Specification 741 – Domestic Water
VIPERT Potable Plumbing Systems

1. General

a) Summary

- This draft specification is for potable plumbing systems using PE-RT (Polyethylene of Raised Temperature) tubing. CB Supplies distributes these systems under the name VIPERT™ Potable Plumbing Systems.

  This draft specification is provided only as an aid in development of the final specification and is not intended as a substitute for sound architectural/engineering judgment. Specifiers shall be responsible for converting this draft specification into a final specification which meets the needs of their client and complies with all applicable codes.

1.2. References

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.

a) ASSE International
(*aka,* American Society of Sanitary Engineering)
- ASSE 1061, Performance Requirements for Push-Fit Fittings

b) ASTM International
(*fka,* American Society for Testing and Materials)
- ASTM D6394, Standard Classification System for and Basis for Specification for Sulfone Plastics (SP)
- ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM F2023, Standard Test Method for Evaluating the Oxidative Resistance of Crosslinked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water
- ASTM F2769, Standard Specification for Polyethylene of Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing and Distribution Systems

c) CSA Group
(*fka,* Canadian Standards Association)
- CSA B137.18, Polyethylene of Raised Temperature Resistance (PE-RT) Tubing Systems for Pressure Applications

d) ICC
(*aka,* International Code Council)

e) ISO/IEC
(*aka,* International Organization for Standardization/International Electrotechnical Commission)
- ISO/IEC 17020, Conformity assessment — Requirements for the operation of various types of bodies performing inspection
- ISO/IEC 17065, Conformity Assessment – Requirements for Bodies Certifying Products, Processes, and Services

f) NSF International
(*fka,* National Sanitation Foundation)
- NSF/ANSI 14, Plastic Piping System Components and Related Materials
- NSF/ANSI/CAN 61, Drinking Water System Components – Health Effects
- NSF/ANSI/CAN 372, Drinking Water System Components – Lead Content

g) PPI
(*aka,* Plastics Pipe Institute)
- PPI TR-3, Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Hydrostatic Design Stresses (HDS), Pressure Design Basis (PDB), Strength Design Basis (SDB), Minimum Required Strength (MRS) Ratings, and Categorized Required Strength (CRS) for Thermoplastic Piping Materials or Pipe

- PPI TR-4, PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

h) UL
(*aka,* Underwriters Laboratories)
- ANSI/UL 263, Standard Fire Tests of Building Construction and Materials

i) ULC
(*aka,* Underwriters Laboratories of Canada)
- CAN/ULC S101, Fire Rated Assemblies
- CAN/ULC S102.2, Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials

2. Definitions

2.1. PE-RT is a polyethylene (PE) resin in which the molecular architecture has been designed such that a sufficient number of tie chains are incorporated to allow operation at elevated or raised temperatures (RT). Tie chains "tie" together the crystalline structures in the polymer, resulting in improved properties such as elevated temperature strength and performance, chemical resistance, and resistance to slow crack growth. Because these tie chains grant exceptional performance properties without the need for crosslinking, PE-RT remains a thermoplastic polymer, with a significantly reduced environmental impact compared to piping materials with equivalent performance.

2.2. Cold-expansion fittings – includes fittings, cold expansion rings, multi-port tees, manifolds, valves and elbows.

3. System Description

3.1. Design Requirements

a) Tubing shall carry recommended hydrostatic pressure ratings for water in accordance with PPI TR-3 and shall be made from resin named in PPI TR-4 as having met PPI TR-3 and ASTM D2837/D2513 policy for substantiation.

b) Tubing stress rupture data must confirm the following hydrostatic ratings with regression at 73°F linear to 50 years:
- Hydrostatic design basis (HDB) of 1600 psi.
- Hydrostatic design stress (HDS) of 1000 psi.

- Nominal water pressure rating (PR) of 250 psi.

c) Tubing shall have a ≤25 Flame Spread Index (FSI) and a ≤50 Smoke Developed Index (SDI) listing to ASTM E84 (in U.S.) or CAN/ULC S102.2 (in Canada).

3.2. 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 PE-RT tubing manufacturer per their published technical guidelines.

3.3. Compliant to the following standards:
a) ASTM F2769
b) CAN/ULC S101
c) CAN/ULC S102.2
d) CSA B137.18
e) NSF/ANSI 14
f) NSF/ANSI/CAN 61
g) NSF/ANSI/CAN 372
h) ASTM E84
i) ANSI/UL 263 through certification listings with Underwriters Laboratories, Inc. (UL).
- UL Design No. L588— 1 hour wood frame floor/ceiling assemblies
- UL Design No. K917 — 2 hour concrete floor/ceiling assemblies
- UL Design No. U383 — 1 hour wood stud/gypsum wallboard wall assemblies
- UL Design No. V461 — 1 hour steel stud/gypsum wallboard wall assemblies

4. Submittals

4.1. Approval and/or acceptance of all submittals are required prior to installation.

4.2. Product Data

a) 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.

b) Submit system design indicating pipe sizing, pipe layout, and fixture connections when required.

4.3. Certification

a) Tubing shall be third-party certified to applicable referenced standards and hold active listings with an organization accredited to ISO/IEC 17065.

b) The design shall be approved by a professional appropriately licensed in the jurisdiction where the installation will take place, as being complete and accurate.

c) Fittings shall be third-party certified to applicable standards and hold active listings with an organization accredited to ISO/IEC 17065.

4.4. Samples

a) A sufficient quantity of tubing or fittings, as agreed upon by the purchaser and the seller, shall be selected and tested to determine conformance with applicable standards.

b) In the case of no prior agreement, random samples selected by an organization accredited to ISO/IEC 17020 shall be deemed adequate.

4.5. Quality Assurance

a) Manufacturer must be a Canadian company specializing in the work of this section with a minimum of 5 years documented experience.

b) PE-RT tubing shall be manufactured in a facility whose quality management system is subject to random third-party audits by at least two organizations accredited to ISO/IEC 17020.

c) PE-RT tubing shall be third-party certified to ASTM F2769 and CSA B137.18 and hold active listings with at least two organizations accredited to ISO/IEC 17065.

d) Fittings shall be third-party certified to applicable standards and hold active listings with an organization accredited to ISO/IEC 17065.

4.6. Warranty

a) Provide manufacturer's standard written warranty.
- The manufacturer shall warrant the PE-RT tubing and cold-expansion, insert, and/or push fittings as an approved connection assembly.
- The PE-RT tubing manufacturer shall warranty the polyethylene of raised temperature tubing and all associated fittings they have supplied to be free from defects in material and workmanship for a period of twenty-five (25) years.

b) Provide installer’s guarantee as appropriate.

4.7. Delivery, Storage, And Handling

a) Deliver and store tubing and fittings in packaging with labeling in place.
- Tubing and fittings shall be kept in original packaging until required for installation.

b) Store tubing and equipment in a safe place, dry, enclosed, under cover, in a well-ventilated area.
- Do not store tubing where exposed to ultraviolet light.
- Protect tubing and manifolds from entry of contaminating materials. Install suitable plugs in open pipe ends until installation.
- Tubing shall not be dragged across the ground or other surfaces and shall be stored on a flat surface with no sharp edges.

c) Protect materials from damage by other trades.

d) Tubing shall be protected from oil, grease, paint, direct sunlight and other elements as recommended by the manufacturer.

5. Products

5.1. Acceptable Manufacturer

a) CB Supplies Ltd, 3325 190th Street, Surrey, BC, V3Z 1A7, Canada; email: salesinfo@cbsupplies.ca; website: http://cbsupplies.ca; upon whose products and equipment these specifications are based.

b) All components of the potable water distribution system shall be sourced from one supplier.

c) No substitutions allowed.

5.2. Piping

a) All pipe shall be polyethylene of raised temperature (PE-RT) tubing.

b) Supplier shall provide tubing in nominal tube sizes (NTS) 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2 and 2 in.

c) Tubing shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature (690 kPa @ 82°C) per PPI TR-4.

d) Tubing shall be made from a resin listed by PPI TR-4 to carry a recommended HDB of 1250 psi and qualify for a 0.63 design factor to establish a recommended HDS of 800 psi at 73°F (23°C) for water, with stress rupture data confirming 73°F (23°C) regression linear to 50 years.

e) Tubing shall be tested for resistance to hot chlorinated water in accordance with ASTM F2023, with a minimum extrapolated time-to-failure of 50 years when running 100% of the time at high temperature (CL5 rating).

f) Bend Radius
- Tubing shall be bent at room temperature without the use of bending tools down to a minimum bending radius of six (6) times the outside diameter.
- Normal precautions shall be taken to avoid buckling or flattening. The tubing shall be fixed by supports on both sides of the bend at installation.

g) PE-RT tubing shall be manufactured in a facility which is subject to random third-party audits by at least two organizations accredited to ISO/IEC 17020.

h) PE-RT tubing shall have a ≤25 Flame Spread Index (FSI) and a ≤50 Smoke Developed Index (SDI) listing to ASTM E84 and CAN/ULC S102.2. This listing may require the pipe to be installed in a rated insulation material.

5.3. Fittings

a) All fittings shall be third-party certified to NSF/ANSI 14 and ASTM F1807 (metal insert), ASTM F1960 (cold expansion), ASTM F2159 (insert polyalloy), or ASSE 1061 (push-fit), in active listings with an organization accredited to ISO/IEC 17065.

b) Where joints are buried underground, joints shall be wrapped if required per the manufacturer’s recommendation to protect the material.

5.4. Manifolds

a) Material: Distribution manifolds shall be manufactured of copper or polyalloy and be supplied by the piping manufacturer as a proven cataloged part of the manufacturer's system.

b) Copper manifolds
- Copper manifolds shall be manufactured from Type L copper.
- Copper and/or brass outlets shall be high temperature brazed (lead-free) into headers.

c) Polyalloy manifolds

- Polyalloy manifolds shall be manufactured from sulfone plastic (SP) as specified in ASTM D6394. The material shall be polysulfone (group 01, class 1, grades 1 or 2) or polyphenylsulfone (group 03, class 1, grade 1 or 2) or polyphenylsulfone/polysulfone blends (group 04, Class 1, grade 2).

5.5. Assembly Tools

a) Tools for assembling PE-RT tubing and fittings shall be part of the manufacturer's cataloged program or tools otherwise explicitly recommended by the manufacturer.

b) Connections shall be assembled in accordance with the manufacturer's installation instructions as well as the assembly specifications in the relevant fitting standard: ASTM F1807, ASTM F1960, ASTM F2159 or ASSE 1061.

5.6. Markings

a) Tubing shall carry the following markings every five (5) feet: Manufacturer's name or trademark; nominal size; 200 psi @ 73.4°F / 100 psi @ 180°F; cNSFus pw-G; U.P. Code; ASTM F2769/F1807/F2159/F1960/F2023; ASSE 1061; CSA B137.18; ICC-ES PMG; CAN/ULC S101 (ANSI/UL 263); CLASSIFIED UL FIRE RESISTANCE; ULC S102.2; PE 4710 (material designation code); CL5; POTABLE WATER TUBING; manufacturing date; MADE IN CANADA; footage mark.

b) Fittings shall be marked with the manufacturer's designation and certification markings.

5.7. Packaging

a) Coiled pipe shall be shipped in protective packaging marked with product name and size.

b) Straight lengths shall be packed in opaque UV-resistant bags, with packaging colour to match the tubing for ease of identification.

c) Fittings shall be shipped in protective packaging marked with product name and size.

6. Execution

6.1. Acceptable Installers

a) Installation shall be performed by qualified laborers trained in the procedures of PE-RT potable plumbing systems and appropriately licensed for the jurisdiction where the installation will take place.

b) Installers must comply with all manufacturer's installation and technical guidelines.

6.2. Inspection

a) Verify that all surfaces and supports, already installed under other sections, comply with the manufacturer's directives. Do not proceed until unsatisfactory conditions are corrected.

b) Beginning of installation means acceptance of existing conditions.

6.3. 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 connections shall be assembled using the manufacturer's approved tools in accordance with published standards and manufacturer's guidelines, where applicable.

6.4. 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
- Charge the completed, yet unconcealed pipes with air at a minimum of 40 psig.
- Do not exceed 150 psig or as required by the local jurisdiction.

c) Water Test
- Purge air from pipes.
- Charge the completed, yet unconcealed pipes with water.
- Take necessary precautions to prevent water from freezing.
- Check the system for leakage, especially at all pipe joints.

d) Perform pressure test per manufacturer's technical guidelines.

6.5. Protection

a) Protect installation throughout construction process until date of final completion.

b) Replace components that cannot be repaired.

END OF SPECIFICATION