, Grade 1, 1/8-inch thick.
 - 3) Nuts and Bolts: ASTM A 307.
4. Unions:
 - a. Reference: FS WW-U-516.
 - b. Material: Bronze.
 - c. Rating: 250-pound W.O.G.

B. Ductile Iron Pipe:

1. Pipe: Ductile Iron, ANSI A21.51.
2. Fittings: Ductile Iron, ANSI A21.1.
3. Joints:
 - a. Mechanical Joints:
 - 1) Glands, Bolts and Nuts: ANSI A21.11.
 - b. Flanged Joints:
 - 1) Reference: ANSI A21.10.
4. Lining: Mortar lined, ANSI A21.4.

C. Dielectric Couplings:

1. Manufacturers: Provide products of one of the following:
 - a. Watts Regulator Company.
 - b. Epco Sales, Incorporated.
 - c. Or equal.
2. Type: Union or flange.
3. Ratings:
 - a. Unions: 250 psi, ANSI B16.39.
 - b. Flanges: 175 psi, ANSI B16.42 (Iron), ANSI B16.24 (Bronze).

2.2 STORM AND SANITARY PIPING

- A. Cast-Iron Soil Pipe and Fittings:
 1. Pipe and Fittings: ASTM A 74.
 2. Weight: Service-Weight.
 3. Joints:
 - a. Compression:
 - 1) Gasket: Neoprene Rubber, ASTM C 564, CISPI HSN.
 - 2) Lubricant: As recommended by pipe manufacturer.
 - b. Calked:
 - 1) Lead: FS QQ-C-40, Type I, Grade AA.
 - 2) Jute Packing: FS HH-P-117, Type I.
- B. Steel Pipe and Fittings:
 1. Pipe: ANSI B125.2.
 2. Weight: Schedule 40.
 3. Finish: Galvanized.
 4. Fittings: ANSI B16.12 recessed drainage pattern galvanized cast-iron, threaded to allow 1/8-inch or 1/4-inch per foot grade, as required.
- C. Hubless Cast-Iron:
 1. No-Hub Pipe and Fittings: ASTM A 888.
 2. Joints: CISPI 310.

2.3 NATURAL GAS PIPING

- A. Steel Pipe:
 1. Pipe:
 - a. Reference: Pipe sizes 2-inches to 24-inches, ASTM A 53/A 53M, Type S, Schedule 40, Grade B.
 - b. Reference: Pipe sizes less than 2-inches, ASTM A 106/A 106M, Schedule 40.
 - c. Weight: Schedule 40.
 - d. Finish: Black.
 - e. Piping 2-inches and larger shall conform to ASTM A 53/A 53M.
 - f. Piping 1-1/2-inches and smaller shall conform to ASTM A 106/A 106M.
 - g. End Connections:
 - 1) Schedule 40: Up to 1-1/2-inch size, may be threaded.

- 2) Schedule 40: Two-inch and larger shall be welded; weld end (API 1104, ASME Section IX Boiler and Pressure Vessel Code. Connections to regulators, valves, meters with flanged ends shall be flanged).
 2. Fittings:
 - a. Threaded:
 - 1) Reference: ANSI B16.33, 150 lb.
 - 2) Material: Malleable iron.
 - 3) Finish: Black.
 - b. Welded:
 - 1) Reference ANSI B16.9.
 - 2) Material: Wrought steel.
 - 3) Finish: Black.
 3. Unions:
 - a. Threaded: Malleable iron, FS WW-U-531, Class 1, Type B.
 4. Joint Compound:
 - a. Materials: Resistant to the action of liquefied petroleum gas or natural gas.
 5. Insulating couplings, Dresser type, a steel body with gaskets and retainer cups.
- B. Buried Piping: Refer to local gas utility company requirements.
- C. Dielectric Couplings:
1. Manufacturers: Provide products of one of the following:
 - a. Watts Regulator Company.
 - b. Epco Sales, Incorporated.
 - c. Or equal.
 2. Type: Union or flange.
 3. Ratings:
 - a. Unions: 250 psi, ANSI B16.39.
 - b. Flanges: 175 psi, ANSI B16.42 (Iron), ANSI B16.24 (Bronze).

2.4 VALVES AND ACCESSORIES

- A. Bronze Body Globe Valves:
1. Products and Manufacturers: Provide one of the following:
 - a. Stockham Valves and Fittings, Fig. No. B-24.
 - b. Lunkenheimer Company, Fig. No. 126.
 - c. Or equal.
 2. Type: Composition disc, union bonnet.
 3. Materials: Brass and bronze.
 4. Rating: 150 lb. SWP.
 5. End Connections: Solder joint.
- B. Bronze Body Check Valves:
1. Products and Manufacturers: Provide one of the following:
 - a. Stockham Valves and Fittings, Fig. No. B-309.
 - b. Lunkenheimer Company, Fig. No. 2145.

- c. Or equal.
 - 2. Type: Swing, regrinding bronze disc, screw-in cap.
 - 3. Materials: Brass and bronze.
 - 4. Rating: 150 lb. SWP.
 - 5. End Connections: Solder joint.
- C. Bronze Body Ball Valves:
- 1. Products and Manufacturers: Provide one of the following:
 - a. Stockham Valves and Fittings, Fig. S-217 BR-R-T.
 - b. Lunkenheimer Company, Fig. 707-XLT.
 - c. Or equal.
 - 2. Type: Non-blowout stem, adjustable packing gland, quarter turn, full port ball valve.
 - 3. Materials:
 - a. Body: Cast bronze.
 - b. Ball: Chrome plated brass.
 - c. Packing and Seats: Teflon.
 - 4. Rating: 150 lb. SWP.
 - 5. End Connection: Screwed. Provide screwed to sweat adapters, where required.
- D. Lubricated Plug Valves:
- 1. Manufacturers: Provide products of one of the following:
 - a. Walworth Company.
 - b. Nordstrom Valves, Inc.
 - c. Or equal.
 - 2. Type: Short pattern, wrench operated.
 - 3. Pressure Rating: 175 lb. W.O.G- 350 lb. test.
 - 4. End Connections: Threaded (up to 2-1/2-inch); flanged (3-inch and larger).
 - 5. Construction: Cast-iron body and plug with steel trim.
 - 6. Sealant: Suitable for gas application.
 - 7. Wrench: To suit valve.
- E. Lubricated Stop Cocks (Up to 2-inches):
- 1. Manufacturers: Provide products of one of the following:
 - a. Eclipse Fuel Engineering Company.
 - b. A. Y. McDonald Manufacturing Company.
 - c. Or equal.
 - 2. Type: Flat head.
 - 3. Pressure Rating: 125 lb. W.O.G.
 - 4. End Connections: Threaded.
 - 5. Construction: Iron body, bronze plug.
- F. Natural Gas Pressure Regulator: In accordance with the requirements of the local utility company.
- G. Natural Gas Meter:
- 1. Manufacturer: In accordance with requirements of the local utility company.

2.5 EQUIPMENT

A. Hose Bibbs, Pipe Drains:

1. Products and Manufacturers: Provide one of the following:
 - a. Woodford Manufacturing Company, Model 24C.
 - b. Nibco, Incorporated, Fig. No. 74VB.
 - c. Or equal.
2. Valve:
 - a. Type: Indoor/non-freeze area boiler drain globe valve, chrome plated.
 - b. Materials: Bronze body, screwed bonnet, renewable composition disc.
 - c. End Connections: Hose thread outlet, male pipe thread or sweat inlet.
 - d. Rating: 125 lbs. W.O.G.
3. Vacuum Breaker:
 - a. Type: Non-removable, atmospheric.
 - b. Materials: Brass body, stainless steel trim, silicone rubber diaphragm and disc.
 - c. End Connections: Hose thread inlet and outlet.

B. Thermometers:

1. Manufacturers: Provide products of one of the following:
 - a. Weksler Instrument Company.
 - b. H.O. Trerice Company.
 - c. Or equal.
2. Range: 30°F to 240°F temperature range in maximum of 2°F increments.
3. Type: Adjustable angle column type thermometer.
 - a. Construction:
 - 1) Scales and Lens: Nine-inch high satin finish aluminum scales, black numerals, front red reading mercury tubes.
 - 2) Wells: Insertion well with brass separable sockets.
 - 3) Neck: 2-1/2-inch extension neck.
 - 4) Case: Cast aluminum with bronze finish.
 - 5) Window: Glass or clear acrylic plastic.

C. Pressure Gages:

1. Manufacturers: Provide products of one of the following:
 - a. Weksler Instrument Company.
 - b. H.O. Trerice Company.
 - c. Or equal.
2. Reference: ANSI B40.1 for Grade AA gages.
3. Type: Direct mounted, dial type pressure gage.
4. Construction:
 - a. Case: Six-inch diameter cast aluminum, flangeless with black finish and bottom 1/4-inch N.P.T.
 - b. Ring: Chrome plated close type.
 - c. Dial: White face, black numbers and graduations.
 - d. Window: Glass or clear acrylic plastic.
 - e. Pointer: Micrometer type, black finish, red tip.

- f. Movement: Stainless steel, rotary type, delrin sector and bushings.
- g. Bourdon Tube: Seamless phosphor bronze, Grade A over pressured and stress relieved.
- h. Socket and Tip: Forged brass, alloy steel and Type 316 stainless steel.
- 5. Accuracy: One percent, minimum.
- 6. Gage Cocks: Provide brass tee handle cock before each gage.

D. Backflow Preventers: RPZ-BFP:

- 1. Products and Manufacturers: Provide one of the following:
 - a. Febco, Model 825.
 - b. Watts Regulator Company, Series 909.
 - c. Or equal.
- 2. Type: Reduced pressure zone device with two independently acting check valves, together with an automatically operated pressure differential relief valve located between the two check valves.
- 3. Materials:
 - a. Body: Bronze.
 - b. Valve Discs: Buna-N rubber.
 - c. Diaphragm: Silicone rubber or Buna-N rubber.
 - d. Springs: Stainless steel.
 - e. Screws: Stainless steel.
- 4. Maximum Working Pressure: 150 psi.
- 5. End Connections: Screwed.
- 6. Accessories:
 - a. Air gap drain funnel with threaded outlet and vent elbow furnished by manufacturer minimum two pipe sizes larger than relief drain outlet.
 - b. Strainer with blowoff on inlet.
 - c. Ball valves on inlet and outlet.
 - d. Reduced pressure principle backflow preventer test kit for each unit furnished, provided in molded plastic carrying case with foam inserts.
- 7. References: ASSE 1013, AWWA C511.

E. Floor Drains:

- 1. Floor Drain and Shower Drain: (FD-1).
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Jay R. Smith, Fig. 2010-BP.
 - 2) Zurn Industries Fig. Z-415 with Y-strainer.
 - 3) Or equal.
 - b. Materials:
 - 1) Body: Enameled cast-iron.
 - 2) Collar: Cast-iron, reversible, threaded for strainer heads, enamel coated.
 - 3) Strainer Head: Square 8-inch by 8-inch nickel bronze grate with bronze body, heel proof grate, and vandal proof screws.
 - c. Outlet Connection: Bottom outlet, calk or no-hub, as required.
- 2. Bar Grate:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Tyler Pipe, Series 547.

- 2) Or equal.
- b. Type: Grate to be used in soil pipe hub openings.
- c. Body: Cast-iron with legs and grating on exposed face.

F. Roof Drains:

- 1. Roof Drain: (RD-1):
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Jay R. Smith, Fig. 1010-R-C-G.
 - 2) Zurn Industries Fig. Z-100-R-C.
 - 3) Or equal.
 - b. Materials:
 - 1) Body: Enameled cast-iron.
 - 2) Dome Top: Galvanized cast-iron.
 - c. Accessories:
 - 1) Sump receiver.
 - 2) Underdeck clamp.
 - d. Outlet Connections: Threaded, calk or no-hub, as required.

G. Cleanouts:

- 1. Cleanout Deck Plates (Finished Areas) FCO-1:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Jay R. Smith, Fig. 4040.
 - 2) Zurn Industries, Fig. No. Z-1400-3.
 - 3) Or equal.
 - b. Materials: Cast-iron body and adjustable nickel bronze top.
 - c. Outlet Connection: Standard spigot.
 - d. Accessories:
 - 1) Square nickel bronze top.
 - 2) Cast bronze taper thread plug.
- 2. Wall Cleanout Plate:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Jay R. Smith, Fig. 4402.
 - 2) Zurn Industries, Fig. No. Z-1440-1.
 - 3) Or equal.
 - b. Materials: Cast bronze taper thread plug.
 - c. Accessories:
 - 1) Stainless steel round shallow wall plate.
 - 2) Cast-iron calked ferrule.

H. Wall Hydrants:

- 1. Exposed Hose Connection, Non-Freeze Type:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Jay R. Smith, Fig. No. 5609-SE.
 - 2) Zurn Industries, Fig. No. Z-1310.
 - 3) Or equal.
 - b. Type: Anti-siphon non-freeze wall hydrant.
 - c. Materials:
 - 1) Casing: Bronze.

- 2) Vacuum Breaker: Integral.
- 3) Threads: Standard 3/4-inch hose thread outlet.
- 4) Wall Clamp: Adjustable with set screw.
- 5) Key: Removable tee handle type.
- d. Connection: 3/4-inch sweat end inlet and 3/4-inch hose thread outlet, universal type.

I. Oil Interceptor:

- 1. Products and Manufacturers: Provide one of the following:
 - a. Jay R. Smith, Fig. No. 8500 Series.
 - b. Zurn Industries, Fig. No. Z-1186.
 - c. Or equal.
- 2. Type: Heavy-duty floor recessed with H-20 load cover plate.
- 3. Materials:
 - a. Body: Acid resistant coated fabricated steel finish interior and exterior.
 - b. Trap: Double wall with cleanout.
 - c. Removable combination pressure equalizing, flow diffusing baffle and sediment bucket.
 - d. Horizontal baffle.
 - e. Specific gravity oil draw-off valve assembly connections either side.
 - f. Secured gasketed non-skid secured cover complete with flow control fitting.
 - g. Threaded inlet and outlet.
- 4. Capacity: Thirty-gallon water capacity.

J. Hangers and Supports:

- 1. Manufacturers: Provide products of one of the following:
 - a. ITT Grinnell Corporation.
 - b. B-LINE.
 - c. Or equal.
- 2. Type: Clamps, hooks, rods, hangers used to support plumbing piping systems from the structure.
- 3. Materials: Comply with the requirements of MSS SP 69, FS WW-H-171 latest edition, Underwriters' Laboratory listed and Factory Mutual approved.

K. Hot Water Temperature Maintenance Heat Tracing System:

- 1. Manufacturers: Provide products of one of the following:
 - a. Thermon Manufacturing Company.
 - b. Tyco Thermal Controls.
 - c. Or equal.
- 2. General: Furnish and install a complete UL listed system of heat trace cable(s) and components approved and designed specifically for maintaining various hot water temperatures ranging from 110°F to 140°F. Hot water from hot water heater(s) to plumbing fixtures and as shown shall be electrically traced with self-limiting heaters. Manufacturer shall assist in selecting the correct tracer and develop Bill of Materials. All connections and equipment shall be moisture-proof.

3. The heater cable assembly shall consist of two No. 14 AWG parallel nickel-plated copper bus wires imbedded in a self-regulating core and covered in a cross-linked polyolefin insulating jacket. The heater assembly shall be covered with tinned copper metallic braid and an outer jacket of cross-linked polyolefin insulation, nominally of 40-mil thickness, and color-coded for easy identification.
4. The cable shall be rated for 120 or 208-volt operation.
5. Pipe and heat trace shall be insulated with 1-1/2-inch thick fiberglass insulation as described herein this Section.
6. Provide all splice power-to-tracing connectors, thermostats, end terminations, straps, ground fault circuit breakers, junction boxes, etc., as required.

2.7 INSULATION

A. Fiberglass Insulation:

1. Products and Manufacturers: Provide one of the following:
 - a. Owens-Corning Fiberglass Corporation, Fiberglass 25ASJ/SSL.
 - b. Certain Teed Products Corporation, Certain Teed Snap-On ASJ-SSL.
 - c. Or equal.
2. Type: Heavy-density sectional pipe insulation with vapor barrier with self-sealing lap.
3. Fire Hazard Classification:
 - a. Flame Spread: 25.
 - b. Fuel Contributed: 50.
 - c. Smoke Developed: 50.
4. Density: Three lbs. per cubic foot, minimum.
5. Fittings: Molded fiberglass.
6. Jointing Materials: Manufacturers recommended adhesives and tape.
7. Valve Insulation: Miter cut nesting size covering segments of same thickness as pipeline, for insulation of valves.

B. Calcium Silicate Insulation at Insulation Protection Shields:

1. Products and Manufacturers: Provide one of the following:
 - a. Owens-Corning Fiberglass Corporation, Kaylo 10.
 - b. Johns-Manville, Thermo 12.
 - c. Or equal.
2. Type: Calcium silicate pipe insulation.
3. Fire Hazard Classification:
 - a. Flame Spread: 0.
 - b. Smoke Developed: 0.
4. Density: Fourteen lbs. per cubic foot.
5. Compressive Strength: 140 psi.
6. Cut insulation 1/2-inch longer than insulation shield it rests on.

C. Handicapped Lavatory Trim Insulation:

1. Products and Manufacturers: Provide one of the following:
 - a. Truebro, Inc., Model No. 102W with Accessory No. 105W.

- b. Brocar Products, Inc., Kit 500R with Accessory 500 HS or 500 HSK, as required.
 - c. McGuire Manufacturing Company, Incorporated, Pro Wrap.
 - d. Or equal.
- 2. Type: Flexible vinyl insulation for waste, traps, hot and cold water supplies.
- 3. References:
 - a. ADA Article 4.19.4.
 - b. ANSI A117.1.

2.8 PAINTING

- A. Piping, equipment and accessories shall be painted in accordance with Section 09 91 00, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install all items as shown, specified, and as recommended by the manufacturer.
 - 2. Request instructions from Engineer, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
 - 3. Present conflicts to Engineer, in writing, who will determine corrective measures to be taken.
 - 4. Do not modify structures to facilitate installation of piping, unless specifically approved by Engineer.
 - 5. Installation to conform to the requirements of all local and state codes.
 - 6. Properly plug or cap the open ends of all piping at the end of each day's Work or other stopping point through construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Fill all systems and fully test all equipment, valves, etc. in operation.
 - 2. Check for excessive vibration while all systems are operating.
 - 3. Installed systems and components will not be released to Owner unless all systems have been tested and approved by the Engineer.
- B. Inspection:
 - 1. Examine areas to receive equipment, piping, valves and accessories for:
 - a. Defects that adversely affect execution and quality of the Work.
 - b. Deviations beyond allowable tolerances for equipment, piping, valves and accessories.
 - c. Start the Work only when conditions are satisfactory.

2. The Engineer reserves the right to reject or authorize replacement of equipment, piping, valves and accessories found to be defective, blistered, cracked or deviated from allowable tolerances as described above.

3.3 ADJUSTING AND CLEANING

- A. Adjusting:
 1. Adjust all controls for proper settings.
 2. While system is operable, balance all equipment, valves, dampers, etc. to achieve design conditions.
- B. Cleaning:
 1. Thoroughly clean all piping, fittings, valves, equipment and accessories prior to installation.
 2. Remove all dirt, rust, dust, etc. from piping and equipment in preparation for painting.
 3. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

- A. Piping:
 1. All potable water supply, hot and cold 2-1/2-inches and smaller, run within the interior of a building, shall be hard-drawn copper Type "L" with solder joints and connections.
 2. All potable water piping 2-1/2-inches and smaller run underground shall be soft-annealed copper Type "K" copper tubing.
 3. All underground water piping 3-inches and larger shall be cement-lined ductile iron pipe with mechanical joints.
 4. All exposed gravity sanitary waste and vent and storm drainage piping run within the interior of a building shall be no-hub cast-iron.
 5. All gravity sanitary waste and vent and storm drainage piping located in concrete slabs or underground to exterior limits as shown shall be cast-iron soil pipe.
 6. All exposed water piping and valves to plumbing fixtures shall be chrome-plated brass.
 7. All exposed gas piping within the interior of a building or run within a chase or shaft shall be Schedule 40 black steel. All gas piping at a pressure of one psig or higher within the building shall be welded. All gas piping 1-inch diameter and larger shall be welded.
 8. All valves for copper or brass piping shall be bronze bodied, unless otherwise specified.
 9. All valves for ductile iron piping shall be iron bodied, unless otherwise specified.
 10. Use "wrought copper" fittings for copper tubing.
 11. Use "butt welded" fittings for welded steel pipe connections.

++ END OF SECTION ++

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install hangers and supports complete with accessories for plumbing piping and equipment.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the hangers and supports for plumbing piping and equipment Work.
2. Notify other contractors in advance of the installation of the plumbing pipe and equipment hangers and supports to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the plumbing piping and equipment hangers and supports Work.

C. Related Sections:

1. Section 05 50 05, Anchor Systems.
2. Section 05 50 13, Miscellaneous Metal Fabrications.
3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:

1. American National Standards Institute, (ANSI).
 - a. ANSI B1.1, Unified Inch Screw Threads. (ASME B1.1).
2. American Society for Testing and Materials, (ASTM).
 - a. ASTM A 36/A 36M, Specification for Carbon Structural Steel.
 - b. ASTM A 47/A 47M, Specification for Ferritic Malleable Iron Castings.
 - c. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - d. ASTM A 575, Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
 - e. ASTM A 668/A 668M, Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
3. Federal Specifications, (FS).
 - a. FS WW-H-171, Hangers and Supports, Pipe.
4. Manufacturer's Standardization Society, (MSS).

- a. MSS SP 58, Pipe Hangers and Supports - Materials, Design and Manufacture.
- b. MSS SP 69, Pipe Hangers and Supports - Selection and Application.
- c. MSS SP 89, Pipe Hangers and Supports - Fabrication and Installation Practices.
- d. MSS SP 90, Guidelines on Terminology for Pipe Hangers and Supports.

1.3 QUALITY ASSURANCE

- A. Installer's Qualifications:
 1. Engage a single installer regularly engaged in hangers and supports installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.
 2. Engage a single installer for the entire plumbing pipe and equipment hangers and supports system with undivided responsibility for performance and other requirements.
- B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 1. American National Standards Institute, (ANSI).
 2. American Society of Mechanical Engineers, (ASME).
 3. National Fire Protection Association, (NFPA).
 4. Underwriters' Laboratories, Incorporated, (UL).
 5. Local and State Building Codes and Ordinances.
 6. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.
- C. Component Supply and Compatibility:
 1. Obtain all products included in this Section regardless of the component manufacturer from a single plumbing pipe and equipment hangers and supports manufacturer.
 2. The plumbing piping and equipment hangers and supports manufacturer shall review and approve all Shop Drawings and other submittals for all components furnished under this Section.
 3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the plumbing piping and equipment hangers and supports manufacturer.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
 1. Shop Drawings:
 - a. Details of installation.

- b. Detailed drawings showing all hangers and supports for each piping system. Drawings shall show location, installation, material, loads, forces, stresses and deflections of all hangers and supports.
 - 2. Product Data:
 - a. Manufacturer's literature, illustrations, specifications and engineering data.
 - b. Other technical data related to the specified material and equipment as requested by Engineer.
- B. Informational Submittals: Submit the following:
- 1. Qualifications Statements:
 - a. Installer's Qualifications.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading:
- 1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.
- B. Storage and Protection:
- 1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
 - 2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.
- C. Acceptance at Site:
- 1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 GENERAL REQUIREMENTS

- A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.
- B. The Drawings show an indication of the arrangement of equipment, piping, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, etc. found to interfere with

the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.

- C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case, adequately provide for expansion and circulation and minimize the amount of space required for the same.
- D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems, Contractor, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the Engineer.
- E. The Drawings do not show all offsets, fittings, accessories and details, which may be required. Contractor shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work "by others", to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Components of hangers and supports shall conform to the following:
 - 1. Materials:
 - a. Bolts: ASTM A 307, Grade A, unless otherwise specified below.
 - b. Forgings: ASTM A 668/A 668M.
 - c. Malleable Iron: ASTM A 47/A 47M.
 - d. Rods and Bars: ASTM A 575.
 - e. Threads: Unified Screw Threads, Class 2A and 2B, ANSI B1.1.
 - f. Structural Steel: ASTM A 36/A 36M.
 - 2. Finish:
 - a. Steel or Malleable Iron Items: Galvanized, unless otherwise specified or as shown.
 - b. Steel or Malleable Iron Materials Used for the Support of Uninsulated Copper Piping: Copper plated.
 - c. Framing Members and Fittings: Dip painted with corrosion resistive primer as specified in Section 09 91 00, Painting.
 - d. All hangers, rods, bolts, nuts, inserts, washers located in the corrosive areas shall be Type 316 stainless steel.
- B. Pipe Attachments: The following types of pipe attachments shall be considered acceptable:
 - 1. Adjustable Steel Clevis: FS WW-H-171E, Type 1.

2. Steel Double Bolt Pipe Clamp: FS WW-H-171E, Type 3.
 3. Steel Pipe Clamp: FS WW-H-171E, Type 4.
 4. Adjustable Swivel Pipe Ring: FS WW-H-171E, Type 6.
 5. Adjustable Steel Band Hanger: FS WW-H-171E, Type 7.
 6. Riser Clamp: FS WW-H-171E, Type 8.
 7. Light-Duty Cleves Hanger: FS WW-H-171E, Type 12.
 8. Long Clips: FS WW-H-171E, Type 26.
 9. Offset J-Hooks: FS WW-H-171E, Type 27.
 10. Steel Pipe Covering Protection Saddle: FS WW-H-171E, Type 40A.
 11. Insulation Protection Shield: FS WW-H-171E, Type 41.
 12. Pipe Saddle Support: FS WW-H-171E, Type 37.
 13. Pipe Stanchion Saddle: FS WW-H-171E, Type 38.
 14. Pipe Saddle Support with Base: FS WW-H-171E, Type 36.
 15. Adjustable Roller Hanger: FS WW-H-171E, Type 42.
- C. Structural Attachments: The following types of structural attachments shall be considered acceptable:
1. Side Beam Clamp: FS WW-H-171E, Type 20.
 2. Center I-Beam Clamp: FS WW-H-171E, Type 21.
 3. Welded Steel Bracket: FS WW-H-171E, Types 32 and 33.
 4. Side Beam Bracket: FS WW-H-171E, Type 35.
 5. Malleable Iron with Galvanized Finish Concrete Insert: FS WW-H-171E, Type 18. The use of steel concrete inserts is prohibited and NOT acceptable.
- D. Hanger Rod Attachments: Use as required to complete assembly:
1. Forged Steel Clevis: FS WW-H-171E, Type 14.
 2. Adjustable Turnbuckle: FS WW-H-171E, Type 15.
 3. Forged Steel Welders Eye Nut: FS WW-H-171E, Type 17.
- E. Expansion Joints:
1. Manufacturers: Provide products of one of the following:
 - a. Flexonics Division, Universal Oil Products Company.
 - b. Anaconda Metal Hose Division, Anaconda American Brass Company.
 - c. Or equal.
 2. 2-1/2-inch and Smaller Copper Tubing:
 - a. Construction: Two-ply phosphor bronze seamless bellows.
 - b. Shrouds: Brass protective shrouds.
 - c. End Connections: Male and female solder end fittings or screwed ends with adaptors for screwed to sweat ends.
 3. 3-inch and Larger:
 - a. Construction: Free flexing expansion joints with stainless steel corrugated members.
 - b. End Connections: Welded ends with flanges.
- F. Alignment Guides:
1. Type: Semi-steel spider with four guiding fingers and guiding cylinder with base.

2. Manufacturers: Provide products of one of the following:
 - a. Flexonics Division, Universal Oil Products Company.
 - b. Anaconda Metal Hose Division, Anaconda American Brass Company.
 - c. Or equal.
- G. Connection Bolts: Materials shall be as specified in other Sections of these Specifications or as shown. Where materials are not specified or shown, they shall be of Type 304 stainless steel with Monel nuts.
- H. Toggle Bolts:
 1. Provide zinc plated spring wing toggle bolts of the size required for secure anchorage of individual items, but not less than 1/4-inch diameter, of length required.
 2. Products and Manufacturers: Provide one of the following:
 - a. Spring Wing Toggle Bolts by Ramset Fastening Systems.
 - b. Rawl Toggle Bolts, Spring Wing Type.
 - c. Or equal.
- I. Contractor shall furnish and install all necessary supports, angle iron stands, miscellaneous steel, inserts, anchor bolts and hangers required for all equipment furnished under this Contract, unless otherwise noted. All supports shall meet the requirements of the applicable Sections of Division 05, Metals.

2.2 PAINTING

- A. All pipe hangers, supports and restraints shall be painted as required in accordance with the requirements of Section 09 91 00, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. Install all items as shown, specified, and as recommended by the manufacturer.
 2. Request instructions from Engineer, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
 3. Present conflicts to Engineer, in writing, who will determine corrective measures to be taken.
 4. Do not modify structures to facilitate installation of pipe hangers, supports and restraints, unless specifically approved by Engineer.
 5. Installation to conform to requirements of all local and state codes.
 6. Protection: Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.2 FIELD QUALITY CONTROL

- A. Inspection:
 - 1. Examine areas to receive plumbing piping and equipment hangers and supports and accessories for:
 - a. Defects that adversely affect execution and quality of the Work.
 - b. Deviations beyond allowable tolerances for pipe hangers, supports and restraints and accessories.
 - c. Start the Work only when conditions are satisfactory.
 - 2. The Engineer reserves the right to reject or authorize replacement of pipe hangers, supports and restraints and accessories found to defective.

3.3 ADJUSTING AND CLEANING

- A. Adjusting:
 - 1. Adjust all materials for proper settings.
- B. Cleaning:
 - 1. Thoroughly clean all pipe hangers, supports and restraints and accessories prior to installation.
 - 2. Remove all dirt, rust, dust, etc. from all pipe hangers, supports and restraints in preparation for required painting.
 - 3. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

- A. Hangers, Supports and Restraints for Horizontal Piping:
 - 1. Space supports and hangers for all piping no farther apart than shown below, unless otherwise shown:
 - a. Copper Tube:
 - 1) All Pipes: 6 feet-0 inch on center.
 - b. Steel Pipe:
 - 1) Pipes up to 1-inch: 6 feet-0 inch on center.
 - 2) Pipes 1-1/4-inch to 6-inch: 8 feet-0 inch on center.
 - c. Cast-Iron Pipe:
 - 1) Two supports per length.
 - d. Plastic Pipe:
 - 1) 3 feet-0 inch on center for all sizes, unless otherwise recommended by manufacturer for 100°F ambient temperature.
- B. Hanger Rods: Size hanger rods according to the schedule below, unless noted otherwise.

<u>Nominal Pipe (Inches)</u>	<u>Rod Diameter (Inches)</u>
1/2 through 2	3/8
2-1/2 through 3-1/2	1/2
4 through 5	5/8

- C. Supports for Vertical Piping:
1. Provide riser clamp placed under hub, fitting or coupling with approved solid bearing on steel sleeve at each floor level.
 2. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.
 3. Support spacing shall not exceed code requirements.
 4. Piping support intervals shall not exceed those listed in Paragraph 3.4.A., above.
 5. Additional supports shall be placed immediately adjacent to any change in piping direction, and on both sides of valves and couplings.
 6. Accurately locate inserts for hanger rods in forms before concrete is placed.
 7. Use Type 304 stainless steel expansion anchor assemblies of the capsule polyester resin adhesive type and only to support rods, hangers and brackets for piping 1-inch and smaller no other type will be considered and only if the expansion anchors are designed to carry 100 percent of the full load, hanger, and/or bracket and pipe load.
- D. Supports for water meters and backflow preventers: Provide pipe saddle supports with base anchored to floor.
- E. Structural members shall conform to Section 05 12 00, Structural Steel Framing.
- F. Anchor bolts, expansion anchors and concrete inserts shall conform to Section 05 05 33, Anchor Systems.
- G. Miscellaneous metal fabrications shall conform to Section 05 50 13, Miscellaneous Metal Fabrications.
- H. Allow clearances for expansion and contraction of piping.
- I. Anchors shall be designed to prevent any pipe movement at pipe anchorage points. Anchors shall be securely fastened to the construction directly or indirectly through structural framing:
1. Piping 2-1/2-inches and Smaller: Anchor horizontal runs over 50 feet to midpoint to allow expansion toward expansion compensators (anchor intervals shall not exceed 30 feet) or elbows.
 2. Piping 3-inches and Larger: Anchor horizontal runs over 100 feet at mid-points to force expansion toward expansion compensators.
 3. Provide alignment guides in accordance with expansion compensator manufacturer recommendations.
- J. Provide expansion compensators where necessary to absorb expansion and contraction in heating lines and as follows:
1. Thirty feet on center of copper piping.
 2. Fifty feet on center of steel piping.

- K. Locate first set of alignment guides within four pipe diameters of the anchor or expansion compensator, the second set of pipe alignment guides shall be located within fourteen pipe diameters of the first guides.

+ + END OF SECTION + +

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install domestic water piping systems complete with accessories.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the domestic water piping systems Work.
2. Notify other contractors in advance of the installation of the domestic water piping systems to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the domestic water piping systems Work.

C. Related Sections:

1. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:

1. ANSI A13.1, Scheme for Identification of Piping Systems.
2. ANSI A21.1, Practice Manual, Computation Strength, Thickness.
3. ANSI A21.4, Cement-Mortar Lining/Cast and Ductile Iron Pipe and Fittings (AWWA C105).
4. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2-inches through 48-inches, for Water (AWWA C110).
5. ANSI A21.11, Rubber Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings (AWWA C111).
6. ANSI A21.51, Ductile-Iron Pipe Centrifugally Cast, in Metal Molds (AWWA C151).
7. ANSI A112.1.2, Air Gaps in Plumbing System.
8. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 150 and 800.
9. ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
10. ANSI B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings (ASME B16.22).
11. ANSI B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, 150 and 300 lbs (ASME B16.24).

12. ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
13. ANSI B16.39, Malleable Iron Threaded Pipe Unions.
14. ANSI B16.42, Ductile Iron Pipe Flanges and Flanged Fittings.
15. ANSI B40.1, Gages - Pressure Indicating Dial - Elastic Element.
16. ANSI H 23.1, Seamless Copper Water Tube, (ASTM B 88).
17. ANSI Z358.1, Emergency Eyewash and Shower Equipment.
18. American Society of Sanitary Engineers (ASSE), ASSE 1001, Performance Requirements for Atmospheric Type Vacuum Breakers.
19. ASSE 1013, Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
20. ASSE 1018, Trap Seal Primer Valves – Water Supply Fed.
21. ASSE 1020, Performance Requirements for Pressure Vacuum Breaker Assembly.
22. ASTM A 126, Specification for Gray Iron Casting for Valves, Flanges and Pipe Fittings.
23. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
24. ASTM B 32, Specification for Solder Metal.
25. ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
26. ASTM B 88, Specification for Seamless Copper Water Tube.
27. ASTM D 1330, Specification for Rubber-Sheet Gaskets.
28. AWWA C511, Reduced-Pressure Principle Backflow Prevention Assembly.
29. FS O-F-506, Flux, Soldering: Paste and Liquid.
30. FS WW-U-516, Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections.
31. Plumbing and Drainage Institute (PDI), PDI WH 201, Water Hammer Arresters.

1.3 QUALITY ASSURANCE

- A. Installer's Qualifications:
 1. Engage a single installer regularly engaged in domestic water piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to Engineer.
 2. Engage a single installer for the entire domestic water piping system with undivided responsibility for performance and other requirements.
- B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 1. National Electrical Code, (NEC).
 2. Local and State Building Codes and Ordinances.
- C. Component Supply and Compatibility:

1. Obtain all equipment included in this Section regardless of the component manufacturer from a single domestic water piping systems manufacturer.
2. The domestic water piping systems manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the domestic water piping systems manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
 - a. 1/4-inch scale piping layouts, dimensioned to show length of piping runs, pipe sizes, support spacing and expansion provisions.
 - b. Details of installation, including piping supports.
 - c. Submit pipe schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
2. Product Data:
 - a. Manufacturer's literature, illustrations, specifications and engineering data.
 - b. Flexible connections.
 - c. Other technical data related to the specified material and equipment as requested by Engineer.
 - d. Gasket material.

B. Informational Submittals: Submit the following:

1. Qualifications Statements:
 - a. Installer's qualifications.

C. Project Closeout Submittals: Submit the following:

1. Record Documentation:
 - a. During progress of the Work keep an up-to-date set of the Drawings showing field and Shop Drawing modifications. Immediately upon completion of piping Work, submit CADD drawings showing the actual in place installation of all piping and equipment installed under this Section at a scale satisfactory to the Owner. The drawings shall reflect all of the piping Work on plans and in sections, with all reference dimensions and elevations required for complete Record Drawings of the piping systems. Two paper prints shall also be furnished. The prints and electronic copies of the CADD files shall be furnished no later than 30 days after completion of the Contract and prior to final payment.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.
- B. Storage and Protection:
 1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
 2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.
- C. Acceptance at Site:
 1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 GENERAL REQUIREMENTS

- A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.
- B. The Drawings show an indication of the arrangement of equipment, ducts, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, ducts, etc. found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions, without additional cost to the Owner.
- C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case, adequately provide for expansion and perfect circulation and minimize the amount of space required for the same.
- D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems, Contractor, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the Engineer.
- E. The Drawings do not show, all offsets, fittings, accessories and details, which may be required. Contractor shall carefully examine all of the General

Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work “by others”, to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Copper Water Tube:

1. Tube:
 - a. Reference: ANSI H23.1, ASTM B 88.
 - b. Type: K or L.
 - c. Temper: Hard-drawn or soft-annealed.
2. Fittings:
 - a. Reference: ANSI B16.22.
 - b. Reference: ANSI B16.26.
 - c. Reference: ANSI B16.18.
3. Joints:
 - a. Sweat:
 - 1) Solder Metal: ASTM B 32, Type 95-5TA.
 - 2) Flux: FS O-F-506, Type 1.
 - b. Flanged:
 - 1) Flanges: ANSI B16.24, 150 lb. class.
 - 2) Gaskets: Red rubber, ASTM D 1330, Grade 1, 1/8-inch thick.
 - 3) Nuts and Bolts: ASTM A 307.
4. Unions:
 - a. Reference: FS WW-U-516.
 - b. Material: Bronze.
 - c. Rating: 250 lb. W.O.G.

B. Ductile Iron Pipe:

1. Pipe: Ductile-iron, ANSI A21.51.
2. Fittings: Ductile-iron, ANSI A21.1.
3. Joints:
 - a. Mechanical Joints:
 - 1) Glands, Bolts and Nuts: ANSI A21.11.
 - b. Flanged Joints:
 - 1) Reference: ANSI A21.10.
4. Lining: Mortar lined, ANSI A21.4.

C. Dielectric Couplings:

1. Manufacturers: Provide products of one of the following:
 - a. Watts Regulator Company.
 - b. Epco Sales, Incorporated.
 - c. Or equal.

2. Type: Union or flange.
3. Ratings:
 - a. Unions: 250 psi, ANSI B16.39.
 - b. Flanges: 175 psi, ANSI B16.42 (Iron), ANSI B16.24 (Bronze).

2.2 VALVES

A. Bronze Body Globe Valves:

1. Products and Manufacturers: Provide one of the following:
 - a. Stockham Valves and Fittings, Fig. No. B-24.
 - b. Lunkenheimer Company, Fig. No. 126.
 - c. Or equal.
2. Type: Composition disc, union bonnet.
3. Materials: Brass and bronze.
4. Rating: 150 lb. SWP.
5. End Connections: Solder joint.

B. Bronze Body Check Valves:

1. Products and Manufacturers: Provide one of the following:
 - a. Stockham Valves and Fittings, Fig. No. B-309.
 - b. Lunkenheimer Company, Fig. No. 2145.
 - c. Or equal.
2. Type: Swing, regrinding bronze disc, screw-in cap.
3. Materials: Brass and bronze.
4. Rating: 150 lb. SWP.
5. End Connections: Solder joint.

C. Bronze Body Ball Valves:

1. Products and Manufacturers: Provide one of the following:
 - a. Stockham Valves and Fittings, Fig. S-217 BR-R-T.
 - b. Lunkenheimer Company, Fig. 707-XLT.
 - c. Or equal.
2. Type: Non-blowout stem, adjustable packing gland, quarter turn, full port ball valve.
3. Materials:
 - a. Body: Cast bronze.
 - b. Ball: Chrome plated brass.
 - c. Packing and Seats: Teflon.
4. Rating: 150 lb. SWP.
5. End Connections: Screwed. Provide screwed to sweat adapters, where required.

D. Strainers:

1. Manufacturers: Provide products of one of the following:
 - a. Mueller Steam Specialty Company.
 - b. Armstrong Steam Specialty Company.
 - c. Or equal.
2. Type: Self-cleaning wye body with blow-off cock.

3. Construction:
 - a. Basket: Perforated stainless steel basket.
 - b. Perforations: 0.045-inches diameter, minimum.
 - c. Free Area: Four times, cross sectional area of connecting pipe, minimum.
 4. Strainers 2-1/2-inch and smaller:
 - a. Materials:
 - 1) Body: Cast bronze, ASTM B 62.
 - b. Pressure Rating: 250 psi steam at 425°F temperature.
 - c. End Connections: Solder ends or screwed ends with adapters for screw to sweat ends.
 - d. Blowoff Connection: Unplugged, NPT blowoff connection.
 5. Strainers 3-Inches and Larger:
 - a. Construction:
 - 1) Body: Cast-iron, ASTM A 126.
 - b. Pressure Rating: 125 psi steam.
 - c. End Connections: Flanged ANSI B16.1 drilling.
 - d. Blowoff Connections: Tapped, NPT, unplugged.
 6. Provide short nipple and blowoff valve for each strainer.
- E. Iron Body Gate Valves:
1. Products and Manufacturers: Provide one of the following:
 - a. Stockham Valves and Fittings, Fig. No. G-623.
 - b. Lunkenheimer Company, Fig. No. 1430.
 - c. Or equal.
 2. Type: Rising stem, outside screw and yoke, solid wedge.
 3. Materials: Iron with bronze trim.
 4. Rating: 125 lb. SWP.
 5. End Connections: Flanged, ANSI B16.1 drilling.
 6. Provide chain wheel operators for all valves above 5 foot-6 inches above finished floor.
- F. Iron Body Check Valves:
1. Products and Manufacturers: Provide one of the following:
 - a. Stockham Valves and Fittings, Fig. No. G-931.
 - b. Lunkenheimer Company, Fig. No. 1790.
 - c. Or equal.
 2. Type: Swing, regrind-renew disc and seat ring, bolted cover.
 3. Materials: Iron body, bronze trim, bronze disc and seat ring.
 4. Rating: 125 lb. SWP.
 5. End Connections: Flanged, ANSI B16.1 drilling.
- G. Tempering Valve:
1. Manufacturers: Provide products of one of the following:
 - a. Holby Valve Company, Incorporated.
 - b. Heat-Timer Corporation.
 - c. Or equal.
 2. Type: Thermostatically operated water-blending device.

3. Materials:
 - a. Body: Brass.
 - b. Vanes: Brass.
 4. Thermostatic element to be located in main body of valve.
 5. Water blending chamber to be 23-inches long.
 6. Low outlet temperature type valve shall be adjustable from 60 to 110°F.
 7. Test Pressure: 300 psi.
- H. Tepid Water Mixing Valve:
1. Manufacturers: Provide products of one of the following:
 - a. Haws Corporation, Model No. TWBS.HS.
 - b. Leonard Water Temperature Controls, Model No. TM-650-STSTL-EXP.
 - c. Or equal.
 2. Type: Thermostatically operated water-blending device.
 3. Materials:
 - a. Body: Brass.
 - b. Vanes: Brass.
 - c. Cabinet: Stainless steel.
 4. Thermostatic element to be located in main body of valve.
 5. Outlet dial thermometer.
 6. Locking temperature regulator set at 85°F.
 7. Internal cold water bypass and temperature override protection.
 8. Maximum Supply Pressure: 125 psi.
 9. Maximum Supply Temperature: 180°F.
 10. Reference: ANSI Z358-1.

2.3 EQUIPMENT

- A. Hose Bibbs, Pipe Drains:
1. Products and Manufacturers: Provide one of the following:
 - a. Woodford Manufacturing Company, Model 24C.
 - b. Nibco, Incorporated, Fig. No. 74VB.
 - c. Or equal.
 2. Valve:
 - a. Type: Indoor/non-freeze area boiler drain globe valve, chrome plated.
 - b. Materials: Bronze body, screwed bonnet, renewable composition disc.
 - c. End Connections: Hose thread outlet, male pipe thread or sweat inlet.
 - d. Rating: 125 lbs. WOG.
 3. Vacuum Breaker:
 - a. Type: Non-removable, atmospheric.
 - b. Materials: Brass body, stainless steel trim, silicone rubber diaphragm and disc.
 - c. End Connections: Hose thread inlet and outlet.
- B. Wall Hydrants:
1. Exposed Hose Connection, Non-Freeze Type:
 - a. Products and Manufacturers: Provide one of the following:

- 1) Jay R. Smith, Fig. No. 5609-SE.
- 2) Zurn Industries, Fig. No. Z-1310.
- 3) Or equal.
- b. Type: Anti-siphon, non-freeze wall hydrant.
- c. Materials:
 - 1) Casing: Bronze.
 - 2) Vacuum Breaker: Integral.
 - 3) Threads: Standard 3/4-inch hose thread outlet.
 - 4) Wall Clamp: Adjustable with set screw.
 - 5) Key: Removable tee handle type.
- d. Connections: 3/4-inch sweat end inlet and 3/4-inch hose thread outlet, universal type.

C. Post Hydrants:

1. Exposed Hose Connection, Non-Freeze Type:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Jay R. Smith, Fig. No. 5910.
 - 2) Zurn Industries, Fig. No. Z-1385.
 - 3) Or equal.
 - b. Type: Anti-siphon, non-freeze wall hydrant.
 - c. Materials:
 - 1) Casing: Bronze.
 - 2) Vacuum Breaker: Integral.
 - 3) Threads: Standard 3/4-inch hose thread outlet.
 - 4) Wall Clamp: Adjustable with set screw.
 - 5) Key: Removable tee handle type.
 - d. Connection: 3/4-inch sweat end inlet and 3/4-inch hose thread outlet, universal type.
 - e. Drain: 1/8-inch NPT drain hole.
 - f. Post Height to Hose Connection: 30-inches above finished ground elevation.

D. Post Hydrants:

1. Exposed Hose Connection, Non-Freeze Type:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Zurn Industries, Fig. No. Z-1390.
 - 2) Or equal.
 - b. Type: Anti-siphon, non-freeze wall hydrant.
 - c. Materials:
 - 1) Casing: Bronze.
 - 2) Vacuum Breaker: Integral.
 - 3) Threads: Two-inch hose thread outlet.
 - 4) Wall Clamp: Adjustable with set screw.
 - 5) Key: Removable tee handle type.
 - d. Connection: Two-inch sweat end inlet and 2-inch hose thread outlet, universal type.
 - e. Drain: 1/8-inch NPT drain hole.

- f. Post Height to Hose Connection: 30-inches above finished ground elevation.
- E. Pipe Labels:
 - 1. Type: Self-adhering, temperature resistant, waterproof, corrosion resistant.
 - 2. Marker size, marker color, legend size, and legend color shall conform to ANSI A13.1.
- F. Flexible Connections:
 - 1. Manufacturers: Provide products of one of the following:
 - a. Flexonics, Incorporated.
 - b. Anaconda Metal Hose Division, Anamet, Incorporated.
 - c. Or equal.
 - 2. Type: Flexible connections for piping 2-1/2-inches and smaller.
 - 3. Construction:
 - a. Hose: Bronze.
 - b. Braid: Bronze.
 - 4. Pressure Ratings: 190 psig working pressure at 250°F temperature.
 - 5. End Connections: Solder end welded to hose and braid ends.

2.4 PAINTING

- A. Piping and accessories shall be painted in accordance with Section 09 91 00, Painting.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install all items as shown, specified, and as recommended by the manufacturers.
 - 2. Request instructions from Engineer, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
 - 3. Present conflicts between piping systems and/or equipment and/or structures to Engineer, in writing, who will determine corrective measures to be taken.
 - 4. Do not modify structures to facilitate installation of piping, unless specifically approved by Engineer.
 - 5. Installation shall conform to requirements of all local and state codes.
 - 6. Properly plug or cap the open ends of all piping at the end of each day's Work or other stopping point through construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:

1. Fill all systems and fully test all equipment, valves, dampers, etc. in operation.
2. Check for excessive vibration while all systems are operating.
3. Installed systems and components will not be released to Owner, unless all systems have been tested and approved by the Engineer.

B. Inspection:

1. Examine areas to receive piping, valves and accessories for:
 - a. Defects that adversely affect execution and quality of the Work.
 - b. Deviations beyond allowable tolerances for piping, valves and accessories.
 - c. Start the Work only when conditions are satisfactory.
2. The Engineer reserves the right to reject or authorize replacement of piping and accessories found to defective.

3.3 ADJUSTING AND CLEANING

A. Adjusting:

1. Adjust all controls for proper settings.
2. While system is operable balance all equipment, valves, dampers, etc. to achieve design conditions.

B. Cleaning:

1. Thoroughly clean all piping, fittings, valves, and accessories prior to installation.
2. Remove all dirt, rust, dust, etc. from piping in preparation for painting.
3. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

A. Piping:

1. Use types of pipe and fittings as specified below, unless otherwise specified or shown.
2. All potable water supply, hot, cold, tepid and hot water circulation piping 2-1/2-inches and smaller, run within the interior of a building, shall be hard-drawn copper Type "L" with solder joints and connections.
3. All potable water piping 2-1/2-inches and smaller run underground shall be soft-annealed copper Type "K" copper tubing.
4. All underground water piping 3-inches and larger shall be cement-lined ductile iron pipe with mechanical joints.
5. All water piping 3-inches and larger run within the interior of a building, shall be cement-lined ductile iron pipe with flanged or grooved joints.
6. All exposed water piping and valves to plumbing fixtures shall be chrome-plated brass.
7. All valves for copper or brass piping shall be bronze bodied, unless otherwise specified.

8. All valves for ductile iron piping shall be iron bodied, unless otherwise specified.
9. Use “wrought copper” fittings for copper tubing.
10. Use “butt welded” fittings for welded steel pipe connections.

+ + END OF SECTION + +