

Section 22 11 16
Domestic Water Piping
(REHAU PEX Plumbing Pipe)

This draft specification is for domestic water piping. REHAU supplies this PEXa piping under the name REHAU PEX Plumbing Pipe.

This draft specification is provided only as an aid in architect's/engineer's development of the final specification and is not intended as a substitute for sound architectural/engineering judgment. The architect/engineer shall be responsible to convert this draft specification into a final specification that meets the functional and aesthetic needs of his/her client, as well as to comply with all applicable codes.

Part 1 - General

1.01 Summary

- A. Domestic potable hot and cold water plumbing system, where shown on the Drawings and Schedules, shall be crosslinked polyethylene pipe, and shall include the following:
 - 1. Crosslinked polyethylene (PEXa) piping.
 - 2. Distribution manifold(s) with balancing and flow control valves where required.
 - 3. Cold-expansion and compression-sleeve fittings.
 - 4. Pipe fasteners as approved by the manufacturer of the PEXa piping.
 - 5. Supervision and field engineering required for the complete and proper function of the system.

1.02 References

- A. Publications listed here are part of this specification to the extent they are referenced. Where no specific edition of the standard or publication is identified, the current edition shall apply.
- B. ASTM - American Society for Testing and Materials
 - 1. ASTM D2765 – Standard Test Method for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics
 - 2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
 - 3. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
 - 4. ASTM F876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing
 - 5. ASTM F877 – Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
 - 6. ASTM F2023 – Standard Test Method for Evaluating the Oxidative Resistance of Crosslinked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water
 - 7. ASTM F2080 – Standard Specification for Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe
- C. AWWA – American Water Works Association
 - 1. AWWA C904-06 - Crosslinked Polyethylene (PEX) Pressure Pipe, 1/2 In.(12 mm) Through 3 In. (76 mm), for Water Service
- D. CSA Canadian Standards Associations
 - 1. CSA B137.5 – Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications
- E. IAPMO – International Association of Plumbing and Mechanical Officials
- F. ICC – International Code Council
- G. ISO – International Organization for Standardization

1. ISO 9001 – Quality Management Systems – Requirements
- H. NSF International
 1. NSF/ANSI 14 – Plastic Piping System Components and Related Materials
 2. NSF/ANSI 61 – Drinking Water System Components – Health Effects
- I. Plastic Pipe Institute
 1. PPI TR-3 / 2007 – Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe
- J. Underwriters’ Laboratories
 1. ANSI/UL 263 – Standard Fire Tests of Building Construction and Materials
- K. Underwriters’ Laboratories of Canada
 1. CAN/ULC S101 – PEX Pipe through Fire Rated Assemblies
 2. CAN/ULC S102.2 – Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials

1.03 Definitions

- A. Crosslinked polyethylene, commonly abbreviated PEX, is made from high density polyethylene (HDPE). Crosslinking is accomplished during manufacturing. Crosslinking enhances the physical & mechanical properties of the polymer. The high-temperature properties are improved. Chemical resistance is enhanced by resisting dissolution. Low temperature properties are also improved; its impact and tensile strength, scratch resistance, and resistance to brittle fracture are enhanced. The required degree of crosslinking, according to ASTM Standard F876-07, is between 70-89%. This specification requires PEX to be designated as PEXa and be manufactured by the high-pressure peroxide method.

1.04 System Description

- A. Design Requirements
 1. Standard grade hydrostatic pressure ratings from Plastics Pipe Institute in accordance with TR-3. The following three standard-grade hydrostatic ratings are required:
 - a. 200°F (93°C) at 80 psi (551 kPa)
 - b. 180°F (82°C) at 100 psi (689 kPa)
 - c. 73.4°F (23°C) at 160 psi (1102 kPa)
 2. Certification of flame spread/smoke development rating of 25/50 in accordance with ASTM E 84 and ULC S101 for the following PEX pipe sizes. It may be necessary to encase with 1/2 inch fiberglass insulation at tube spacing of not less than 4 inches apart, as required by the specific manufacturer. Certain sizes may not conform to this standard; appropriate insulation shall be installed to meet the standard.
 - a. 3/8 inch (9.53 mm)
 - b. 1/2 inch (12.7 mm)
 - c. 3/4 inch (19.05 mm)
 - d. 1 inch (25.4 mm)
 - e. 1 1/4 inch (31.75 mm)
 - f. 1 1/2 inch (38.1 mm)
 - g. 2 inch (50.8 mm)
- B. Performance Requirements: To provide a domestic potable hot and cold water plumbing system, which is manufactured, fabricated and installed to comply with regulatory agencies and to maintain performance criteria stated by the PEX pipe manufacturer without defects, damage or failure.
- C. Compliant to the following standards:
 1. NSF/ANSI Standard 14

2. NSF/ANSI Standard 61
3. ASTM F877
4. ASTM E119
5. ANSI/UL 263 through certification listings with Underwriters Laboratories, Inc. (UL).
 - a. UL Design No. L557 — 1 hour wood frame floor/ceiling assemblies
 - b. UL Design No. K913 — 2 hour concrete floor/ceiling assemblies
 - c. UL Design No. U372 — 1 hour wood stud/gypsum wallboard wall assemblies
 - d. UL Design No. V444 — 1 hour steel stud/gypsum wallboard wall assemblies

1.05 Submittals

- A. Comply with Section 01 33 00, Submittal Procedures. Approval and/or acceptance of all submittals are required prior to fabrication.
- B. Product Data: Submit manufacturer's Technical Manual, submittal forms, catalog cuts, brochures, specifications, and installation instructions. Submit data in sufficient detail to indicate compliance with the contract documents.
 1. Submit manufacturer's instructions for installation.
 2. Submit data for equipment, fittings, fasteners and associated items necessary for the installation of the piping and manifolds.
- C. Submit computer-generated system design indicating pipe sizing, flow rates and temperatures.
- D. Shop Drawings: Provide plans drawn to scale for all installation areas.
 1. Indicate dimensions, descriptions of materials, general construction, component connections, and installation procedures.
 2. Indicate design, schematic layout of system, including equipment and critical dimensions as well as details for protecting exposed PEX piping.
- E. Certification:
 1. Submit independent certification results for the piping systems from an accredited independent testing laboratory.
 2. The design shall be approved by a professional appropriately licensed in the jurisdiction where the installation will take place, as being complete and accurate.
 3. Fittings shall be third-party as approved by the manufacturer's PEX piping system with applicable plumbing and mechanical code certifications.
 4. Fittings encased behind walls or ceilings shall be certified to ASTM F2080.
- F. Samples: Submit samples of metal and exposed finishes if requested by Architect.
- G. Maintenance Instructions: Submit instructions for any maintenance required or recommended by manufacturer.

1.06 Quality Assurance

- A. Comply with Section 01 43 00, Quality Assurance.
- B. Manufacturer: Must be a company specializing in the Work of this Section with a minimum of 5 years documented experience.
- C. All components shall be supplied by one manufacturer.
- D. Pipe shall be manufactured in a facility whose quality management system is ISO 9001 certified.
- E. Crosslinked polyethylene (PEXa) pipe shall conform and be certified to ASTM F876, F877 and CSA B137.5. Fittings shall conform and be certified to ASTM F877 or F2080, and CSA B137.5.

1.07 Delivery, Storage, And Handling

- A. Comply with Section 01 60 00, Product Requirements.
- B. Deliver and store piping and equipment in shipping containers with labeling in place.
 - 1. Pipe shall be kept in original shipping boxes until required for installation.
- C. Store piping and equipment in a safe place, dry, enclosed, under cover, in a well-ventilated area.
 - 1. Do not expose pipe to ultraviolet light beyond exposure limits recommended by manufacturer.
 - 2. Protect piping and manifolds from entry of contaminating materials. Install suitable plugs in open pipe ends until installation.
 - 3. Where possible, connect pipes to assembled manifolds to eliminate possibility of contaminants and cross-connections.
 - 4. Piping shall not be dragged across the ground or other surfaces, and shall be stored on a flat surface with no sharp edges.
- D. Protect materials from damage by other trades.
- E. Pipe shall be protected from oil, grease, paint, direct sunlight and other elements as recommended by manufacturer.

1.08 Warranty

- A. Provide manufacturer's standard written warranty.
 - 1. The warranty shall include as a minimum, provisions to repair defects from faulty materials or workmanship developed during the guarantee period, or provide for replacement with new materials, at no expense to Owner.
 - 2. The pipe manufacturer shall warrant the crosslinked polyethylene piping to be free from defects in material and workmanship for a period of twenty-five (25) years starting at completion of successful pressurized water tests immediately following system installation.
 - 3. Cold-expansion compression-sleeve pipe repair couplings shall be warranted to be free from defects in material and workmanship for a period of twenty-five (25) years starting at completion of successful pressurized water tests immediately following system installation.
 - 4. All manifolds and distribution headers shall be warranted to be free from defects in material and workmanship for a period of two (2) years starting at completion of successful pressurized water tests immediately following system installation.
- B. Provide installer's guarantee as appropriate.

Part 2 - Products

2.01 Acceptable Manufacturer

- A. REHAU, 1501 Edwards Ferry Road, NE; Leesburg, VA 20176; email: rehau.mailbox@rehau.com; website: www.rehau.com; upon whose products and equipment these specifications are based.
- B. No Substitutions allowed.

2.02 Components

- A. Piping
 - 1. All pipe shall be high-density crosslinked polyethylene manufactured using the high-pressure peroxide method of crosslinking (PEXa). Pipe shall conform to ASTM F876, ASTM F877 CSA B137.5, NSF/ANSI 14 and NSF/ANSI 61.
 - 2. Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature (690 kPa @ 82°C), and 80 psi gauge pressure at 200°F temperature (550 kPa @ 93°C).

3. Pipe shall be certified by PPI to standard TR-3, with applicable plumbing and mechanical code certifications.
4. Pipe to be manufactured using a high-pressure peroxide method with a minimum degree of crosslinking of 70-89% when tested in accordance with ASTM D2765, Method B.
5. Pipe to be tested for resistance to hot chlorinated water in accordance with ASTM F2023. Pipe to have a minimum extrapolated time-to-failure of 50 years, calculated in accordance with section 13.3 of F2023 and listed as "3006" per the ASTM F876 standard.
6. When required, PEX pipe to have a co-extruded colored UV Shield made from UV-Resistant polyethylene providing UV resistance.
7. Pipe to be manufactured in an ISO 9001 certified production facility.
8. Bend Radius:
 - a. The minimum bend radius for cold bending of the pipe shall be not less than five (5) times the outside diameter.
 - b. Bends with a radius less than this shall require the use of a bending template as supplied by the pipe manufacturer, and/or hot air.
9. Pipe to have a Flame Spread Index of less than 25, and a Smoke Developed Index of less than 50 when tested in accordance with ASTM E84 (in U.S.) or CAN/ULC S102.2 (in Canada). In any case where the pipe does not conform to these standards, appropriate piping insulation shall be installed in order to meet the standard.

B. Fittings

1. All Fittings used with crosslinked polyethylene (PEX) water distribution pipe intended for plumbing applications shall be of the cold-expansion compression-sleeve design.
2. All Fittings shall be third-party certified to applicable standards ASTM F877, ASTM F2080, NSF/ANSI 14, NSF/ANSI 61 and CSA B137.5 and approved by the manufacturer's PEX piping system, with applicable plumbing and mechanical code certifications.
3. Compression-sleeve fittings shall be manufactured of brass and shall be supplied by the piping manufacturer as part of a proven cataloged system.
4. Where fittings are encased in concrete or buried underground, fittings shall be wrapped as per manufacturer's recommendation to protect the material.

C. Manifolds

1. Material: Distribution manifolds shall be manufactured of copper and be supplied by the piping manufacturer as a proven cataloged part of the manufacturer's system.
2. Copper manifolds
 - a. Copper manifolds shall be manufactured from Type L copper.
 - b. Copper and/or brass outlets shall be high-temperature brazed (lead-free) into headers.
 - c. Outlets in copper headers shall be made using the T-drill process according to ASTM F2014.

2.03 Markings

- A. Pipe shall carry the following markings every three (3) feet (0.9 meters): Manufacturer's name or trademark, nominal size, PEXa 3006 (material designation) SDR9 (standard dimension ratio), ASTM F876/ F877 / F2080, CSA B137.5, NSF-pw, UPC Shield, 160 psi @ 73.4°F / 100 psi @ 180°F / 80 psi @ 200°F, POTABLE TUBING, manufacturing date and footage mark.

2.04 Packaging

- A. Coiled pipe shall be shipped in protective cardboard boxes marked with product name and size.
- B. Straight lengths shall be packed in plastic bags.

Part 3 - Execution

3.01 Acceptable Installers

- A. As a minimum, installation shall be performed by qualified laborers trained by the manufacturer in the procedures of PEX systems and they shall be appropriately licensed for the jurisdiction where the installation will take place.

3.02 Examination

- A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions are corrected.
- B. Beginning of installation means acceptance of existing conditions.

3.03 Preparation

- A. Coordinate with related trades and manufacturer's recommendations with regard to installation in conjunction with:
- B. Prepare a suitable cavity for the manifold, with a secure mounting plate that will secure the manifold at least 30 inches (75 cm) above floor level. Manifold must be installed in an area that will allow easy access for piping as well as future access for maintenance.

3.04 Installation

- A. Install in accordance with manufacturer's published installation manual and/or published guidelines and final shop drawings.
- B. Manifolds shall be mounted as level as possible.
- C. Route piping in an orderly manner, according to layout and spacing shown in final shop drawings. All installation notes shown on the drawings shall be followed.
- D. At connections and fittings, use a plastic pipe cutter to ensure square (90°) and clean cuts, and join pipes immediately or cap ends of pipe to seal from contaminants.
- E. Pipe shall be dispensed using a suitable uncoiling device. Remove twists prior to securing pipe. Pipe shall lie flat on an even plane.
- F. Piping that passes through expansion joints or walls shall be covered in protective polyethylene convoluted sleeving (flexible conduit) extending 15 inches (38 cm) on each side of the joint. Sleeving shall be secured on pipe to prevent movement during installation.
- G. Where piping enters or exits a wall a protective conduit shall be placed around the pipe, with the conduit extending a minimum of 6 inches (15 cm) into the floor and exiting by a minimum of 6 inches (15 cm). For penetrations at manifolds, use rigid PVC bend guides secured in place to prevent movement.

3.05 Field Quality Control

- A. Filling, Testing & Balancing: Tests of domestic plumbing systems shall comply with authorities having jurisdiction, and, where required, shall be witnessed by the building official.
- B. Pressure gauges used in testing and balancing shall show pressure increments of 1 psig and shall be located at or near the lowest points in the distribution system.
- C. Air Test
 - 1. Charge the completed, yet unconcealed pipes with air at a minimum of 40 psig.
 - 2. Do not exceed 150 psig.
 - 3. Use soap solution to check for leakage at manifold connections.

- D. Water Test
 - 1. Purge air from pipes.
 - 2. Charge the completed, yet unconcealed pipes with water.
 - 3. Take necessary precautions to prevent water from freezing.
 - 4. Check the system for leakage, especially at all pipe joints.
 - E. Perform a preliminary pressure test pressurizing the system to the greater of 1.5 times the maximum operating pressure or 100 psig for 30 minutes.
 - 1. As the piping expands, restore pressure, first at 10 minutes into the test and again at 20 minutes.
 - 2. At the end of the 30-minute preliminary test, pressure shall not fall by more than 8 psig from the maximum, and there shall be no leakage.
 - F. After successfully performing the preliminary pressure test, perform the main pressure test immediately.
 - 1. The test pressure shall be restored and continued as the main test for 2 hours.
 - 2. The main test pressure shall not fall more than 3 psig after 2 hours.
 - 3. No leakage shall be detected.
 - G. Complete inspection and furnish test reports supplied by the manufacturer of the system.
- 3.06 Cleaning
- A. Clean exposed surfaces upon completion of installation using clean, damp cloth. No cleaning agents are allowed.
 - B. Comply with manufacturer's recommendations.
- 3.07 Protection
- A. Protect installation throughout construction process until date of final completion.
 - B. Replace components that cannot be repaired.

END OF SECTION