SECTION 23 21 13

HYDRONIC PIPING

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\*\* NOTE TO SPECIFIER \*\* Uponor ; plumbing piping, hydronic distribution, radiant heating and cooling.  
This section is based on the products ofUponor , which is located at:  
5925 148th Street West  
Apple Valley, MN 55124  
Toll Free Tel: (800) 321-4739  
Tel: (952) 891-2000  
Fax: (952) 891-2008  
Email:[request info (mike.rivers@uponor.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Uponor+&coid=36585&rep=&fax=(952))  
Web:[http://www.uponorpro.com](http://http://www.uponorpro.com)  
[[Click Here](http://www.arcat.com/arcatcos/cos36/arc36585.html)] for additional information.  
With over 40 years of performance in structures around the globe, Uponor is the professional's choice for commercial plumbing, hydronic distribution and radiant heating and cooling systems. Using technologies proven in the most demanding environments, Uponor has perfected the art of providing systems that exceed expectations and deliver consistent quality for decades of use.  
Get Uponor product data, in the right formats, in the places, to quickly and accurately design and estimate your PEX-a plumbing, radiant heating/cooling and hydronic distribution piping project. 2D/3D CAD files and BIM files in multiple platforms are available at www.uponorpro.com/catalog.

1. GENERAL
   1. SECTION INCLUDES

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

* + 1. Hydronic Piping and Fittings (PEX-a) for the Following Applications:
       1. Hot-water heating piping, above ground.
       2. Hot-water heating piping installed below ground and within slabs.
       3. Chilled-water piping, above ground.
       4. Chilled-water piping installed below ground and within slabs.
       5. Condenser-water piping.
       6. Makeup-water piping, above ground.
       7. Makeup-water piping installed below ground 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 23 21 13 - Hydronic 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 F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
       2. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
    2. American National Standards Institute (ANSI)/American Water Works Association (AWWA)
       1. ANSI/AWWA C901 AWWA Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch (13 mm) Through 3 inch (76 mm), for Water Service
       2. ANSI/AWWA C906 AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 inch (100 mm) Through 63 inch (1575 mm), for Water Distribution.
    3. American Standards Institute (ANSI)/National Sanitation Foundation (NSF): ANSI/NSF 61 Drinking Water System Components - Health Effects
    4. International Code Council (ICC): International Plumbing Code (IPC)
    5. International Association of Plumbing and Mechanical Officials (IAPMO): Uniform Plumbing Code (UPC)
    6. Plastic Pipe Institute (PPI): PE 3408/PE 3608 IPS Geothermal Pipe Specifications
    7. Uponor, Inc.: Uponor Pre-insulated Pipe 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 possessing documentation proving familiarization training by the tubing manufacturer.

\*\* 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 trades person.

\*\* 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 tubing 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 potable pre-insulated piping coils under cover to prevent dirt or foreign material from entering the service tubing.
        2. Do not expose the service pipe to direct sunlight for more than 30 days. If construction delays are encountered, cover piping that is exposed to direct sunlight.

\*\* 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. PEX Manufacturer’s Warranty: Warranty must meet the following conditions:
        1. PEX tubing and fittings shall carry a twenty-five (25) year non-prorated warranty against failure due to defect in material or workmanship and;
        2. All tubing manufacturer’s valves and stops shall carry a one (1) year non-prorated warranty against failure due to defect in material or workmanship and;
        3. The assembly of manufacturer’s tubing and fittings shall carry a twenty-five (25) year non-prorated warranty on maintaining a leak-proof seal and;
        4. Warranty shall provide for repair or replacement of any tube, fittings or connection, which are proven to be defective and pay for consequential damages and;
        5. Warranty shall be transferable to subsequent owners and;
        6. Effective Warranty: Current manufacturer’s warranty at time of installation and;
        7. Warranty Period: Warranty shall commence on Date of Substantial Completion.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Uponor, which is located at: 5925 148th Street West; Apple Valley, MN 55124; Toll Free Tel: (800) 321-4739; Tel: (952) 891-2000; Fax: (952) 891-2008; Email:[request info (mike.rivers@uponor.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Uponor+&coid=36585&rep=&fax=(952)); Web:[http://www.uponorpro.com](http://http://www.uponorpro.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. HYDRONIC PIPING AND FITTINGS (PEX-a)
     1. Performance Requirements: PEX-a piping and fittings shall meet the following pressure and temperature ratings:
        1. 200 degrees F (93 degrees C) at 80 psi (551 kPa).
        2. 180 degrees F (82 degrees C) at 100 psi (689 kPa).
        3. 73.4 degrees F (23 degrees C) at 160 psi (1,102 kPa).
     2. Plastic Pipe and Fittings:
        1. PEX-a (Engle-method Crosslinked Polyethylene) Piping: Uponor Wirsbo hePEX , ASTM 876 with oxygen-diffusion barrier that meets DIN 4726.
        2. PEX-a Fittings, Elbows and Tees (1/2 inch through 2 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:
           1. UNS No. C69300 Lead-free (LF) Brass.
           2. 20 percent glass-filled polysulfone as specified in ASTM D6394.
           3. Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D6394.
           4. Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D6394
           5. Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D6394.
           6. Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".

\*\* NOTE TO SPECIFIER \*\* Do not specify engineered polymer (EP) polyphenylsulfone fittings for systems that contain ethylene glycol.

* + - 1. PEX-a Fittings (2-1/2 inch through 4 inch nominal pipe size): SDR9 compression type fitting consisting of a double O-ring insert with a compression sleeve tightened around the pipe and insert.
    1. Plastic-to-Metal Transition Fittings:
       1. Manufacturer: Provide fittings from the same manufacturer of the piping.
       2. Threaded Brass to PEX-a Transition: One-piece brass fitting with male or female threaded adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring. Typically used for PEX sizes 2 inch and below.
       3. Brass Sweat to PEX-a Transition: One-piece brass fitting with sweat adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring. Typically used for PEX sizes 2 inch and below.
       4. Dezincification-resistant (DZR) Brass to PEX-a Transition: Male NPT thread and PEX compression fitting. Editor: Typically used for PEX sizes 2-1/2 inch through 4 inch.
    2. Plastic-to-Metal Transition Unions:
       1. Manufacturer: Provide unions from the same manufacturer of the piping.
       2. Threaded Brass to PEX-a Union: One-piece brass fitting with male or female threaded adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring. Typically used for PEX sizes 2 inch and below.
       3. Brass Sweat to PEX-a Union: One-piece brass fitting with sweat adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring. Typically used for PEX sizes 2 inch and below.
    3. Piping Applications:
       1. Hot-water heating piping, aboveground (2 inch and below) shall be the following: PEX-a piping, with F1960 cold-expansion fittings.
       2. Hot-water heating piping, aboveground (21/2 inch through 4 inch) shall be the following: PEX-a piping, with compression fittings.
       3. Hot-water heating piping installed below ground and within slabs shall be any of the following:
          1. 2 inch and below: Sleeved PEX-a piping with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
          2. 1 inch through 2 inch: Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
          3. 2-1/2 inch through 4 inch: Pre-insulated PEX-a piping with multi-layer, closed-cell, PEX-foam insulation and a corrugated HDPE jacket with compression fitting. Use the fewest possible joints and install per manufacturer's recommendations.
       4. Chilled-water piping, aboveground (2 inch and below) shall be the following: PEX-a piping, with F1960 cold-expansion fittings.
       5. Chilled-water piping, aboveground (21/2 inch through 4 inch) shall be the following: PEX-a piping, with compression fittings.
       6. Chilled-water piping installed below ground and within slabs shall be any of the following:
          1. 2 inch and below: Sleeved PEX-a piping with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
          2. 1 inch through 2 inch: Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
          3. 2-1/2 inch through 4 inch: Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with compression fitting. Use the fewest possible joints and install per manufacturer's recommendations.
       7. Condenser-water piping, aboveground (2 inch and below) shall be the following: PEX-a piping, with F1960 cold-expansion fittings.

\*\* NOTE TO SPECIFIER \*\* Consult PEX manufacturer regarding water treatment system when specifying PEX for condenser water applications.

* + - 1. Condenser-water piping, aboveground (21/2 inch through 4 inch) shall be the following: PEX-a piping, with compression fittings.
      2. Condenser-water piping installed below ground and within slabs shall be any of the following:
         1. 2 inch and below: Sleeved PEX-a piping with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
         2. 1 inch through 2 inch: Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
         3. 2-1/2 inch through 4 inch: Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with compression fitting. Use the fewest possible joints and install per manufacturer's recommendations.
      3. Makeup-water piping, aboveground (2 inch and below) shall be the following: PEX-a piping, with F1960 cold-expansion fittings.
      4. Makeup-water piping, aboveground (21/2 inch through 4 inch) shall be the following: PEX-a piping, with compression fittings.
      5. Makeup-water piping installed below ground and within slabs shall be any of the following:
         1. 2 inch and below: Sleeved PEX-a piping with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
         2. 1 inch through 2 inch: Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.
         3. 2-1/2 inch through 4 inch: Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with compression fitting. Use the fewest possible joints and install per manufacturer's recommendations.

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 Pre-insulated Pipe Systems Design and Installation Manual, current edition.

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

* + 1. Below-grade Installation:
       1. Pre-insulated piping shall be installed in accordance with manufacturer's recommendations and the details as shown on the contract drawings.
       2. The system will be installed with the fewest number of underground joints as possible.
       3. The system does not require expansion loops, expansion joints or compensators of any type.
       4. An EPDM rubber end cap shall be applied at all terminations of the piping system, including all fitting locations, to form a watertight seal.
       5. All buried fittings will be installed, insulated and sealed in accordance with the piping manufacturer's instructions.
       6. Connection Vaults or Insulation Kits are required for all below-grade installations.
    2. Backfill:
       1. The pre-insulated piping system will be backfilled with clean sand material.
          1. Minimum vertical distance from the bottom of the tubing to the trench floor is 4 inches (100 mm).
          2. Minimum lateral distance from the side of the tubing to the trench wall is 6 inches (150 mm).
          3. Install a minimum of 12 inches (300 mm) of clean fill over the top of the potable pre-insulated piping.
       2. The balance of the trench can be backfilled with native soil void of stone greater than 2 inches (50m) in diameter.

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

* + 1. PEX-a Piping:
       1. PEX-a Piping Hanger Spacing: Install hangers for PEX-a piping with the following maximum spacing:
          1. 1 inch and below: Maximum span, 32 inches.
          2. 1-1/2 inch and above: Maximum span, 48 inches.
       2. PEX-a Piping Hanger Spacing with PEX-a Support Channel: Install hangers for PEX-a piping with horizontal support channel in accordance with local jurisdiction and manufacturer's recommendations, with the following maximum spacing:
          1. Maximum span, 8 feet.
       3. PEX-a Riser Supports: Install CTS riser clamps at the base of each floor and at the top of every other floor. Install mid-story guides between each floor.
       4. Pipe Joint Connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for F1960 connections.
  1. FIELD QUALITY CONTROL
     1. Site Tests: To ensure system integrity, pressure-test the tubing before and during backfilling of the piping. The service tubing will be air tested at 11/2 times the operating pressure for a minimum of 1 hour prior to system burial
  2. CLEANING
     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
  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