

SECTION 23 21 13

HYDRONIC PIPING

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete system types not required.

* + 1. Crosslinked polyethylene, Engel method (PEX-a) pipe and fittings for the following applications:
       1. Hot-water heating piping, aboveground.
       2. Hot-water heating piping installed belowground and within slabs.
       3. Chilled-water piping, aboveground.
       4. Chilled-water piping installed belowground and within slabs.
       5. Condenser-water piping.
       6. Makeup-water piping, aboveground.
       7. Makeup-water piping installed belowground and within slabs.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required

* + 1. Section 22 11 13 ‒ Facility Water Distribution Piping.
    2. Section 22 11 16 – Domestic Water Piping.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASTM International (ASTM):
       1. ASTM D2657 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
       2. ASTM D2765 Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics.
       3. ASTM D6394 Specification for Sulfone Plastics (SP).
       4. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
       5. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
       6. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
       7. ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
       8. ASTM F877 Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.
       9. ASTM F1960 Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Crosslinked Polyethylene (PEX) Tubing.
       10. ASTM F2389 Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems.
    2. American National Standards Institute (ANSI)/National Sanitation Foundation (NSF):
       1. NSF/ANSI Standard 359 Valves for Crosslinked Polyethylene (PEX) Water Distribution Tubing Systems.
    3. American National Standards Institute (ANSI)/Underwriters Laboratories, Inc. (UL)
       1. UL/ANSI 263 Standard for Safety for Fire Tests of Building Construction and Materials.
       2. UL/ANSI 2846 Standard for Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics.
    4. American Society of Mechanical Engineers (ASME)
       1. ASME B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.
       2. ASME B16.51 Copper and Copper Alloy Press-Connect Pressure Fittings.
    5. Canadian Standards Association (CSA)
       1. CAN/CSA B137.5 Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
       2. CSA B242-05 Groove-and Shoulder-Type Mechanical Pipe Couplings.
    6. German Institute for Standardization (DIN)
       1. DIN 4726 Warm Water Surface Heating Systems and Radiator Connecting Systems ‒ Plastics Piping Systems and Multilayer Piping Systems.
    7. International Code Council (ICC)
       1. International Mechanical Code (IMC)
    8. International Association of Plumbing and Mechanical Officials (IAPMO)
       1. Uniform Mechanical Code (UMC)
    9. International Organization for Standardization (ISO)
       1. ISO 15874 Plastics Piping Systems for Hot and Cold Water Installations – Polypropylene (PP).
    10. Plastics Pipe Institute (PPI)
        1. PPI Technical Report TR-4.
    11. Underwriters Laboratories (UL)
        1. UL 2846 Standard for Fire Tests of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics.
    12. Uponor Inc.
        1. Uponor PEX Piping Systems Installation Guide, current edition.
        2. Uponor PEX Piping Systems Design and Installation Manual, current edition.
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 ‒ Administrative Requirements.
     2. Product data: Submit manufacturer’s product submittal data and installation instructions.
     3. Shop drawings: Provide installation drawings indicating: piping layout, size dimension by installation segment, vault locations, support fixtures and schedules with all details required for installation of the system.
     4. Samples: Submit selection and verification samples of piping.
     5. Quality assurance/control submittals
        1. Test reports: Upon request, submit test reports from recognized testing laboratories.
        2. Submit the following documentation.
           1. Manufacturer’s certificate stating that products comply with specified requirements.
           2. Manufacturer’s flow schedule for the distribution system.
           3. Documentation that the installer is trained to install the manufacturer’s products.
     6. Closeout submittals: Submit the following documents.
        1. Warranty documents specified herein.
        2. Operation and maintenance data.
        3. Manufacturer’s field reports specified herein.
        4. Final as-built piping layout drawing.
  2. QUALITY ASSURANCE
     1. Installer qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and who has been trained by Uponor or an Uponor-approved trainer.

\*\* NOTE TO SPECIFIER \*\* Paragraph below should list obligations for compliance with specific code requirements particular to this section. Typically, general statements to comply with a particular code are addressed in Conditions of the Contract and Division 1 Regulatory Requirements Section. Avoid repetitive statements.

* + - 1. Regulatory requirements and approvals: Ensure the piping distribution system complies with all applicable codes and regulations.
      2. Certifications: Provide letters of certification indicating: Installer uses skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed tradesperson.

\*\* NOTE TO SPECIFIER \*\* Retain paragraph below if pre-installation meeting is required.

* + - 1. Pre-installation meetings:
         1. Verify project requirements, excavation conditions, system performance requirements, manufacturer’s installation instructions and warranty requirements.
         2. Review project construction timeline to ensure compliance or discuss modifications as required.
         3. Interface with other trade representatives to verify areas of responsibility.
         4. Establish the frequency and construction phase the project engineer intends for site visits and inspections by the piping manufacturer’s representative.
    1. Installer qualifications for PEX: Installer shall have successfully completed the Uponor Piping Systems Training Course and is able to provide proof/verification of the training. Course shall be conducted by the manufacturer or a manufacturer’s representative.

\*\* NOTE TO SPECIFIER \*\* Article below should include specific protection and environmental conditions required during storage. Coordinate article below with Division 1 Product Requirements Section.

* 1. DELIVERY, STORAGE, and HANDLING
     1. General: Comply with Division 1 Product Requirement Section.
     2. Comply with manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.
     3. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.
     4. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
        1. Store PEX piping in cartons or under cover to avoid dirt or foreign material from entering the piping.
        2. Do not expose white or blue PEX piping to direct sunlight for more than one month. Do not expose red PEX piping to direct sunlight for more than six months.
        3. Store piping on a flat surface to prevent unwanted deformation.

\*\* NOTE TO SPECIFIER \*\* Coordinate article below with Conditions of the Contract and with Division 1 Closeout Submittals (Warranty) Section. Use this article to require special or extended warranty or bond covering the work of this section.

* 1. WARRANTY
     1. Project warranty: Refer to Conditions of the Contract for project warranty provisions.
     2. Manufacturer’s warranty:
        1. PEX-a manufacturer system warranty shall cover piping and fittings from defect for a duration of 25 years from the date of installation. Piping system warranty shall apply to systems constructed of pipe and fitting products sourced from the same manufacturer.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable manufacturer: Uponor, located at: 5925 148th St. W.; Apple Valley, MN, 55124; toll-free: 800-321-4739; tel: 952-891-2000; email: [NAspecifications@uponor.com](mailto:NAspecifications@uponor.com); web: [uponor.com](http://www.uponor.com).

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 ‒ Product Requirements.
  1. PEX-A PIPE AND FITTINGS
     1. PEX-a (Engel-method crosslinked polyethylene) piping: SDR 9, ASTM F876 and F877 (CAN/CSA-B137.5) by Uponor (Wirsbo) with an oxygen barrier meeting DIN 4726.
     2. Pre-insulated PEX-a piping (1/2 inch through 2 inch nominal pipe size): PEX-a piping, with a closed-cell polyethylene foam insulation.
     3. Fittings for PEX-a piping: Elbows, adapters, couplings, plugs, tees and multiport tees (1/2 inch through 3 inch nominal pipe size): ASTM F1960 cold-expansion fittings in brass or engineered polymer (EP) manufactured by the pipe manufacturer, utilizing cold-expansion PEX-a reinforcing rings made of same material as the pipe. Fittings shall be third-party certified to NSF 14 and ASTM F1960 and shall comply with ASTM F876 and ASTM F877.

TRANSITION FITTINGS FOR PEX PIPE

* + 1. PEX-to-metal transition fittings:
       1. Manufacturers: Provide transition fittings from the same manufacturer as the piping.
       2. PEX-a to threaded transition: One-piece brass fitting with one male or female threaded end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
       3. PEX-a to copper sweat transition: One-piece brass fitting with one sweat adapter end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
       4. PEX-a to copper press transition: One-piece lead-free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
       5. PEX-a to flange transition: Two-piece fitting with one steel flange conforming to ASME B16.5 and one lead-free (LF) brass adapter conforming to ASTM F1960.
       6. PEX-a to groove transition: One-piece lead-free (LF) brass fitting with one CSA B242-05 groove end in either iron pipe size (IPS) or copper tube size (CTS) and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
    2. PEX-to-CPVC transition fittings:
       1. PEX-a to CPVC transition: Thermoplastic fitting with one ASTM D1784 spigot or socket end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
  1. VALVES FOR PEX PIPE
     1. PEX-to-PEX, brass ball valves (1/2 inch through 2 inch nominal pipe size)
        1. Manufacturers: Provide ball valve(s) from the same manufacturer as the piping system.
        2. Full-port ball valve: Two-piece, ASTM F1960 cold-expansion ends, with PEX-a reinforcing cold-expansion ring.
        3. In compliance with: 250 CWP, NSF/ANSI 359, ASTM F1960, ASTM F877   
           (CAN/CSA B137.5).

1. EXECUTION
   1. EXAMINATION
      1. Site verification of conditions: Verify that site conditions are acceptable for installation of the hydronic piping distribution system. Do not proceed with installation until unacceptable conditions are corrected.
   2. INSTALLATION
      1. Install hydronic piping according to approved shop drawings or coordination drawings.
      2. Comply with manufacturer’s product data, including product technical bulletins, installation instructions, and design drawings, including the following:
         1. Uponor PEX Piping Systems Installation Guide, current edition.
         2. Uponor PEX Piping Systems Design and Installation Manual, current edition.

\*\* NOTE TO SPECIFIER \*\* Delete below if not required.

* + 1. PEX-a hangers and supports:
       1. Horizontal PEX-a piping: Install supports suitable for PEX-a piping in compliance with local codes, the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition, and the Uponor PEX Piping Systems Installation Guide, current edition.
          1. Note: Per ICC PMG-1006, the above maximum hanger spacing requirements may be extended with the use of a continuous support channel such as Uponor PEX-a Pipe Support.
       2. Horizontal PEX-a piping with PEX-a pipe support: Install supports for PEX-a piping with horizontal support channel in accordance with manufacturer's recommendations and the following maximum spacing:
          1. 3 inch nominal and smaller: Maximum span, 8 feet (2.4 m).
          2. Support 1½ inch and smaller fittings within 12 inches (0.3 m).
          3. Install clamps and fixed points per the Uponor Piping Systems Installation Guide, current edition.
       3. Vertical PEX-a piping: Install supports suitable for PEX-a piping in compliance with local codes, the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition, and the Uponor PEX Piping Systems Installation Guide, current edition.
          1. Support vertical in-wall piping every 5 feet (1.5 m).
          2. Support riser piping at the base of each floor and every 5 feet (1.5 m) vertically.

Refer to the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition, and the Uponor PEX Piping Systems Installation Guide, current edition, for additional requirements.

* + 1. Piping schedule:
       1. Belowground / under-building slab, mechanical piping (3 inch and below) shall be the following:

\*\* NOTE TO SPECIFIER \*\* Use for field-insulated PEX.

* + - * 1. 1/2 inch through 3 inch ‒ PEX-a piping with engineered polymer (EP) or brass F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer’s recommendations.

\*\* NOTE TO SPECIFIER \*\* Use for pre-insulated PEX.

* + - * 1. 1/2 inch through 2 inch ‒ Pre-insulated PEX-a piping with PEX-foam insulation with engineered polymer (EP) or brass ASTM F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer’s recommendations.
      1. Aboveground mechanical piping [3 inch nominal and below] shall be the following:
         1. PEX-a piping, with engineered polymer (EP) or brass ASTM F1960 cold-expansion fittings.
    1. PEX-a connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for ASTM F1960 connections.
  1. FIELD QUALITY CONTROL
     1. Pressure testing PEX pipe and fittings: Pressure test PEX-a piping systems in accordance with local code and manufacturer’s requirements.
  2. CLEANING AND FLUSHING
     1. Remove temporary coverings and protection of adjacent work areas.
     2. Repair or replace damaged installed products.
     3. Clean the installed products in accordance with manufacturer’s instructions prior to owner’s acceptance.
     4. Remove construction debris from project site and legally dispose of debris.
     5. Flush the system with fresh potable water to remove any potential debris from installation.
     6. If disinfection is required, follow the manufacturer’s guidelines for the specific application.
  3. DEMONSTRATION
     1. Demonstrate operation of the piping distribution system to owner’s personnel.
  4. PROTECTION
     1. Protect installed work from damage caused by subsequent construction activity on the site.

END OF SECTION