

SECTION 22 11 00 - FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Potable water system including but not limited to the following:
 - a. Water piping.
 - b. Water filters.
 - c. Valves.
 - d. Check valves
 - e. Hose bibbs.
 - f. Backflow preventers.
 - g. Flow restrictors.
 - h. Immersion temperature sensor.
 - i. Thermometers
 - j. Expansion tanks.
 - k. Water hammer arresters.
 - l. Access panels.
 - m. Outdoor floral hose reel assembly
 - n. Vacuum breakers.
 - o. Water pressure-reducing valves.
 - p. Balancing valves.
 - q. Thermostatic mixing valves
 - r. Drain valves.
 - s. Trap-seal primer valves.
 - t. Piping protection
 - u. Flushing, Cleaning and Disinfecting
 - v. Testing
 - w. Excavation and Backfilling (within building).
2. **KROGER DIRECT BUY PROGRAM:** Owner supplied/Contractor installed.
 - a. The Kroger Company will supply the following items:
 - 1) Immersion temperature sensor.
 - 2) Water Filters.
 - b. Comply with requirements in Division 00 Section "General Conditions."

1.2 SUBMITTALS

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

- B. Field quality-control test reports.
- C. Operation and maintenance data.
- D. The Owner will provide the submittals for Owner furnished products for the Contractor's review. The Contractor shall review and return submittals as specified in Division 00 Section "General Conditions."

1.3 QUALITY ASSURANCE

A. NSF Compliance:

- 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
- 2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 WATER PIPING

A. Piping, Fittings, and Valves Material Usage (unless otherwise required by Authorities Having Jurisdiction):

- 1. Interior Above Floor: CPVC
 - a. Provide Type "L" Copper in rated walls around exhaust hoods.
- 2. Interior Under Floor: PEX tubing or Type "K" soft copper tubing.
- 3. RO Water Distribution Piping: PEX tubing.

B. Materials:

- 1. CPVC: ASTM F 441/F 441M, Schedule 40.
 - a. CPVC Socket Fittings: ASTM F 438 for Schedule 40.
 - b. CPVC Threaded Fittings: ASTM F 437, Schedule 80.
 - c. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.
- 2. Copper
 - a. Type "L": ASTM B 88, hard drawn copper tubing, with wrought copper bronze fittings and 95/5 tin/antimony or 94/6 tin/silver solder or copper pressure seal fittings (Contractor's option).
 - b. Type "K": ASTM B 88, soft copper tubing of one continuous piece, where possible, with wrought copper fittings and 15 percent silver alloy brazed joints.
 - c. Copper, Pressure-Seal Fittings (Contractor Option to Solder-Joint Fittings): ASME B16.22.

- 1) Products:
 - a) Elkhart Products Corporation; Xpress.
 - b) Viega, LLC; ProPress.
 - 2) **NPS 2 (DN 50)** and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
 - 3) **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
3. PEX Tube and Fittings
- a. PEX Distribution Piping: ASTM F 876 and ASTM F 877, SDR 9 tubing.
 - b. Tubing Colors:
 - 1) Hot Water: Red.
 - 2) Cold Water: Blue.
 - 3) Reverse Osmosis (RO) Water: White.
 - 4) Sterilox Solution: White with blue stripe.
 - c. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
 - d. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.
 - e. Installation Accessories: Snap-in clips, plastic pipe clamps, suspension pipe clamps and plastic PEX bend supports.

2.2 WATER FILTERS (OWNER SUPPLIED/CONTRACTOR INSTALLED)

- A. Water filters that are lost or damaged are to be replaced by Contractor at no cost to Owner as follows:
1. Manufacturers: Provide products by 3M as distributed by Cincinnati Ice Machine Co., 513-861-9000.
 2. Single Combi Oven: Single Manifold Filter System: 3M; Single Manifold Filter System part #CIKR1CF with wall mounting, shut off valve, gauge and one HF95-S-SR filter.
 3. Two Combi Ovens: Twin Manifold Filter System: 3M; Twin Manifold Filter System, part #CIKR2CF with wall mounting, shut off valve, gauge, and two HF95-S-SR filters.
 4. Seafood Ice Machines, Seafood Steamer, Seafood Case Mister: Triple Manifold Filter System: 3M; Triple Manifold Filter System, part no. TRM3XXHF95S with wall mounting, shut off valve, gauge, and three HF95-S-SR filters.
 5. Beverage Bar: Dual Port Complete Water Filter System: 3M; one port for beverage and one for ice machine, tea and coffee. Part No. CIDF1XX95CL95S.
 6. Bakery Proofer and Produce Ice Machine: Twin Manifold Filter System: 3M; part no. TM2XXH95S.
 7. Produce Misting System: RO Filtration System; 3M; part no. CISGLP200CLBP (replaces Steralux and Prodew systems).

2.3 VALVES

A. Bronze or Brass Valves:

1. Manufacturers: Provide the Basis-of-Design product indicated or comparable products by one of the following:
 - a. Cincinnati Valve Co, Lunkenheimer Valves.
 - b. Powell Valves
 - c. Walworth Co.
2. Basis-of-Design Product:
 - a. Ball Valves: Powell Valves; Figure 4201T
 - b. Check Valves: Wilkins, a Zurn Company; model 40XL2 In-line single check valve.

B. CPVC Valves

1. Manufacturers:
 - a. American Valve, Inc.
 - b. Asahi/America.
 - c. NIBCO, Inc.
 - d. Spears Manufacturing Company.
 - e. Thermoplastic Valves, Inc.
2. CPVC Union Ball Valves:
 - a. Standard: MSS SP-122.
 - b. Pressure Rating and Temperature: [125 psig (860 kPa)] [150 psig (1035 kPa)] at 73 deg F (23 deg C).
 - c. Body Material: CPVC.
 - d. Body Design: Union type.
 - e. End Connections for Valves NPS 2 (DN 50) and Smaller: Detachable, socket or threaded.
 - f. End Connections for Valves NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Detachable, socket or threaded.
 - g. Ball: CPVC; full port.
 - h. Seals: PTFE or EPDM-rubber O-rings.
 - i. Handle: Tee shaped.
3. CPVC Ball Check Valves:
 - a. Pressure Rating and Temperature: [125 psig (860 kPa)] [150 psig (1035 kPa)] at 73 deg F (23 deg C).
 - b. Body Material: CPVC.
 - c. Body Design: Union-type ball check.
 - d. End Connections for Valves NPS 2 (DN 50) and Smaller: Detachable, socket or threaded.

- e. End Connections for Valves **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: Detachable, socket or threaded.
 - f. Ball: CPVC.
 - g. Seals: EPDM- or FKM-rubber O-rings.
4. CPVC Non-Union Ball Valves:
- a. Standard: MSS SP-122.
 - b. Pressure Rating and Temperature: [**125 psig (860 kPa)**] [**150 psig (1035 kPa)**] at **73 deg F (23 deg C)**.
 - c. Body Material: CPVC.
 - d. Body Design: Non-union type.
 - e. End Connections: Socket or threaded.
 - f. Ball: CPVC; full or reduced port.
 - g. Seals: PTFE or EPDM-rubber O-rings.
 - h. Handle: Tee shaped.

2.4 HOSE BIBBS

- A. Manufacturers: Provide the Basis-of-Design products by the Woodford Manufacturing Co. or comparable products by one of the following:
- 1. Jay R.Smith Co. Division of Smith Industries, Inc.
 - 2. Tyler Pipe, Wade Division
 - 3. Zurn Plumbing Products Group
- B. Basis-of-Design Product:
- 1. Interior Hose Bibbs (HB): Woodford Manufacturing Co.; Model 24P-CH, chrome-plated brass.
 - 2. Yard Hydrants, When Used Inside Building: Woodford Manufacturing Co.; Model Y-95, key actuated. Provide weep in bottom of box.
 - 3. Exterior Hose Bibs (WB): Woodford Manufacturing Co.; Model B-65 wall hydrant with chrome finish on brass casting. Conceal within interior partitions.
 - 4. Exterior Hose Reel Wall Faucet: Woodford Manufacturing Co.; Model 19, freezeless, anti-siphon and resetting pressure relief valve.
 - 5. Roof Hydrant (RH): MAPA Products; Model MPH-24-FP pedestal hydrant, complete system with freezeless roof hydrant, double check valve backflow preventer, and mounting system.

2.5 BACKFLOW PREVENTERS

- A. Manufacturers: Provide the Basis-of-Design product by the Watts Water Technologies, Inc. or a comparable product by one of the following:
- 1. Cla-Val Automatic Control Valves
 - 2. Hershey-Beeco Company
 - 3. Rockwell International
 - 4. Zurn Plumbing Products Group

B. Basis-of-Design Product:

1. Backflow Preventer for Interior Hose Bibbs Including Prep Room Hose Bibb Connections: Watts Water Technologies, Inc.; #9D.
2. Backflow Preventer for Coffee Machines, Ice Machines, Seafood Steamer and Water Machine: Watts Water Technologies, Inc.; No. #SD3.
3. Reduced Pressure Principle Backflow Preventer for carbonators (such as soda fountain) (ASSE 1013): Watts Water Technologies, Inc.; No. 009-QT. Copper shall not be used downstream from the backflow.
4. Backflow Preventer for Pharmacy Reverse Osmosis (RO) Water Filtration Dispensing System: Watts Water Technologies, Inc.; No. LF719QT-S, 1/2 inch (15 mm).

2.6 FLOW RESTRICTOR

- A. Basis-of-Design Product: American Standard; 2591.017, 0.5 gpm flow restrictor/aerator.

2.7 IMMERSION TEMPERATURE SENSOR (OWNER SUPPLIED/CONTRACTOR INSTALLED)

- A. Refer to Division 01 Section "Vendor Contact List" for information on immersion temperature sensor.

2.8 THERMOMETERS

- A. Liquid filled with 2-inch scale divisions, 40 to 240 degrees F range, installed in threaded well in water line.

2.9 EXPANSION TANKS

- A. Basis-of-Design Product: Amtrol, Inc.; AST #12 Extrol Expansion Tank where required by authority having jurisdiction on water heaters.

2.10 WATER HAMMER ARRESTORS (WHA)

- A. Manufacturers: Provide the Basis-of-Design product by the Sioux Chief Manufacturing Company, Inc. or a comparable product by one of the following:

1. Jay R.Smith Co. Division of Smith Industries, Inc.
2. Precision Plumbing Products, Inc.
3. Tyler Pipe, Wade Division.
4. Zurn Plumbing Products Group

- B. Basis-of-Design Product: Sioux Chief Manufacturing Company, Inc.; 650/660 Series Piston Type, Copper.

2.11 ACCESS PANELS

- A. Provide flush metal access panels, where valves occur in inaccessible locations, as specified in Division 08 "Access Doors and Frames."

2.12 OUTDOOR FLORAL HOSE REEL ASSEMBLY

- A. Hose Reel and Hose:
 - 1. Product: Reelcraft Industries; Model #82100 OLP.
 - a. Distributor: W. W. Grainger, Inc.; Item number 5PG04.
 - 2. Hose: Manufacturer's standard 1/2 inch (13 mm) diameter, 100 feet (30.5) long PVC hose.
- B. Adapter Fitting: Watts Water Technologies, Inc.; LFA-663, 3/4 inch (19 mm) by 1/2 inch (13 mm) brass male hose to male pipe threaded adaptor fitting.
- C. Spray Wand: Fiskars Brands, Inc.; Gilmour model 490GF, 36 inch (915 mm) long, 7-pattern water wand with articulating head and trigger shut-off.

2.13 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Manufacturers:
 - a. Watts Water Technologies, Inc.
 - b. Zurn Plumbing Products Group; Wilkins Div.
 - 2. Standard: ASSE 1011.
 - 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 4. Body: Bronze.
 - 5. Inlet and Outlet Connections: Threaded.
- B. Hose-Connection Vacuum Breakers:
 - 1. Manufacturers:
 - a. Watts Water Technologies, Inc.
 - b. Woodford Manufacturing Company.
 - c. Zurn Plumbing Products Group.
 - 2. Standard: ASSE 1011.
 - 3. Body: Bronze, nonremovable, with manual drain.
 - 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.

2.14 WATER PRESSURE-REDUCING VALVES

- A. General: Provide water pressure regulators where necessary to limit the incoming water pressure to 80 psi inside the building.
- B. Pressure Reducing Valves (PRV's).
 - 1. Basis-of-Design Product: Watts Water Technologies, Inc.; No. #U5B.
- C. Water Regulators:
 - 1. Manufacturers:
 - a. Honeywell Water Controls.
 - b. Watts Water Technologies, Inc.
 - c. Zurn Plumbing Products Group.
 - 2. Standard: ASSE 1003.
 - 3. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).

2.15 BALANCING VALVES

- A. Memory-Stop Balancing Valves:
 - 1. Manufacturers:
 - a. Crane Co.; Crane Valve Group.
 - b. Hammond Valve.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Red-White Valve Corp.
 - 2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
 - 3. Pressure Rating: 400-psig minimum CWP.
 - 4. Size: NPS 2 or smaller.
 - 5. Body: Copper alloy.
 - 6. Port: Standard or full port.
 - 7. Ball: Chrome-plated brass.
 - 8. Seats and Seals: Replaceable.
 - 9. End Connections: Solder joint or threaded.
 - 10. Handle: Vinyl-covered steel with memory-setting device.

2.16 THERMOSTATIC MIXING VALVES

- A. (TMV) Point of use Water-Temperature Limiting Devices for Public Hand Washing Lavatories:
 - 1. Manufacturers: Provide the Basis-of-Design product by Symmons Industries, Inc. or a comparable product by one of the following:

- a. Honeywell Water Controls.
 - b. Watts Water Technologies, Inc.
 - c. Zurn Plumbing Products Group; Wilkins Div.
 2. Basis-of-Design Product: Symmons Industries, Inc.; 5-210-CK Maxline thermostatic mixing valve.
 3. Size: 3/8 inch compression inlets/outlet and integral checks.
 4. Body: Brass with dual stainless steel strainers.
 5. Adjustment: Vandal-resistant cap/temperature adjustment handle.
 6. Finish: Rough brass.
 7. Certification: Dual certified to ASSE 1017/1070. (.5 - 5 GPM)
 8. Pressure Rating: 125 psig.
 9. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
- B. (MTMV) Master Thermostatic Mixing Valve (Hot water system mixing valve):
1. Manufacturers: Provide the Basis-of-Design product by Powers Controls, a Watts Water Technologies Company, or a comparable product by one of the following:
 - a. Honeywell Water Controls.
 - b. Watts Water Technologies, Inc.
 - c. Zurn Plumbing Products Group; Wilkins Div.
 2. Basis-of-Design Product: Powers Controls, a Watts Water Technologies Company; Series MM, size valve for water line size indicated on Drawings.
 3. Material: Bronze body with corrosion-resistant interior components.
 4. Finish: Chrome plated.
 5. Construction: Paraffin actuation, single-seat design for virtual shut down in the event of cold-water failure, and triple-duty check stops with screens.
 6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
 7. Flow Rate: Minimum 0.5 gpm (3 gpm to ASSE 1017) to 28 gpm at 20 psi pressure drop.
 8. Certification: ASSE 1017 and certified to CSA B125.
 9. Approach Temperature: 5 degrees F (3 degrees C).
 10. Pressure Rating: 125 psig.
- C. (ETV) Emergency Tempering Valve with Cold Water Bypass:
1. Manufacturer: Provide the Basis-of-Design product by Haws model 9201EFE or a comparable product by one of the following:
 - a. Powers, model ES150, HydroGuard.
 - b. Guardian Equipment, model G3600.
 - c. Navigator; Bradley Corporation, model S19-2000.

2.17 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.

2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.18 TRAP-SEAL PRIMER VALVES

- A. Manufacturers: Provide the Basis-of-Design product by Sioux Chief Manufacturing Company, Inc., or a comparable product by one of the following:
 1. MIFAB, Inc.
 2. PPP Inc.
 3. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 4. Watts Water Technologies, Inc.
- B. Basis-of-Design Product: Sioux Chief Manufacturing Company, Inc.; TP 695-01
- C. Standard: ASSE 1018.
- D. Pressure Rating: 125 psig minimum.
- E. Body: Heavy Zamace
- F. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
- G. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
- H. Performance: Trap prime up to eight drains.

2.19 PIPING PROTECTION

- A. Protection Sleeve for Underground Copper Piping: Polyethylene sleeve manufactured from virgin material conforming to ASTM D 1248.
 1. Basis-of-Design Product: Northtown Company; Polywrap-C.
 2. Tensile Strength: MD-3400 psi, TD-2800 psi.
 3. Density: 924
 4. Elongation: MD-300 percent, TD-500 percent.
 5. Color: [Natural][Blue][Orange].

PART 3 - EXECUTION

3.1 GENERAL

- A. Appropriate compression shutoff valve and ground joint unions shall be used at each fixture and piece of equipment to facilitate removal of equipment.
- B. Adapters used for screwed valves and any connection to steel shall be insulated to prevent electrolysis.
- C. Use dielectric unions where dissimilar metals are joined together.

3.2 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install check valves on both the hot and cold water supply lines under sinks equipped with overhead sprayers in addition to the faucets for service sinks.
- C. Install water pressure regulators on equipment as indicated on the drawings with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- D. Install balancing valves in locations where they can easily be adjusted.
- E. Install Owner supplied immersion temperature sensor for connection to the environmental control system.
- F. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 - 1. Install thermometers and water regulators if specified.
 - 2. Install cabinet-type units recessed in or surface mounted on wall as specified.
- G. Install water hammer arresters in water piping according to PDI-WH 201.
- H. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

- I. Install piping protection for underground copper piping by slipping piping protection over the barrel length. Overlap joints a minimum of six inches. Repair any damage to piping protection with tape or piping protection material cut and wrapped around the pipe and secured in place.
- J. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- K. Equipment Nameplates and Signs:
 - 1. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 2. Nameplates and signs are specified in Division 22 Section "Common Work Results for Plumbing."
 - 3. Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - a. Intermediate atmospheric-vent backflow preventers.
 - b. Reduced-pressure-principle backflow preventers.
 - c. Double-check backflow-prevention assemblies.
 - d. Water pressure-reducing valves.
 - e. Primary, thermostatic, water mixing valves.
 - f. Supply-type, trap-seal primer valves.

3.3 EXCAVATION

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."
- B. Remove excavating debris, materials and equipment promptly from the premises upon completion.

3.4 TESTING

- A. The entire water distribution system shall be tested and proven tight under air or water pressure of fifty percent more than the maximum pressure of each system but in no case less than 100 pounds.
- B. Combination domestic and sprinkler service piping shall be tested and proven under a water pressure of 200 psi. for two hours.
- C. Test temperature at sink locations to comply with 110 degrees F (43.3 degrees C) delivered temperature.
- D. Perform systems tests in the presence of the Plumbing Inspector and Owner. Notify Owner of systems tests at least 48 hours in advance.
- E. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

3.6 FLUSHING AND CLEANING

- A. Upon completion of testing, flush all domestic water piping until water shows no discoloration. Clean all valves, strainers, etc.
- B. After flushing and cleaning, disinfect pipe by the use of chlorine or chlorine compounds in amounts to produce a concentration of 50 parts per million. At the end of six (6) hours, flush all piping until chlorine residual is less the two (2) parts per million.
 - 1. Provide any additional system cleaning and disinfecting as required by state or local codes.
- C. Prepare and submit reports of purging and disinfecting activities.

3.7 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance.
- E. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- F. Install PEX piping with loop at each change of direction of more than 90 degrees.

3.8 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

- C. Copper-Tubing, Pressure-Sealed Joints (Contractor Option to Solder-Joint Fittings): Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer. Install per ASTM B16.18 or ASTM B16.22
 - 1. Mechanically formed tee-drill fittings are only acceptable where new piping is connected to existing piping.
- D. PEX Piping: Join according to ASTM F 1807.
- E. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.9 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support devices are specified in Division 20 Section "Hangers and Supports for Facility Services." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100-feet (30.5-m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100-feet (30.5-m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100-feet (30.5-m): MSS Type 49, spring cushion rolls, if indicated.
 - 3. Multiple, Straight, Horizontal Piping Runs 100-feet (30.5-m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 20 Section "Hangers and Supports for Facility Services."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8-inch (9.5-mm).
- E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4 and Smaller: 84 inches (2-m) with 3/8-inch (9.5-mm) rod.
 - 2. NPS 1-1/2: 108 inches (2.7-m) with 3/8-inch (9.5-mm) rod.
 - 3. NPS 2: 10-foot (3-m) with 3/8-inch (9.5-mm) rod.
 - 4. NPS 2-1/2: 11-foot (3.35-m) with 1/2-inch (13-mm) rod.
 - 5. NPS 3 and NPS 3-1/2: 12-foot (3.7-m) with 1/2-inch (13-mm) rod.
 - 6. NPS 4 and NPS 5: 12-foot (3.7-m) with 5/8-inch (16-mm) rod.
 - 7. NPS 6: 12-foot (3.7-m) with 3/4-inch (19-mm) rod.
- F. Install supports for vertical steel piping every 15 feet (4.5-m).

- G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches (1.5-m) with 3/8-inch (9.5-mm) rod.
 - 2. NPS 1-1/4: 72 inches (1.8-m) with 3/8-inch (9.5-mm) rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches (2.4-m) with 3/8-inch (9.5-mm) rod.
 - 4. NPS 2-1/2: 108 inches (2.7-m) with 1/2-inch (13-mm) rod.
 - 5. NPS 3 to NPS 5: 10-foot (3-m) with 1/2-inch (13-mm) rod.
 - 6. NPS 6: 10-foot (3-m) with 5/8-inch (16-mm) rod.
- H. Install supports for vertical copper tubing every 10 feet (3-m).
- I. Install vinyl-coated hangers for PEX piping with a maximum horizontal spacing and minimum rod diameters of 32 inches (813 mm) with 3/8-inch (9.5 mm) rod
- J. Install hangers for vertical PEX piping every 48 inches (1220 mm).
- K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

- A. General: Install piping to all mechanical equipment requiring water, including equipment supplied by Owner and equipment supplied and installed by Owner.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:
 - 1. Booster Pumps: Cold-water suction and discharge piping.
 - 2. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Commercial Plumbing Fixtures."
 - 4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.11 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

END OF SECTION 22 11 00