SECTION 23 21 13

HYDRONIC PIPING

1. GENERAL
   1. SECTION INCLUDES

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

* + 1. Polypropylene random copolymer with modified crystallinity and temperature resistance   
       (PP-RCT) pipe and fittings for the following applications:
       1. Heating hot-water piping, aboveground.
       2. Heating hot-water 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 23 05 29 ‒ Hangers and Supports for HVAC and Piping Equipment
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not 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 E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
       3. ASTM F2389 Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems.
    2. 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.
    3. Canadian Standards Association (CSA):
       1. CSA B242-05 Groove-and Shoulder-Type Mechanical Pipe Couplings.
       2. CSA B137.11 Polypropylene (PP-R) Pipe and Fittings for Pressure Applications.
    4. German Welding Society (DVS) (Deutscher Verband für Schweißen):
       1. DVS 2207-11: 2017 Welding Thermoplastic Materials – Heated Element Welding of Pipes, Piping Parts, and Sheets made of Polypropylene.
    5. International Code Council (ICC):
       1. International Mechanical Code (IMC)
    6. International Association of Plumbing and Mechanical Officials (IAPMO):
       1. Uniform Mechanical Code (UMC)
       2. R&T K-12775 Research and Testing – Pressure Rated Polypropylene Piping Systems.
    7. International Organization for Standardization (ISO):
       1. ISO 15874 Plastics Piping Systems for Hot and Cold Water Installations – Polypropylene (PP).
    8. Uponor, Inc.:
       1. Uponor PP-RCT Piping Systems Manual, current edition.
       2. Uponor PP-RCT Piping Systems Installation Guide, 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. Note that if using PP-RCT where metallic piping was the basis of design, the contractor shall provide shop drawings clearly indicating that the design has been adjusted, as required, to maintain scheduled flow and pressure drops. Any design requiring re-sizing of pumps shall not be permitted.
     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.
      3. 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 PP-RCT: Installer shall have successfully completed a training course on fusion tool use and connections and carry a current certification or qualification from the fusion tool manufacturer or pipe and fittings manufacturer.

\*\* NOTE TO SPECIFIER \*\* Retain paragraph below if data logging is required by owner.

* + 1. Data Logging of PP-RCT Butt-fusion Joints: Installer shall provide digital verification of the fusion process for each butt-fusion joint completed. Installer shall have been trained on the use of the data logging software by the fusion tool manufacturer or the pipe and fittings manufacturer.

\*\* 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. If product is delivered in damaged packaging, recipient shall notify manufacturer within 24 hours.
        2. Store PP-RCT piping in original packaging or in containers or under cover to avoid dirt or foreign material from entering the piping.
        3. Do not expose PP-RCT piping to direct sunlight for more than 30 days.
        4. Store piping in the original shipping packaging on a flat surface to prevent unwanted deformation. Follow manufacturer’s stacking height guidelines.

\*\* 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. PP-RCT manufacturer system warranty shall cover piping and fittings from defect for a duration of 25 years from the date the product is delivered to the end user for installation. Refer to manufacturer’s warranty for complete details.

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. PP-RCT PIPE AND FITTINGS
     1. Mechanical pipe: Uponor PP-RCT mechanical pipe with fiber layer, manufactured from a   
        PP-RCT resin meeting the requirements of ASTM F2389 or CSA B137.11. SDR shall be determined by project requirements for temperature and pressure.
     2. Fittings for PP-RCT pipe: Uponor PP-RCT certified as complying with ASTM F2389 (CSA B137.11):

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| --- |
| * + - 1. Socket fusion type: For sizes 1/2 inch nominal (20 mm) through 4 inch nominal   (125 mm).   * + - 1. Butt fusion type or socket fusion type using coupling: For size 4 inch nominal (125 mm) pipe-to-pipe and pipe-to-flange adapter connections.       2. Butt fusion type: For sizes 2 inch (63 mm) and larger.   1. TRANSITION FITTINGS FOR PP-RCT PIPE      1. PP-RCT-to-metal Transition Fittings:         1. PP-RCT socket fusion to flange transition [1-1/2 inch nominal (50 mm) through 4 inch nominal (125 mm)]: Steel flange conforming to ASME B16.5 with one PP-RCT socket fusion ASTM F2389 end.         2. PP-RCT butt fusion to flange transition [4 inch nominal (125 mm) through 12 inch nominal (315 mm)]: Steel flange conforming to ASME B16.5 with one PP-RCT butt fusion ASTM F2389 end.         3. PP-RCT-to-threaded transition (NPT) [1/2 inch nominal (20 mm) through 2 inch nominal (63 mm)]: One PP-RCT socket fusion ASTM F2389 end and one brass male or female threaded adapter.      2. PP-RCT-to-PEX Transition Fittings [1 inch nominal (32 mm) and smaller]:         1. PP-RCT to PEX-a transition: One PP-RCT socket fusion adapter by male or female threaded by fusion ASTM F2389 end with ASTM F1960 cold-expansion end with PEX-a reinforcing cold-expansion ring.         2. PP-RCT to PEX-a saddle transition: One PP-RCT saddle fusion end and one ASTM F1960 cold-expansion end with PEX-a reinforcing cold-expansion ring.   2. VALVES FOR PP-RCT PIPE      1. Valves shall be manufactured in accordance with the manufacturer’s specifications and shall comply with the performance requirements of ASTM F 2389 or CSA B137.11.      2. PP-RCT-to-PP-RCT, Ball Valves [1/2 inch nominal (20 mm) through 2 inch nominal (63 mm) pipe size]:         1. Recommended manufacturers: Red-White model 1501PAB or Webstone H10170W series         2. Full-port ball valve: PP-RCT or brass body with chrome-plated ball and polyfusion ends.         3. In compliance with NSF/ANSI 14.      3. PP-RCT-to-PEX-a, Ball Valves [1/2 inch nominal (20 mm) through 1 inch nominal (32 mm) pipe size]:         1. Recommended manufacturers: Red-White model 1516AB         2. Full-port ball valve: PP-RCT body with chrome-plated ball and one ASTM F1960 end and one polyfusion end.         3. In compliance with ANSI/NSF 14, 61 and 372.      4. PP-RCT-to-PP-RCT Flange Butterfly Valves [2-1/2 inch nominal (75 mm) to 12 inch (315 mm) nominal pipe size]: |

* + - 1. Recommended manufacturers: Apollo model LD145 or NIBCO model LC-2000
         1. Iron, single-flange butterfly valves with aluminum-bronze disc:
         2. Standard: MSS SP-67 & API 609
         3. CWP Rating for Valves NPS 2 to NPS 12): 200 psig (1380 kPa).
         4. Body Design: Lug type, suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
         5. Body Material: ASTM A126, cast iron, or ASTM A536, ductile iron.
         6. Seat: [EPDM] [NBR].
         7. Stem: One-piece or two-piece stainless steel.
         8. Disc: Aluminum bronze

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 PP-RCT Piping Systems Manual, current edition.
         2. Uponor PP-RCT Piping Systems Installation Guide, current edition.

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

* + 1. PP-RCT Hangers and Supports:
       1. Horizontal PP-RCT piping: Install supports suitable for PP-RCT piping in compliance with local codes and the Uponor PP-RCT Piping Systems Manual, current edition, and the Uponor PP-RCT Piping Systems Installation Guide, current edition.
       2. To minimize linear expansion, use fixed points and expansion arms or loops in accordance with the Uponor PP-RCT Piping Systems Manual, current edition, or the Uponor PP-RCT Piping System Installation Guide, current edition.
       3. Vertical piping: Support vertical piping at each floor penetration and as specified in the applicable plumbing or mechanical code.
       4. Do not over tighten riser clamps on the pipe.
       5. Hot-water and cold-water piping clamps and supports shall be rubber, vinyl, or felt lined and shall be free of sharp edges that may gouge the pipe.
    2. Piping Schedule:

\*\* NOTE TO SPECIFIER \*\* Amend below per application.

* + - 1. Belowground / under-building slab, mechanical piping [12 inch (315 mm) and smaller] shall be the following:
         1. PP-RCT mechanical pipe: Fiber composite layer, SDR 7.4, 9, 11, or 17.6 pipe, with socket fusion type fittings for 4 inch (125 mm) and smaller and butt fusion type connections for 2 inch (63 mm) and larger.
      2. Aboveground mechanical piping [1/2 inch (20 mm) and larger] shall be the following:
         1. PP-RCT mechanical pipe: Fiber composite layer, SDR 7.4, 9, 11, or 17.6 pipe, with socket-fusion type fittings for 1/2 inch (20 mm) to 4 inch (125 mm).
         2. PP-RCT mechanical pipe: Fiber composite layer, SDR 9, 11, or 17.6 pipe, with butt-fusion type fittings for fitting 2 inch (63 mm) through 12 inch (315 mm).
    1. PP-RCT connections: Fusion connections shall be made in accordance with DVS 2207-11: 2017 and manufacturer’s specifications and the following:
       1. Socket-fusion type: For sizes 1/2 inch nominal (20 mm) to 4 inches nominal (125 mm)
       2. Butt-fusion type: For sizes 2 inch (63 mm) and larger.
    2. Fusion machines, equipment and tools: As suggested by the pipe manufacturer or specified.
    3. Joint preparation, setting, alignment, fusion process, cooling times and working pressures: In accordance with DVS 2207-11: 2017 and the pipe and fitting manufacturer’s specifications.
  1. FIELD QUALITY CONTROL
     1. Pressure testing PP-RCT pipe and fittings: Pressure test PP-RCT 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 chemical compatibility guidelines for flushing agents.
  3. DEMONSTRATION
     1. Demonstrate operation of the piping distribution system to Owner’s personnel.
  4. PROTECTION
     1. Protect installed work from UV exposure or damage caused by subsequent construction activity on the site.

END OF SECTION