

**Installation Standard
For
CPVC SOLVENT CEMENTED HOT AND
COLD WATER DISTRIBUTION SYSTEMS**

IS 20-2010e1

1.0 SCOPE

1.1 This standard shall govern the installation of CPVC piping (IPS pipe and SDR-11 tubing) in potable hot and cold water distributing systems within buildings. (For allowable locations and pressure, see Sections 2.9.2 and 2.9.4) Installation, material and inspection shall comply with the current edition of the UPC [UPC]TM, published by the International Association of Plumbing and Mechanical Officials, and shall also comply with this standard.

NOTE: *The following sections of the Uniform Plumbing Code apply to CPVC IPS piping and SDR-11 tubing.*

103.5 Inspections
301.0 Minimum Standards
310.0 Workmanship
311.0 Prohibited Fittings and Practices
313.0 Protection of Piping, Materials and Structures
314.0 Hangers and Supports
316.2.3 Plastic Pipe to Other Materials

Chapter 6 Water Supply and Distribution

Chapter 2* DEFINITIONS

205.0 CPVC Chlorinated Poly (Vinyl Chloride) Pipe or Tubing - "Pipe" or "Piping" includes both pipe and piping, unless specified as "IPS Pipe" or "tubing".

Table 14-1

Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot and Cold Water Distribution System ASTM D 2846
Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80 ASTM F 441
Socket Type Chlorinated Poly (Vinyl Chloride) (CPV) Plastic Pipe Fittings Schedule 40 ASTM F 438
Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings Schedule 80 F 439
Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings ASTM F 493

ABBREVIATIONS

ASTM American Society for Testing and Materials

IAPMO	International Association of Plumbing and Mechanical Officials
UPC	Uniform Plumbing Code as published by IAPMO

*The first three numbers refer to the corresponding section of the UPC.

2.0 PRODUCT REQUIREMENTS

2.1 Minimum Standards

2.1.1 Materials. Materials shall comply with the following:

Materials	ASTM Standard
Raw Material-CPVC 23447	
IPS Pipe	D 1784
Sch. 40 (1/2 in., 3/4 in. and 1 in.) (12.7 mm, 19.1 mm, 25.4 mm)	F 441
Sch. 80 (1/2 in. – 10 in.) (12.7 mm – 254 mm) Tubing	F 441
SDR 11 (1/2 in. thru 2 in.) (12.7 mm – 51 mm) Fitting	D 2846
Sch. 40 (1/2 in., 3/4 in. and 1 in.) (12.7 mm, 19.1 mm, 25.4 mm)	F 438
Sch. 80 (1/2 in. – 10 in.) (12.7 mm – 254 mm)	F 439
Tube Fittings (1/2 in. – 2 in.) (12.7 mm – 51 mm)	D 2846

2.1.2 Primer. Listed primers shall be used that are compatible with the type of listed CPVC cement and pipe used. The primer shall be a true solvent for CPVC, containing no slow drying ingredient. Cleaners shall not be allowed to be used as a substitute or equivalent for a listed primer.

Exception: Listed solvent cements that do not require the use of primer

shall be permitted for use with CPVC pipe and fittings, manufactured in accordance with ASTM D 2846, 1/2 inch through 2 inches in diameter.

Note: Manufacturer shall provide test data from an independent testing laboratory acceptable to the Administrative Authority that their CPVC pipe, together with recommended fittings has a Short Term Working Pressure (STWP) and Temperature Rating of 150 psi (1030 kPa) at 210°F (99°C) for 48 hours or more.

2.1.3 Material. Pipe and fittings are plastic and are usually light gray for IPS pipe and fittings, and tan for SDR 11 tubing and fittings.

2.2 Markings

2.2.1 Pipe and Tubing. IPS pipe and tubing markings shall be in accordance with F 441 or D 2846. [UPC 301.1.2]

2.2.2 Fittings. Fitting markings shall be in accordance with F 438 or F 439 or D 2846. [UPC 301.1.2]

Note: Standard number may be omitted on smaller fittings when marked thus with four raised dots.

2.2.3 Solvent Cement. Container labeling of CPVC solvent cement shall be in accordance with F 493.

2.2.3.1 Color. Solvent cements requiring the use of a primer shall be colored orange or gray. Solvent cements that do not require the use of a primer shall be colored yellow.

2.2.4 Primer. Primer container markings shall be in accordance with F 656.

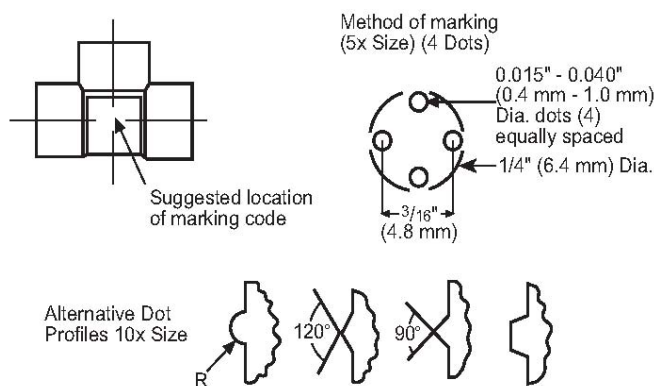
2.2.4.1 Color. Primer shall be colored so as to make its use obvious on a finished joint, but shall not be colored orange, yellow or gray.

2.2.5 Position of Markings.

Identification markings shall be visible for inspection without moving materials.

2.2.6 Alignment.

Piping and fittings shall be aligned properly without strain.



2.3 Protection of Tubing

2.3.1 Abrasion. Pipe or tubing passing through drilled or notched metal studs or joists or hollow shell masonry walls shall be protected from abrasion due to thermal expansion and contraction by elastomeric or plastic sleeves or grommets or other approved means. Straight runs may have protection at maximum 3 feet (915 mm) intervals. [UPC 313.0]

2.3.2 Puncture. Steel plate protection shall be installed when required by the Administrative Authority or section 313.9 of the Uniform Plumbing Code.

2.3.3 Storage and Handling. Pipe shall be stored in a way to protect it from mechanical damage (slitting, puncturing, etc.). It shall be stored under cover to keep it clean and avoid long term exposure to sunlight. Exposure to sunlight during normal construction periods is not harmful. CPVC solvent cements should be stored in a cool place except when actually in use

on the job site. The solvent cement manufacturer's specific storage instruction should be followed.

2.3.4 Freezing. In areas where the system must be drained to protect it from freezing, horizontal lines shall be graded to drain.

2.3.5 Overheating:

- (a) Tubing shall not be positioned or closer to devices that generate heat such that the temperature around the CPVC tubing is greater than 180°F
- (b) Do not apply direct flame onto CPVC.

2.3.6 Chemical Compatibility: Pipe and Fitting materials can be damaged by contact with chemicals found in some construction products. The chemical compatibility of such products with the particular pipe or fitting material must be verified prior to use. Otherwise, contact between the construction product and the pipe or fitting must be avoided.

2.4 Thermal Expansion

2.4.1 General. Allowance for thermal expansion and contraction shall be provided by approved means. Thermal Expansion is mainly a concern on hot water lines. In vertical piping loops are not required when the temperature change (ΔT) is 120°F or less. Allowance shall be based on an expansion rate formula listed below (See Table 1) or per the manufacturer's installation instructions.

$$\begin{aligned} \epsilon &= [3ED(\Delta L) / 2S]^{1/2} \\ \Delta L &= L_p \times C \times \Delta T \\ \Delta L &= \text{change in length of pipe in inches} \\ L_p &= \text{length of pipe in inches} \end{aligned}$$

C = coefficient of thermal expansion
for CPVC, 3.8×10^{-5} in/in/°F
 ΔT = change in temperature in °F

Note: Expansion rate is independent of the size of the pipe.

2.4.2 Offsets and Loops. Thermal expansion may be provided for by use of expansion loops, offsets, or changes of direction. From Table 1 determine the length "L" that is required. Note that "L" is based on length of run, diameter of pipe, and maximum temperature of water.

2.5 Clearance. Adequate clearance shall be provided between piping and structure (such as bored holes and sleeves) to allow for free longitudinal movement.

2.6 Hangers and Supports

2.6.1 Vertical Tubing. Vertical piping shall be supported at each floor or as specified by the design engineer to allow for expansion/contraction. Piping shall have a mid-story guide. [UPC 314.0]

2.6.2 Horizontal Tubing. Unless an engineered design is provided and approved by the Administrative Authority, the following provisions shall apply. Horizontal piping 1 inch (25.4 mm) or smaller shall be supported at maximum 3 foot (914 mm) intervals or per manufacturer's installation instructions. Piping 1-1/4 inch (32 mm) or larger shall be supported at maximum 4 foot (1219 mm) intervals or per manufacturers installation instructions.

2.6.3 Hangers and Anchors. Piping shall not be anchored rigidly to a support, but rather secured with smooth hangers or straps that provide for a degree of movement and that

prevent damage to the pipe. Hangers or straps with sharp or abrasive edges shall not be used. Hangers that pinch the piping shall not be used.

2.7 Solvent Cement Joints

2.7.1 SAFETY REQUIREMENTS AND PRECAUTIONS¹

- (a) General. Solvents contained in CPVC plastic pipe cements are classified as airborne contaminants and flammable and combustible liquids. Precautions listed in this appendix should be followed to avoid injury to personnel and the hazard of fire.
- (b) Prolonged breathing of solvent vapors should be avoided. When pipe and fittings are being joined in partially enclosed areas, a ventilating device should be used in such a manner to minimize the entry of vapors into the breathing areas.
- (c) Solvent cements should be kept away from all sources of ignition, heat, sparks and open flame.
- (d) Containers for solvent cements should be kept tightly closed except when the cement is being used.
- (e) All rags and other materials used for mopping up spills should be kept in a safety waste receptacle which should be emptied daily.
- (f) Most of the solvents used in CPVC pipe cements can be considered eye irritants and contact with the eye should be avoided for it may cause eye injury. Proper eye

- protection and the use of chemical goggles or face shields are advisable where the possibility of splashing exists in handling solvent cements. In case of eye contact, flush with plenty of water for 15 minutes and call a physician immediately.
- (g) Repeated contact with the skin should be avoided. Proper gloves impervious to and unaffected by the solvents should be worn when frequent contact with the skin is likely. Application of the solvents or solvent cements with rags and bare hands is not recommended. Brushes and other suitable applicators can be used effectively for applying the solvent cement, thus avoiding skin contact. In the event of excessive contact, remove contaminated clothing and wash skin with soap and water.

2.7.2 Selection. Follow the manufacturer's recommendations for type of solvent cements for such conditions as temperatures over 100°F (38°C), or humidity over 60%.

2.7.3 Handling (to maintain effectiveness). Package solvent cement in containers no larger than 1 quart (1 liter). Keep solvent cement can closed and in the shade when not in use. Keep applicator submerged in solvent cement between applications. Discard solvent cement when it thickens appreciably or gels. Solvent cement shall not be thinned.

2.7.4 Primer. A listed primer in compliance with ASTM F 656 shall be used with CPVC solvent cements that require the use of a primer. CPVC solvent cements that do not require the use of a primer are permitted for joints up to 2 inches in size.

2.7.5 Size of Applicator. Applicator should be about one half the pipe diameter. Do not use small applicator on large pipes.

2.7.6 Procedures

- Step 1 Cut pipe square with, mechanical cutoff saw or tube cutter designed for plastic.
- Step 2 Ream and chamfer pipe (to eliminate sharp edges, beads and all burrs).
- Step 3 Clean all dirt, moisture and grease from pipe and fitting socket. Use a clean, dry rag.
- Step 4 Check dry fit of pipe in fittings. Pipe should enter fitting socket 1/4 to 3/4 of socket depth. On larger sizes of Sch. 80 fittings, a looser fit may be expected. This is a normal condition, and requires care to apply an adequate amount of cement.
- Step 5 Apply CPVC primer (see Section 2.7.4) to inside of fitting socket. Take care to avoid puddling.
- Step 6 Apply CPVC primer to outside surface of pipe to depth of fitting socket.
- Step 7 When using solvent cements requiring a primer wait until primer surface is tacky. DO NOT attempt to soften (dissolve) the surface as is required for PVC.
- Step 8 Apply a liberal coat of CPVC solvent cement to the outside surface of the pipe to the depth of the fitting socket.
- Step 9 Apply a light coat of CPVC solvent cement to inside of fitting socket.