

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and Divisions 00 and 01, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 33.
  - 2. Division 23.
  - 3. Division 22.

### 1.2 SUMMARY

- A. This Section includes water distribution piping from locations indicated to fixtures and equipment inside building.

### 1.3 DEFINITIONS

- A. Facility Water Distribution Piping: Water piping outside building that conveys water to building.
- B. Service Entrance Piping: Water piping at entry into building between facility water distribution piping and domestic water piping.
- C. Domestic Water Piping: Water piping inside building that conveys potable cold and hot water to fixtures and equipment throughout the building.
- D. Non-Potable Water Piping: Water piping inside building that conveys non-potable water to fixtures and equipment throughout the building.

### 1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Service Entrance Piping: 160 psig.
  - 2. Water Distribution Piping: 125 psig.

### 1.5 SUBMITTALS

- A. General: See Division 23 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals for the following:
  - 1. Soft copper tubing.
  - 2. Hard copper tubing.
  - 3. Ductile-iron pipe.
  - 4. Pipe and tube fittings.
- C. Reports and Certificates: Provide submittals of the following:

1. Test Reports specified in "Field Quality Control."

D. Shop Drawings: None required.

## 1.6 CODES AND STANDARDS

- A. Codes and Standards shall be the current version adopted by the Authority Having Jurisdiction.

## 1.7 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- C. Comply with the Reduction of Lead in Drinking Water Act of 2011. This act redefines "lead free" as "not containing more than 0.2 percent lead when used with respect to solder and flux and not more than a weighted average of 0.25 percent lead when used with respect to wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures". Products required to be "lead free" shall have NSF 61-G or NSF 372 certification.

## PART 2 – PRODUCTS

### 2.1 BASIC, COMMON FEATURES

- A. Lead free products and materials shall be used where required by Part 3.
- B. Soldered Lead Free End Connections: Copper alloys with silicone content greater than 0.005% are not allowed.

### 2.2 PIPE AND TUBE MATERIALS

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.
- C. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
- D. Ductile-Iron Pipe: AWWA C151, 250-psig minimum pressure rating with mechanical-joint bell, plain spigot end, and AWWA C104 cement-mortar lining. Include AWWA C111 ductile-iron gland, rubber gasket, and steel bolts.

### 2.3 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
  1. Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.
- B. Press-Connect Mechanical Joint Fittings: Viega ProPress may be used as an option to soldered pipe joining methods as allowed by the Piping Applications section. Bronze or copper:

ASME B16.18, ASME B16.22, or ASME B16.51 and the performance requirements of IAPMO PS117, ICC LC1002 and NSF61-G or NSF 372 certified Lead Free.

1. Copper, Grooved-End Fittings shall be Victaulic full flow copper fittings with grooved ends. Standard fittings shall be copper per ASTM B-75 alloy C12200; bronze and cast per ASTM B-584 copper alloy CDA 836 per ANSI B16.18.
- C. Press-Connect Mechanical Joint Flange Adapters: Viega ProPress may be used as an option to soldered pipe joining methods as allowed by the Piping Applications section: Bronze: Class 150, ASME B16.18, ASME B16.22, or ASME B16.51 and the performance requirements of IAPMO PS117, ICC LC1002 and NSF61-G or NSF 372 certified Lead Free.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- E. Copper Unions: ASME B16.18, cast-copper-alloy, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.
- F. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile- or gray-iron standard pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining. Include AWWA C111 ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- G. Ductile-Iron Flanged Fittings: AWWA C110, ductile- or gray-iron standard pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining.

## 2.4 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 23 for commonly used joining materials.
- C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.
- D. Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.
- E. Press-Connect Mechanical Joint Fitting Piping System:
  1. General: Viega ProPress mechanical joint pipe fittings may be used as an option to soldered pipe joining methods as allowed in the Pipe Applications section. All Press-Connect mechanical fittings shall conform to local code approval.
  2. Sealing Element: EPDM compound sealing element, temperature operating range 32 degrees F to 250 degrees F.
  3. Press-Connect Mechanical Joint Fittings: Elbows, tees, adapters, caps, unions, couplings, reducers, manifolds, stub-outs, and cross-overs, unpressed fittings shall bypass the testing gas or liquid and leak during the two-step pre-test outlined in Part 3.
  4. Press-Connect Mechanical Joint Fittings 2-1/2 – 4-Inch: EPDM sealing element with 420 stainless steel grip ring and PBT separator ring.
- F. Copper keyed couplings shall have angle bolt pads and shall be cast of ductile iron conforming to ASTM A-536, Grade 65-45-12 with a copper color alkyd enamel paint coating, Style 606 as manufactured by Victaulic Company of America. Couplings rated to 300 psi. Gaskets

shall be flush-seal style Grade 'F'. FPDM compound molded of materials conforming to ASTM B-2000, UL/ULC classified to ANSI/NSF 61 for cold and hot potable water service.

- G. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

## 2.5 POLYETHYLENE ENCASEMENT

- A. Polyethylene Encasement for Piping: ASTM A 674 or AWWA C105 polyethylene film, 0.008-inch minimum thickness, tube or sheet.

## 2.6 VALVES

- A. Refer to Division 23 for general-duty valves.
- B. Refer to Division 22 for special-duty valves.

## PART 3 – EXECUTION

### 3.1 EXCAVATION

- A. Refer to Division 31 for excavating, trenching, and backfilling.

### 3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Underground, Service Entrance Piping: Do not use valves underground. Use the following:
  - 1. 4-Inch NPS and Smaller: Soft copper tube, Type K; copper, solder-joint pressure fittings; and brazed joints.
  - 2. 6- to 12-Inch NPS: Ductile-iron pipe and fittings, and mechanical joints.
- D. Aboveground, Domestic Water Piping: Use the following:
  - 1. 4-Inch NPS and Smaller: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
  - 2. Viega ProPress mechanical joint pipe fittings may be used as an option to soldered pipe joining methods on 4-Inch NPS and Smaller.
  - 3. The Victaulic Copper Groove Piping System may be used on 2-1/2 – 4-inch Type L copper. System consists of mechanical couplings with angular bolt pads with flush-seal style gaskets, UL classified in accordance with ANSI/NSF 61, copper or cast bronze fittings with grooved ends. Install per latest edition of the Manufacturer's Installation Instruction Handbook.
  - 4. 6 to 12-Inch NPS: Hard copper tube, Type L with grooved ends; copper, grooved-end fittings. Install per manufacturers recommendations.
- E. Underground, Domestic Water Piping: Do not use flanges or valves underground. Use the following:

1. 2-Inch NPS and Smaller: Soft copper tube, Type K; wrought-copper, solder-joint pressure fittings; and brazed joints.
  2. 2-1/2- to 4-Inch NPS: Hard copper tube, Type L; wrought-copper, solder-joint pressure fittings; and brazed joints.
- F. Non-Potable-Water Piping: Use the following:
1. 4-Inch NPS and Smaller: Hard copper tube, Type L; solder-joint pressure fittings; and brazed joints.
  2. Viega ProPress mechanical joint pipe fittings may be used as an option to soldered pipe joining methods on 4-Inch NPS and Smaller.
  3. 6 to 12-Inch NPS: Hard copper tube, Type L with grooved ends; copper, grooved-end fittings; and copper, keyed couplings.
- G. Water distribution piping that is used for domestic water piping systems shall be "lead free".

### 3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use gate, ball, or butterfly valves. Grooved-end butterfly valves may be used with grooved-end piping.
  2. Balancing: Use circuit balancing valve.

### 3.4 PIPING INSTALLATION, GENERAL

- A. Refer to Division 23 for basic piping installation.

### 3.5 SERVICE ENTRANCE PIPING INSTALLATION

- A. Extend service entrance piping to exterior water service piping in sizes and locations indicated for service entrances into building. Refer to Division 22 for facility water distribution piping.
- B. Install shutoff valve, hose-end drain valve, strainer, and pressure gage inside building at first accessible point for each service entrance pipe.
- C. Install water-pressure regulators and backflow preventers downstream from shutoff valves. Refer to Division 22 for water-pressure regulators and backflow preventers.
- D. Ductile-Iron, Service Entrance Piping: Comply with AWWA C600. Install buried piping between shutoff valve and connection to water service piping with restrained joints. Anchor pipe to wall or floor at entrance. Include thrust-block supports at vertical and horizontal offsets.
1. Encase piping with polyethylene film according to ASTM A 674 or AWWA C105.
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service entrance pipe penetration through exterior wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 23 for sleeves and mechanical sleeve seals.

### 3.6 DOMESTIC WATER PIPING INSTALLATION

- A. Install piping with 0.25 percent slope downward toward drain.

### 3.7 JOINT CONSTRUCTION

- A. Refer to Division 23 for basic piping joint construction.
- B. Press-Connect Mechanical Joint Fitting Piping System: Use as allowed by Pipe Applications section. Install system per manufacturer's written instructions.
  - 1. Installers shall attend a Viega ProPress installation training class.
  - 2. Tube ends shall be cut on a right angle (square) to the tube. Tube ends shall be reamed and chamfered, all grease, oil or dirt shall be removed from the tube end with a clean rag. Visually examine the fitting sealing element to insure there is no damage, and it is properly seated into the fitting. Insert tube fully into the fitting. Make a mark with a felt tip pen on the tube wall at the face of the fitting. Always examine the tube to insure it is fully inserted into the fitting prior to pressing the joint.
  - 3. Fittings shall be joined using Rigid ProPress Tools and shall be installed according to the most current edition of the Viega installation guidelines.
  - 4. Sealing elements shall be verified for the intended use.
- C. Grooved Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- D. Mechanically Formed Copper Tube Tee Fittings: Mechanically formed tee fitting, as created by T-Drill Industries, Inc. is an acceptable method of installation. Installers shall be trained and certified in using this technique. Limited to applications where the branch line is smaller than the main line. Form tee in copper tube according to equipment manufacturer's written instructions. 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. Soft Solder joints shall not be permitted.

### 3.8 ROUGHING-IN FOR WATER METERS

- A. Rough-in water piping for water meter installation according to utility company's requirements. Water meters will be provided by utility.

### 3.9 VALVE INSTALLATION

- A. Sectional Valves: Install sectional valves close to main on each branch and riser serving plumbing fixtures or equipment, and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.
- B. Shutoff Valves: Install shutoff valves on each water supply to equipment, close to main, on each plumbing fixture without supply stops, and where indicated. Use ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.
- C. Drain Valves: Install hose end drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
  - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
  - 2. Install stop-and-waste drain valves where indicated.

- D. Circuit Balancing Valves: Install in each hot-water circulation return branch as indicated in plan and diagrams, discharge side of each pump and circulator, and where indicated. Refer to Division 22 for circuit balancing valves.

### 3.10 HANGER AND SUPPORT INSTALLATION

- A. Support pipe in accordance with Division 23. Install the following:
1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
  2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs of cold water and hot water 100 feet and less.
  3. Adjustable roller hangers, MSS Type 43, for individual, straight, horizontal runs of hot water longer than 100 feet.
  4. Pipe rolls, MSS Type 44, for multiple, straight, horizontal runs of hot water 100 feet or longer. Support pipe rolls on trapeze.
  5. Spring hangers, MSS Type 52, for supporting base of vertical runs.
- B. Install supports according to Division 23.
- C. Install seismic restraints according to Division 23.
- D. Vertical Piping Support:
1. Support vertical copper piping and tubing at base and at each floor and at maximum distance of 10-feet (whichever is less).
  2. Support vertical steel piping at base and at each floor and at maximum distance of 15-feet (whichever is less).
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Horizontal pipe hanger spacing and rod diameters:
- | Nom. Pipe Size (inches) | Steel Pipe Max. Span (Feet) | Copper Tube Max. Span (Feet) | Min. Rod Diameter (Inches) |
|-------------------------|-----------------------------|------------------------------|----------------------------|
| Up to 3/4               | 7                           | 5                            | 3/8                        |
| 1                       | 7                           | 6                            | 3/8                        |
| 1-1/4                   | 7                           | 6                            | 3/8                        |
| 1-1/2                   | 9                           | 6                            | 3/8                        |
| 2                       | 10                          | 8                            | 3/8                        |
| 2-1/2                   | 11                          | 9                            | 3/8                        |
| 3                       | 12                          | 10                           | 3/8                        |
| 4                       | 12                          | 10                           | 1/2                        |
| 6                       | 12                          | 10                           | 1/2                        |
| 8                       | 12                          | 10                           | 5/8                        |
| 10                      | 12                          | 10                           | 3/4                        |
| 12                      | 12                          | 10                           | 7/8                        |
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.11 CONNECTIONS

- A. Connect service entrance piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
- B. Connect water distribution piping to service entrance piping at shutoff valve, and extend to and connect to the following:
  - 1. Booster Systems: Connect cold-water suction and discharge piping.
  - 2. Water Heaters: Connect cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 3. Plumbing Fixtures: Connect hot- and cold-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22.
  - 4. Equipment: Connect hot- and cold-water supply piping as indicated. Provide shutoff valve and union for each connection. Use flanges instead of unions for connections 2-1/2-inch NPS and larger.

### 3.12 FIELD QUALITY CONTROL

- A. Inspect water distribution piping as follows:
- B. Inspect service entrance piping and water distribution piping as follows:
  - 1. Do not enclose, cover, or put piping into operation until it is 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.
  - 3. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    - a. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
    - b. 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.
- C. Test service entrance piping and water distribution piping as follows:
  - 1. 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.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
  - 3. Perform a two-step pre-test as follows: Test the system with air or nitrogen at 0.5 psi and 45 psi, or water at 15 psi and 85 psi and examine pressure gauge to determine any system pressure loss. If the system does not hold pressure, walk the system and check for un-pressed mechanical joint fittings. Insure for any un-pressed fittings that the pipe is fully inserted into the fitting and press the fitting. After appropriate repairs have been made, proceed to next step.
  - 4. Cap and subject piping to static water pressure of 150 psig or 1-1/2 times the operating pressure, whichever is greater, without exceeding pressure rating of piping system ma



materials. Isolate test source and allow to stand for 24 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 and submit reports for tests and required corrective action.

### 3.13 CLEANING

#### A. Clean and disinfect potable-water distribution piping as follows:

1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:
  - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - b. Fill and isolate system according to either of the following:
    - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
    - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for 3 hours.
  - c. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.
  - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows contamination.

#### B. Prepare and submit reports for purging and disinfecting activities.

#### C. Clean interior of piping system. Remove dirt and debris as work progresses.

### 3.14 START-UP PROCEDURES

#### A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

#### B. Perform the following steps before putting into operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.

#### C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

- D. Check plumbing specialties and verify proper settings, adjustments, and operation.
  - 1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.
- E. Energize pumps and verify proper operation.

**END OF SECTION**