SECTION 22 1112 PEX WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section includes PEX tubing, fittings and specialties for domestic cold water, hot water, and hot water recirculation distribution below slab within the building.

1.02 DEFINITIONS

A. Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content less than or equal to 0.25% per Safe Drinking Water Act as amended January 4th, 2011 Section 1417.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the provisions of the following codes:
 - 1. ASTM E84 Surface Burning Characteristics of Building Materials.
 - 2. ASTM F876 Standard Specification for Cross-linked Polyethylene (PEX) Tubing
 - 3. ASTM F877 Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
 - 4. ASTM F1960 Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing
 - 5. ASTM D6394 Specification for Sulfone Plastics (SP)
 - 6. ANSI/NSF Standard 14 Plastics Piping System Components and Related Materials
 - 7. ANSI/NSF Standard 61 Drinking Water System Components Health Effects
 - 8. ASTM F1807 Standard Specification for Insert Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing
 - 9. Plastics Pipe Institute (PPI) Technical Report TR-4/06
 - 10. Comply with NSF 61 Annex G and / or NSF 372 for wetted surfaces of brass or bronze fittings containing no more than 0.25% lead by weight for domestic water distribution.
 - 11. Comply with the manufacturer's installation guide for installation of PEX tubing, including methods for dealing with thermal expansion.
 - a. Uponor Professional Plumbing Installation Guide, 2010
 - b. Uponor Plumbing Design Assistance Manual, 2008
- B. PEX tubing and fittings shall be by one manufacturer assembled with the manufacturer's approved installation tools.
- C. Comply with NSF 61 Annex G for wetted surfaces of fittings containing less than or equal to 0.25% lead by weight compliance for use in domestic water service.
- D. Obtain training from the PEX tubing manufacturer for all workers that will be installing or handling the PEX tubing systems.
- E. Comply with the manufacturer's installation guide for installation of PEX tubing, including methods for dealing with thermal expansion.
- F. Installer Qualifications:
 - 1. Company specializing in performing work of the type specified in this Section, with minimum three years of documented experience.
 - Obtain installation training from the PEX tubing manufacturer for all workers that will be installing or handling the PEX tubing components per Part III "FIELD QUALITY CONTROL" below. Maintain a copy of each worker's training certificate of completion on site for the duration of the project.

1.04 SUBMITTALS

- A. Submit in accordance with conditions of Contract and Division 01 submittal procedures.
- B. Product Data: Submit data for each type of coupling, fitting and special-duty valve indicated. Include flow and pressure drop curves based on manufacturer's testing.Maintenance data for

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each tubing specialty and valve specified for inclusion in Maintenance Manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."

- C. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Failed test results and corrective action taken to achieve requirements.
- D. Submit certification that fittings for domestic water distribution comply with NSF 61 Annex G and / or NSF 372.
- E. Submit certification that tubing and fittings shall be manufactured in plants located in the United States or certified that they comply with applicable ANSI, ASTM and MSS standards.
- F. NSF Compliance:
 - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
 - 2. Comply with NSF 61, "Drinking Water System Components Health Effects; Sections 1 through 9."
- G. Submit training certificate of completion for each worker to engineer of record within 30-days of mobilization. Include copy of each worker's training certificate of completion with closeout documents.

1.05 COORDINATION

A. Reference Division 22 Section "Water Distribution Piping and Specialties" for coordination.

1.06 SPARE PARTS

- A. Maintenance Stock: Furnish the following for each system component:
 - 1. One complete crimping/expander tool set with crimp dies for each pipe size.
 - 2. One tube cutter.
 - 3. (6) fittings, tees, els and couplings and required number of crimp rings for all installed pipe sizes

1.07 WARRANTY

- A. Piping system warranty shall apply to potable water distribution and water service systems constructed of pipe and fitting products sourced from the same manufacturer.
- B. Manufacturer system warranty shall cover pipe and fittings for a duration of 25 years, from the date of installation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with Division 22 Section "Basic Plumbing Piping Materials and Methods."

PART 2 PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Manifolds:

a. REHAU PEXa & EVERLOC Fittings

- b. Uponor, Inc.
- 2. Plumbing Pipe Support Brackets
 - a. Holdrite
 - b. Sioux Chief
 - Cold Expansion Polyethylene Cross-Linked (PEX) Tubing System
 - a. REHAU PEXa & EVERLOC Fittings
 - b. Uponor, Inc.
 - c. Zurn Expansion PEX with 5306 marking

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2.02 TUBE MATERIALS, GENERAL

- A. Pipe and Tube: Refer to Part 3, Article "Pipe Applications", for identification of systems where the materials listed below are used.
- B. Cold Expansion PEX Tube: ASTM F876 and F877, SDR 9 PEX Water Tube with a pressure rating of 160psi at 73°F and blue or red color coded. Manufactured utilizing the PEX "A" method. NSF 14 certified and NSF 61 listed.
 - 1. PEX tube for hot water and hot water return shall be marked "5206".
 - 2. Factory vinyl or polyethylene corrugated sleeve for PEX tubing for underground installation.

2.03 FITTING MATERIALS

- A. Cold-expansion fittings: Meeting ASTM F1960, NSF 14 certified and NSF 61 listed, with internal diameter identical to PEX tubing sizes and manufactured from the following material types:
 - 1. 20% glass-filled polysulfone meeting ASTM D6394
 - 2. Lead-free Brass meeting ASTM B84.
 - 3. Reinforcing cold-expansion rings: Manufactured from the same source as PEX "A" tubing and marked "F1960".
- B. Stub Out Els: Square "O" strap ASTM B 88 type "L" line size copper tube with 90° bend and line size cold expansion PEX hose barb inlet.

2.04 PIPE SUPPORT BRACKETS:

- A. Sheet Stud Bracket: 20 gauge copper with nominal copper tube holes of holes of ³/₄" or 1" on 4" centers.
- B. Pipe Mounted Bracket: 20 gauge copper or plastic bracket with clamps for securing copper water tube and stainless steel hose clamp for securing bracket to vertical waste and vent pipe in wall.
 1. Brackets for installation in return air plenums shall meet ASTM E84.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Install tubing and specialties in accordance with manufacturer's installation instructions.

3.02 STORAGE AND PROTECTION

- A. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
- B. Store PEX piping in original packaging or under cover to avoid dirt or foreign material from being introduced into the piping.
- C. Do not expose PEX piping to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of piping exposed to direct sunlight.

3.03 PIPE APPLICATIONS

A. Install PEX tubing for underslab hot and cold water piping 2-1/2" and smaller for interior water piping below grade only. Maximum allowable fluid velocity is 8 feet per second. Provide equivalent SDR 9 PEX tubing nominal diameter to copper type "L" tube nominal (to provide equivalent internal diameters) as shown on the drawings:

Type "L" copper	SDR 9 PEX
Tube Size (inches)	Tubing Size (inches)
3/4	1
1	1-1/4
1-1/4	1-1/2
1-1/2	2
2	3
2-1/2	3

B. Install PEX tubing for under slab cold, hot and hot water recirculation water piping with one continuous piece of PEX tubing with no joints from the shutoff valve above grade to the shutoff valve at the fixture served. Install PEX tubing within PVC conduit with long radius fittings of

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adequate size for piping sized on indicated on plans with insulation. Hot water and hot water recirculation tubing may be installed in one conduit sized for both systems. Cold water tubing shall be installed in individual conduit. Provide cold water piping with factory vinyl or polyethylene sleeve at penetration of concrete slab. Provide insulation specified in Division 22 specification section "Plumbing Insulation".

- C. Install type "L" copper tube at the inlet and outlet of the water heater, minimum 18" long. Refer to Division 22 Section "Water Distribution Piping and Specialties" copper tubing.
- D. Install PEX tube listed to NSF-pw (CL5) chlorine resistance rating and marked "5306" for hot water and hot water return systems.
- E. Install copper tubing for hot water piping operating in excess of 140°F. Refer to Division 22 Section "Water Distribution Piping and Specialties" copper tubing.

3.04 TUBING INSTALLATION

- A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the tubing systems. Location and arrangement of tubing layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install tubing as indicated.
- B. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, unless indicated to be exposed to view.
- C. Install horizontal tubing as high as possible allowing for proper slope and coordination with other components. Install vertical tubing tight to columns or walls. Provide space to permit insulation applications, with 1-inch clearance outside the insulation
- D. Locate groups of pipes parallel to each other, spaced to permit applying full.
- E. Install tubing in a manner to prevent stress from thermal expansion with 12" wide offsets in straight runs over 20' or with loops with diameters not less then 8 tube diameters.
- F. Install nailing plate over all stud penetrations of studs.
- G. Install tubing level with no pitch.
- H. Install blue tubing for cold water and red tubing for hot or hot water recirculation.
- I. Install PEX tubing below slab with manufacturer's factory protective vinyl or polyethylene sleeve, full length and provide polyethylene shrink wrap over brass fittings.
- J. Install PEX tubing from underground thru slab with manufacturer's factory protective vinyl or polyethylene sleeve, thru full length to 6" below and above slab.
- K. Connect PEX tubing to copper tubing with lead free brass or bronze copper sweat X PEX hose barb adapters.
- L. Install PEX tubing, hangers, fittings and adapters, and provide recommended methods for controlling thermal expansion in hot water piping for straight runs every 50' per the Plastics Pipe Institute (PPI) "Residential PEX Water Supply Plumbing Systems Design Guide" and the appropriate installation guide of the installed PEX manufacturer.

3.05 HANGERS AND SUPPORTS

- A. Pipe Attachments: Install the following:
 - 1. Clamps, designed specifically for use with PEX tubing for installation inside walls.
 - 2. Pipe insulators, designed specifically for use with PEX tubing.
- B. .Support water tubing within 12" of each elbow, tee or stub out el.

3.06 PIPE AND TUBE JOINT CONSTRUCTION

A. Tubing Joints: Comply with the manufacturer's published installation instructions and use installation tools and materials by one manufacturer only – do not mix different manufacturers tools and materials.

A. Insulate hot water and hot water return piping as specified in Division 22 Section "Plumbing Insulation." Cold water piping need not be insulated.

3.08 INSTALLATION OF VALVES

- A. Installation of general duty valves is specified in Division 22 Section "General Duty Valves for Plumbing Piping."
- B. Installation of special duty valves is specified in Division 22 Section "Water Distribution Pipe and Specialties."

3.09 FIELD QUALITY CONTROL

- A. Inspections: Inspect water distribution tubing as follows:
 - 1. Do not enclose, cover, or put into operation water distribution tubing system until it has been inspected and approved by the authority having jurisdiction.
 - 2. During the progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
 - a. Rough-in Inspection: Arrange for inspection of the tubing system before concealed or closed in after system is roughed in and prior to setting fixtures.
 - b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.
 - c. Reinspections: Whenever the plumbing official finds that the tubing system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.
 - d. Reports: Prepare inspection reports signed by the plumbing official and turn over to the Architect upon completion of the project.
- B. Tubing System Test: Test water distribution systems in accordance with the procedures of the authority having jurisdiction, or in the absence of a published procedure, as follows:
 - 1. Test for leaks and defects all new water distribution tubing systems and parts of existing systems that have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
 - 2. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution tubing until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.
 - 3. Cap and subject the tubing system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the tubing system materials. Isolate the test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - 4. Repair all leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
 - 5. Reports: Prepare inspection reports and required corrective action signed by the plumbing official and turn over to the Architect upon completion of the project.

3.10 FIELD QUALITY CONTROL

- A. Installing contractor shall schedule certification training session with the PEX tubing manufacturer, or manufacturer's representative, for all workers that will be installing or handling the mechanically joined piping systems. Training shall cover the proper use of mechanically joining tools and installation of mechanically joined piping products.. Mechanically joined piping component manufacturer, or manufacturer's representative shall provide a certificate of completion for each attending worker.
- B. Provide testing procedures as defined in Division 22 Section "Water Distribution Systems and Specialties" and as specified in PEX tubing manufacturer's installation instructions.

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- C. Installing contractor shall visually inspect PEX tubing and joints and repair or replace any misaligned joints with gaps prior to calling for inspection as defined in Division 22 Section "General Plumbing Requirements."
- D. PEX tubing manufacturer's representative shall make periodic visits to the jobsite during construction to ensure the installing contractor is following the latest published manufacturer's field installation instructions and best practice procedures provided during the job-site training session.
- E. Workers performing mechanically joined joints shall initial each joint with a permanent ink marker, such as a "Sharpie". Initials shall be block letters with a minimum height of 1/4".

END OF SECTION