

Section 22 11 16
Domestic Water Piping
(REHAU PEXa and F1960 Plumbing System)

This recommended specification is for domestic water piping and fittings. REHAU supplies this PEXa piping system under the names REHAU RAUPEX PEXa UV Shield Pipe and Cold Expansion Fittings with PEX Reinforcing Rings.

This recommended specification is provided as guide for architect's/engineer's/builder's development of the final specification. The architect/engineer/builder shall be responsible to convert this recommended specification into a final specification that meets the functional needs of the client, as well as to comply with all applicable building, plumbing, and mechanical codes.

Part 1 - General

1.01 Summary

- A. Hot and cold domestic water piping system shall be crosslinked polyethylene pipe, and shall include the following:
- Crosslinked polyethylene (PEXa) piping
 - Cold Expansion Fittings with PEX Reinforcing Rings
 - Pipe fasteners and support channels as approved by the manufacturer of the PEXa piping.
 - Compression-sleeve assembly tools.

Supervision and field engineering required for the complete and proper function of the system.

1.01 References

- A. 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 F2657 – Standard Test Method for Outdoor Weathering Exposure of Crosslinked Polyethylene (PEX) Tubing
 8. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX)
- B. CSA Canadian Standards Associations
1. CSA B137.5 – Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications
- C. IAPMO – International Association of Plumbing and Mechanical Officials
- D. ICC – International Code Council
- E. ISO – International Organization for Standardization
1. ISO 9001 – Quality Management Systems – Requirements
- F. NSF International
1. NSF/ANSI 14 – Plastic Piping System Components and Related Materials
 2. NSF/ANSI 61 – Drinking Water System Components – Health Effects

3. NSF/ANSI 372 – Drinking Water System Components – Lead Content

G. Plastic Pipe Institute

1. PPI TR-3– 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

H. Underwriters’ Laboratories

1. ANSI/UL 263 – Standard Fire Tests of Building Construction and Materials

I. 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

J. 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.

1.02 Definitions

A. PEXa pipe – a polyethylene material which has undergone a change in molecular structure using a chemical process whereby the polymer chains are chemically linked, resulting in crosslinked polyethylene pipe. This specification requires PEX to be designated as PEXa and be manufactured by the high-pressure peroxide method.

B. Cold Expansion Fittings with PEX Reinforcing Rings - includes fittings, PEX reinforcing rings, multi-port tees, manifolds, valves and copper ells

1.03 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. Listing of Flame Spread Index and Smoke Developed Index to ASTM E 84 (U.S.) and ULC S102.2 (Canada). It may be necessary to encase with minimum 1/2-inch fiberglass insulation, 1/2-inch closed-cell foam insulation or install in galvanized support channel as required by the manufacturer’s listing.

B. Performance Requirements: To provide a hot and cold domestic water piping system, which is manufactured, fabricated and installed to comply with regulatory agencies and to maintain performance criteria defined by the PEXa pipe manufacturer per their published technical guidelines.

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. L588— 1 hour wood frame floor/ceiling assemblies
b. UL Design No. K917 — 2-hour concrete floor/ceiling assemblies
c. UL Design No. U383 — 1 hour wood stud/gypsum wallboard wall assemblies

- d. UL Design No. V461 — 1 hour steel stud/gypsum wallboard wall assemblies
- 6. CSA B137.5
- 7. ASTM F1960

1.04 Submittals

- A. Comply with Section 01 33 00, Submittal Procedures. Approval and/or acceptance of all submittals are required prior to installation.
- B. Product Data: Submit manufacturer's product instructions, product submittal, catalog, specifications, and installation instructions. Submit data required for compliance with the contract documents necessary for the installation of the system.
- C. Submit system design indicating pipe sizing, pipe layout, and fixture connections when required.
- D. Certification:
 - 1. Submit independent certifications for the piping system components from an accredited third-party 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 cold expansion fittings with PEX reinforcing rings assembled as per Section 3.04.
- E. Samples: Submit product samples if requested by Architect.

1.05 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. PEXa pipe shall be manufactured in a facility whose quality management system is ISO 9001 certified.
- D. PEXa pipe shall be certified to ASTM F876, F877 and CSA B137.5.
- E. Fittings shall be cold expansion fittings with PEX reinforcing rings that are certified to ASTM F877, ASTM F1960 and CSA B137.5.

1.06 Delivery, Storage, And Handling

- A. Comply with Section 01 60 00, Product Requirements.
- B. Deliver and store piping and fittings in packaging with labeling in place.
 - 1. Pipe and fittings shall be kept in original packaging until required for installation.
- C. Store products in a safe, dry place.
 - 1. Do not expose pipe and fittings to ultraviolet light beyond exposure limits recommended by manufacturer.
 - 2. Protect products from exposure to contaminating materials. Install suitable plugs in open pipe ends until installation when necessary.
 - 3. Piping shall not be dragged across the ground or other surfaces. The pipe shall be stored on a flat surface with no sharp edges.
- D. Protect materials from damage by other trades.
- E. Pipe and fittings shall be protected from oil, grease, paint, direct sunlight and other elements as recommended by the manufacturer.

1.07 Warranty

- A. Provide manufacturer's standard written warranty.
 - 1. The manufacturer shall warrant the PEXa pipe and cold-expansion fittings with PEX reinforcing rings as an approved connection assembly.
 - 2. The PEXa 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.
 - 3. Cold-expansion fittings with PEX reinforcing rings shall be warranted to be free from defects in material and workmanship for a period of twenty-five (25) years.
 - 4. All manifolds and distribution headers shall be warranted to be free from defects in material and workmanship for a period of one (1) year 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.na.rehau.com; upon whose products of which 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. Supplier shall provide pipe in sizes 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2 and 2 in.
 - 3. Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature (690 kPa @ 82°C) and shall have a rating of 80 psi gauge pressure at 200°F temperature (550 kPa @ 93°C) per the manufacturer's requirements.
 - 4. Pipe shall be certified by PPI to standard TR-3, with applicable plumbing and mechanical code certifications.
 - 5. 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.
 - 6. 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 "3306" per the ASTM F876 standard.
 - 7. Pipe to have a minimum bend radius for cold bending not less than five (5) times the outside diameter. 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.
 - 8. PEXa pipe to have a co-extruded red, white or blue UV Shield made from UV-resistant polyethylene providing a minimum UV resistance of 6 months when tested according to ASTM F2657. In addition, pipe shall have a manufacturer's recommended UV resistance of 12 months based on additional testing to ASTM F2657.
 - 9. Pipe to be manufactured in an ISO 9001 certified production facility.
 - 10. Pipe to have a Flame Spread Index and a Smoke Developed Index listing to ASTM E84 (in U.S.) or CAN/ULC S102.2 (in Canada) with insulation or galvanized support channel as necessary.
- B. Fittings & Multi-port Tees

All Fittings used with crosslinked polyethylene (PEXa) water distribution pipe intended for plumbing applications shall be cold-expansion fittings with PEX reinforcing rings.

1. All polymer fittings shall be made from PPSU (black) in accordance with ASTM D6394.
2. PPSU Multi-port Tees shall be manufactured from poly-phenylsulfone (PPSU) material.
3. All brass fittings shall be lead free brass made from ECO BRASS UNS C69300 or equivalent.
4. All PEX reinforcing rings shall be made from PEXa crosslinked polyethylene.
5. All fittings shall be third-party certified to applicable standards ASTM F877, NSF/ANSI 14, NSF/ANSI 61 and CSA B137.5.
6. Where joints are encased in concrete or buried underground, joints shall be wrapped if required per the 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.

D. Galvanized Support Channels

1. Material: Support Channels shall be manufactured of Carbon Rolled Steel and be supplied by the piping manufacturer as a proven cataloged part of the manufacturer's system.
2. Support Channel:
 - a. Support channel should be made to fit securely to the pipe without requiring the use of additional strapping to mitigate expansion/contraction of the pipe. Supplier shall provide installation guide for installing PEX pipe with Galvanized Support Channels.

E. Assembly Tools

Cold Expansion Fittings with PEX Reinforcement Rings tools:

1. Tools for assembling F1960 Cold-expansion fittings with PEX reinforcement rings should be acquired by installing contractor from tools manufacturers in the market.
2. These tools should be certified to make ASTM F1960 Cold-Expansion Fittings with PEX Reinforcement Rings.

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 3306 (material designation) SDR9 (standard dimension ratio), ASTM F876/ F877 / F2080 F1960, CSA B137.5, NSF-pw, U.P. Code, 160 psi @ 73.4°F / 100 psi @ 180°F / 80 psi @ 200°F, POTABLE TUBING, manufacturing date and footage mark.
- B. Cold-expansion fittings and PEX reinforcement rings shall be marked with manufacturer's designation, production code, and certification markings.

2.04 Packaging

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

Part 3 - Execution

3.01 Acceptable Installers

- A. As a minimum, installation shall be performed by qualified installers trained by the manufacturer in the procedures of PEX systems appropriately licensed for the jurisdiction where the installation will take place.
- B. Installers must comply with all manufacturer's technical guidelines.

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 of the domestic water piping system.

3.04 Installation

- A. Install in accordance with manufacturer's most current published technical guidelines and final drawings where required.
- B. Route piping in an orderly manner, according to layout and spacing shown in final drawings. All installation notes shown on the drawings shall be followed.
- C. All cold-expansion with PEX Reinforcement rings fittings shall be assembled using the F1960 approved tools and must consist of the following process
 1. Make a clean, square cut of the PEXa pipe
 2. Fully insert pipe into the F1960 PEX reinforcement ring.
 3. Expand the PEXa pipe and PEX reinforcement ring as many times as called out in the operational instruction guide of F1960 assembly tool.
 4. Insert the cold-expansion fitting into the expanded PEXa pipe / PEX Reinforcement ring.
 5. Allow the PEX Pipe and PEX Reinforcement ring to return back to its original shape such that the pipe and ring securely hold onto the fitting.

3.05 Field Quality Control

- A. Tests of domestic plumbing systems shall comply with authorities having jurisdiction, and, where required, shall be witnessed by the building official.
- B. Air Test
 1. Charge the completed, yet unconcealed pipes with air at a minimum of 40 psig.
 2. Do not exceed amount of pressure required by the local jurisdiction. Contractor responsible for ensuring all proper and safe procedures are followed per manufacturer's instructions.
- C. 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.
- D. Perform pressure test per manufacturer's technical guidelines.

3.06 Protection

- A. Protect installation throughout construction process until date of final completion.
- B. Replace components that cannot be repaired.

END OF SECTION