SECTION 22 11 00
FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1. DESCRIPTION

A. Domestic water systems, including piping, valves, equipment and all necessary accessories as designated in this section.

2. SUBMITTALS

A. Submit in accordance with GENERAL CONDITIONS and SUPPLEMENTARY GENERAL CONDITIONS.

B. Manufacturer's Literature and Data:

1. All items listed in Part 2 - Products.

3. DELIVERY, STORAGE AND HANDLING

A. Protect all products from damage, weather and contamination. Clean all product as required prior to installation. Protect all openings with caps and plugs.

4. QUALITY ASSURANCE

A. For mechanical pressed sealed fittings, only tools approved by fitting manufacture shall be used. Mechanical pressed fittings shall be installed by manufacturer-trained workers.

B. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be by the same manufacturer as the groove components.

C. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

D. Installers of press-connect bronze, copper, carbon steel or stainless steel fittings:

1. Installers shall attend a manufacturer’s installation training class as having been trained and qualified to join piping with press-connect fittings.

2. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of press-connect bronze, copper, carbon steel or stainless steel fittings.
3. Press-connect bronze, copper, carbon steel or stainless steel fittings shall be installed using proper tool, actuator, jaws, and rings as instructed by the manufacturer.

5. SPARE PARTS

A. For mechanical pressed sealed fittings provide tools required for each pipe size used at the facility.

6. REFERENCED STANDARDS

A. **ASME B16.51** – Copper and Copper Alloy Press-Connect Pressure Fittings
B. **ASTM B75** – Standard Specification for Seamless Copper Tube
C. **ASTM B88** – Standard Specification for Seamless Copper Water Tube
D. **ASTM F3226 –** Standard Specification for Metallic Press-Connect Fittings for Piping and Tubing Systems
E. **NSF/ANSI/CAN 61** – Drinking Water System Components – Health Effects
F. **NSF/ANSI/CAN 372** – Drinking Water System Components – Lead Content
G. **IAPMO PS 117** – Press and Nail Connections

PART 2 – PRODUCTS

1. UNDERGROUND WATER SERVICE PIPING

A. From inside face of exterior wall to a distance of approximately 5 feet outside of building and underground inside building, material selected shall be the same for the size specified.

B. 3 inch Diameter and Over: Ductile iron, AWWA C151, 125 psi water steam pressure (WSP), exterior bituminous coating, and cement lined. Provide flanged and anchored connection to interior piping.

C. Under 3 inch Diameter: Copper tubing, ASTM B88, Type K, seamless, annealed. Fittings as specified herein. Use brazing alloys, AWS A5.8, Classification BCuP.

D. Piping shall not have joints installed underneath the building. All piping will be continuous and without joints when installed under the building slab.

2. ABOVE GROUND (INTERIOR) WATER PIPING

A. Pipe: Copper tube, ASTM B88, Type K or L, drawn. CPVC piping is an acceptable alternate only as shown by the contractor to meet all pressure, temperature and expansion tolerances within the scope of operation for the installation.

B. Fittings for Copper Tube:

1. Wrought copper or bronze castings conforming to ANSI B16.18 and B16.22. Unions shall be bronze, MSS SP72 & SP 110, Solder or braze joints. Use 95/5 tin and antimony for all soldered joints.

2. Grooved fittings, 2 to 6 inch wrought copper ASTM B75 C12200, 5 to 6 inch bronze casting ASTM B584, CDA 844. Mechanical grooved couplings, ductile iron, ASTM A536 (Grade 65-45-12), or malleable iron, ASTM A47 (Grade 32510) housing, with EPDM gasket, steel track head bolts, ASTM A183, coated with copper colored alkyd enamel.

3. Viega ProPress Copper and Cast Copper Alloy Press-Connect Fittings:
    a. Approved for use with copper tubing conforming to ASTM B88 or B75. When pressing onto B88 copper tube, types K, L, and M may be used. Tempers O60 and O50, known as “soft copper”, are limited to nominal sizes 1/2" to 1-1/4”. Temper H58, known as “hard copper”, may be used with nominal sizes 1/2” to 4".
    b. Shall conform to ASME B16.51, ASTM F3226, IAPMO PS-117, NSF 61, and NSF 372.
    c. Copper alloy fittings:
        i. Shall be zero lead silicon bronze alloy C87710 (cast) or C88700 (machined).
        ii. Shall not be bismuth bronze or yellow brass.
    d. Peroxidically cured EPDM elastomeric sealing element rated to 300 psi with a temperature range of 0-250 degrees (F). Sealing element shall be uniform in size and free from deformities or indentations.
    e. 420 stainless steel grip & PBT separator rings for 2-1/2” to 4” sizes.
    f. Press Connect fitting shall have the Viega Smart Connect feature integral to the fitting body to detect unpressed fittings during the testing process.
    g. Color-coded markings on exterior of fitting for readily identifying/inspecting sealing element type.
    h. Single source manufacturer. Technology and installation instructions vary between manufacturers.
        i. Approved manufacturer: Viega LLC

4. Mechanical press sealed fittings, 2-1/2” in size and smaller.
    a. Viega ProPress Copper and Cast Copper Alloy Press-Connect Fittings:
        i. Approved for use with copper tubing conforming to ASTM B88 or B75. When pressing onto B88 copper tube, types K, L, and M may be used. Tempers O60 and O50, known as “soft copper”, are limited to nominal sizes 1/2" to 1-1/4”. Temper H58, known as “hard copper”, may be used with nominal sizes 1/2” to 4".

ii. Shall conform to ASME B16.51, ASTM F3226, IAPMO PS-117, NSF 61, and NSF 372.
iii. Copper alloy fittings:
    1. Shall be zero lead silicon bronze alloy C87710 (cast) or C88700 (machined).
    2. Shall not be bismuth bronze or yellow brass.
iv. Peroxidically cured EPDM elastomeric sealing element rated to 300 psi with a temperature range of 0-250 degrees (F). Sealing element shall be uniform in size and free from deformities or indentations.
v. 420 stainless steel grip & PBT separator rings for 2-1/2" to 4" sizes.
vi. Press Connect fitting shall have the Viega Smart Connect feature integral to the fitting body to detect unpressed fittings during the testing process.
vii. Color-coded markings on exterior of fitting for readily identifying/inspecting sealing element type.
viii. Single source manufacturer. Technology and installation instructions vary between manufacturers.
ix. Approved manufacturer: Viega LLC (no exceptions).

5. Mechanically formed tee connection: Form mechanically extracted collars in a continuous operation by drilling pilot hole and drawing out tube surface to form collar, having a height of not less than three times the thickness of tube wall. Adjustable collaring device shall insure proper tolerance and complete uniformity of the joint. Notch and dimple joining branch tube in a single process to provide free flow where the branch tube penetrates the fitting. Braze joints.

6. Adapters: Provide adapters for joining screwed pipe to copper tubing.

7. Solder: ASTM B32 Composition Sb5 HA or HB. Provide non-corrosive flux.

8. Brazing alloy: AWS A5.8, Classification BCuP.

9. EXECUTION

    a. Press-Connect Fittings for Copper Tubing: Join copper tube and pressure-connect fittings with tools recommended by fitting manufacturer.
        i. The manufacturer's installation instructions shall be strictly adhered to.
        ii. All connections shall bear full insertion marks on the tubing.
        iii. Special attention shall be given to the required two step pressure test.
            1. Initial Smart Connect test for unpressed fitting detection per manufacturer's installation manual.
            2. Following a successful Smart Connect test, the system may be pressure tested up to 600 psi maximum for water and 200 psi maximum for air if required by local code requirements.

C. Fittings for CPVC Piping:

1. All pipe and fittings to be manufactured from CPVC compound with a cell class of 24448 for pipe and 23447 for fittings as per ASTM D 1784 and conform with National Sanitation Foundation (NSF) standards 14 and 61.

2. Pipe and fittings to be Charlotte Pipe and Foundry Company FlowGuard Gold® CPVC Copper Tube Size or prior approved equal, manufactured to standard dimension ratio (SDR) 11 and shall conform to ASTM D 2846. Transition fittings to have brass male or female connections with integral CPVC socket connections by the same manufacturer as the pipe.

3. All pipe and fittings to be produced by a single manufacturer and to be installed in accordance with manufacturer's recommendations and applicable code requirements. Buried pipe shall be installed in accordance with ASTM F 1668. Solvent cement shall conform to ASTM F 493 and system may be installed with approved one-step cement.

D. PEX Piping (APPLIES TO DWELLING UNIT BRANCH DISTRIBUTION ONLY):

1. All products, components, etc. specified herein are manufactured by and/or are available from Zurn PEX, Inc. tubing manufacturer or prior approved equal.

2. Tubing tested in general accordance with ASTM E84 for a flame spread/smoke developed index of 25/50 or less for the following PEX tube sizes encased with ½ inch fiberglass insulation;
   1 1/4 inch
   1 1/2 inch
   2 inch

3. Tubing tested in general accordance with ASTM E84 for a flame spread/smoke developed index of 25/50 or less for the following PEX tube sizes;
   3/8 inch
   1/2 inch
   5/8 inch
   3/4 inch
   1 inch

4. To provide a PEX tubing hot and cold potable water distribution system, which is manufactured, fabricated and installed to comply with regulatory agencies and to maintain performance criteria stated by the PEX tubing manufacturer without defects, damage or failure

Comply with NSF Standard 14
Comply with NSF Standard 61
Show compliance with ASTM F877

5. Manufacturer's Warranty shall cover the repair or replacement of improperly installed tubing and fittings proven defective as well as incidental damages. Warranty period for PEX tubing and subsequent system shall be 25 year non-prorated warranty against failure due to defect in material or workmanship, beginning with the date of installation. It is the installer's responsibility to avoid mixing fittings manufactured by others as it will reduce the owner's warranty.

6. Tubing:
   a. Cross-linked polyethylene (PEX) manufactured by the Silane method
   b. Non-barrier type
   c. Shall have a pressure and temperature rating of 160 PSI at 73°F, 100 PSI at 180°F and 80 PSI at 200°F
   d. Tubing shall have a minimum of 6 months UV protection
   e. Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third-party agency
   f. Must have Pex 5006 chlorine designation for hot water recirculation
   g. Plenum tested in accordance with ASTM E84
   h. Fittings must be brass (F1807) in compliance with NSF-Annex "G" for no lead or engineered polymer (F2159) (Acudel) corrosion resistant type.
   i. Must have a 25 year non-prorated warranty

7. Fittings:
   a. Fittings shall be manufactured by Zurn PEX Inc or installed pipe manufacturer equal, identified by the letters "Q" or "Z" Manufactured in accordance with ASTM F1807 or ASTM F2159 and/or comply with ASTM F877 system standard as identified on the fitting

8. Crimp Systems
   a. Listed to ASTM F877.
   b. Copper Crimp Ring: Listed to ASTM F1807 and/or ASTM F877.

9. Tools
   a. Quickclamp tools shall be supplied by the PEX tubing manufacturer, identified by the manufacturer name on the tool.

b. Copper Crimp Ring tools shall be supplied by the PEX tubing manufacturer or approved by the PEX tubing manufacturer for use.

10. Valves: Shall be of the plastic or metal type, meeting the requirements of ASTM F877, identified as such with the appropriate mark on the product

11. EXECUTION: Comply with manufacturer's product data, including product technical bulletins, technical memos, installation instructions and design drawings.

12. EXAMINATION: Site Verification of Conditions:
    a. Verify that site conditions are acceptable for the installation of the PEX potable water system
    b. Do not proceed with installations of the PEX potable water system until unacceptable conditions are corrected

13. INSTALLATION
    a. Install PEX tubing in accordance with tubing manufacturer's recommendations and as indicated in the manufacturer installation guide
    b. Do not install PEX tubing within 6 inches of gas appliance vents or within 12 inches of any recessed light fixtures
    c. Do not solder within 18 inches of PEX tubing in the same waterline. Make sweat connections prior to making PEX connections
    d. Ensure no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tubing manufacturer
    e. Do not expose PEX tubing to direct sunlight for more than 6 months
    f. Use grommets or sleeves at the penetration for PEX tubing passing through metal studs
    g. Use a PEX manufacturer recommended fire stop sealant manufacturer
    h. Protect PEX tubing with sleeves where abrasion may occur
    i. Use nail plates where PEX tubing penetrates wall stud or joists and has the potential for being struck with a screw or nail
    j. Allow slack of approximately 1/8 inch per foot of tube length to compensate for expansion and contraction
    k. Minimum horizontal supports are to be installed not less than 32 inches between hangers in accordance with plumbing codes and the manufacturer installation guide
    l. Pressurize PEX tubing in accordance with applicable codes or in the absence of applicable codes, test pressure shall be at least equal to normal system working pressure, but not less than 40 PSI water or air and not greater than 225 PSI water, 125 PSI air

3. EXPOSED WATER PIPING

A. Finished Room: Use full iron pipe size chrome plated brass piping for exposed water piping connecting fixtures, casework, cabinets, and equipment.

1. Pipe: Fed. Spec. WW-P-351, standard weight.
2. Fittings: ANSI B16.15 cast bronze threaded fittings with chrome finish, (125 and 250).
3. Nipples: ASTM B 687, Chromium-plated.
4. Unions: Mss SP-72, SP-110, Brass or Bronze with chrome finish. Unions 65 mm (2-1/2 inches) and larger shall be flange type with approved gaskets.

B. Unfinished Rooms, Mechanical Rooms and Kitchens: Chrome-plated brass piping is not required. Paint piping systems.

4. TRAP PRIMER WATER PIPING

A. Pipe: Copper tube, ASTM B88, type K, hard drawn.

B. Fittings: Bronze castings conforming to ANSI B16.18 Solder joints.

C. Solder: ASTM B32 composition Sb5. Provide non-corrosive flux.

5. STRAINERS

A. Provide on high pressure side of pressure reducing valves, on suction side of pumps, on inlet side of indicating and control instruments and equipment subject to sediment damage and where shown on drawings. Strainer element shall be removable without disconnection of piping.

B. Water: Basket or "Y" type with easily removable cover and brass strainer basket.

C. Body: Smaller than 3 inches, brass or bronze; 3 inches and larger, cast iron or semi-steel.

6. DIELECTRIC FITTINGS

A. Provide dielectric couplings or unions between ferrous and non-ferrous pipe.

7. STERILIZATION CHEMICALS

A. Hypochlorites ANSI/AWWA B300-10

B. Liquid Chlorine ANSI/AWWA B301-10

9. WATER HAMMER ARRESTER

A. Closed copper tube chamber with permanently sealed 60 psig air charge above a Double O-ring piston. Two high heat Buna-N 0-rings pressure packed and lubricated with FDA approved silicone compound. All units shall be designed in accordance with ASSE 1010 for sealed wall installations without an access panel. Size and install in accordance with Plumbing and Drainage Institute requirements (PDI WH 201). Provide water hammer arrestors at:

1. All solenoid valves.
2. All groups of two or more flush valves.
3. All quick opening or closing valves.

PART 3 - EXECUTION

1. INSTALLATION

A. General: Comply with the International Plumbing Code, local building codes, accepted standards and the following:

1. Install branch piping for water from the piping system and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those not furnished by this contractor. Provide shut-off cocks at all equipment.
2. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, except for plastic and glass, shall be reamed to full size after cutting.
3. All pipe runs shall be laid out to avoid interference with other work.
4. Install union and shut-off valve on pressure piping at connections to equipment.
5. Pipe Hangers, Supports and Accessories:
   a. All piping shall be supported per the International Plumbing Code, Chapter No. 3.
   b. Shop Painting and Plating: Hangers, supports, rods, inserts and accessories used for pipe supports shall be shop coated with red lead or zinc chromate primer paint.

Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.

c. Floor, Wall and Ceiling Plates, Supports, Hangers:
   1) Solid or split unplated cast iron.
   2) All plates shall be provided with set screws.
   3) Pipe Hangers: Height adjustable clevis type.
   4) Adjustable Floor Rests and Base Flanges: Steel.
   5) Concrete Inserts: "Universal" or continuous slotted type.
   6) Hanger Rods: Mild, low carbon steel, fully threaded or Threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
   7) Riser Clamps: Malleable iron or steel.
   8) Rollers: Cast iron.
   9) Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.
   10) Hangers and supports utilized with insulated pipe and tubing shall have 180 degree (min.) metal protection shield Centered on and welded to the hanger and support. The shield shall be 4 inches in length and be 16 gauge steel. The shield shall be sized for the insulation.
   11) Miscellaneous Materials: As specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories. If the vertical distance exceeds 20 feet for cast iron pipe additional support shall be provided in the center of that span. Provide all necessary auxiliary steel to provide that support.
   12) With the installation of each flexible expansion joint, provide piping restraints for the upstream and downstream section of the piping at the flexible expansion joint. Provide calculations supporting the restraint length design and type of selected restraints.

6. Install chrome plated cast brass escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
7. Penetrations:
   a. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases. Completely fill and seal clearances between raceways and openings with the fire stopping materials.
   b. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant. Provide Link-Seal at all slab penetrations 3” or greater.

B. Piping shall conform to the following:
   1. Domestic Water:
      a. Grade all lines to facilitate drainage. Provide drain valves at bottom of risers and all low points in system. Install domestic hot water circulating lines with no traps.
      b. Connect branch lines at bottom of main serving fixtures below and pitch down so that main may be drained through fixture. Connect branch lines to top of main serving only fixtures located on floor above.

2. TESTS

A. General: Test system either in its entirety or in sections.
B. Potable Water System: Test after installation of piping and domestic water heaters, but before piping is concealed, before covering is applied, and before plumbing fixtures are connected. Fill systems with water and maintain hydrostatic pressure of 100 psi gage for two hours. No decrease in pressure is allowed. Provide a pressure gage with a shutoff and bleeder valve at the highest point of the piping being tested.
C. All Other Piping Tests: Test new installed piping under 1 1/2 times actual operating conditions and prove tight.

3. STERILIZATION

A. After tests have been successfully completed, thoroughly flush and sterilize the interior domestic water distribution system in accordance with AWWA C651.
B. Use liquid chlorine or hypochlorites for sterilization.

- END OF SECTION -