



NSF International

Special Engineered Specification
NSF SE 7033

CPVC / AL / CPVC
Composite Pipe / CPVC
Fittings System

The Public
Health and Safety
Company.™



**SPECIFICATIONS FOR A SPECIAL ENGINEERED (SE) PRODUCT
NSF SE7033**

CPVC / AL / CPVC Composite Pipe / CPVC Fittings System

1. Purpose:

Product specific requirements for CPVC/AL/CPVC Composite Pipe /CPVC Fitting Systems are not covered by any nationally recognized standard. This specification defines the product specific requirements for CPVC/AL/CPVC Composite Pipe /CPVC Fitting Systems for NSF/ANSI Standard 14 by NSF International. This specification serves as guide for producers, specifiers, contractors, installers and regulators to provide a basis for evaluation and acceptance as alternate materials and methods of construction.

2. Scope of Specification:

This specification establishes the testing, marking, in-plant QC and joining requirements for CPVC-AL-CPVC Composite Pipe, and CPVC Fittings. The pipe is outer diameter controlled. The system has a maximum design temperature of 180 F at a pressure of 100psi. The interchangeability of pipe and fittings defined by different manufacturers' systems is not addressed in this specification.

3. Application:

CPVC/AL/CPVC Composite Pipe /CPVC Fitting Systems are designed for hot and cold potable water distribution systems.

4. Reference Documents:

- 4.1 ASTM D1784-06a Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- 4.2 ASTM D2846/D2846M-06 Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
- 4.3 ASTM F1281-05 Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe
- 4.4 ASTM F493-04 Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
- 4.5 AWWA C901-02 Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service
- 4.6 International Plumbing Code 2006
- 4.7 International Residential Code 2006
- 4.8 Plastic Pipe Institute TR-3-2006 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
- 4.9 NSF/ANSI Standard 14-2006 Plastics Piping System Components and Related Materials
- 4.10 NSF/ANSI Standard 61-2006 Drinking Water System Components-Health Effects
- 4.11 Uniform Plumbing Code 2006



5. Testing Requirements:

- 5.1 **Basic material requirements:** CPVC material used to make pipe and fittings shall conform to the requirements of ASTM D1784 for cell classification of 23447.
- 5.2 **Long term hydrostatic strength:** CPVC-AL-CPVC pipe shall have a long-term hydrostatic design stress and hydrostatic design basis rating at 73 F and 180 F as defined in PPI-TR-3.
- 5.3 **Dimensions and Tolerances:**
- 5.3.1 CPVC/AL/CPVC pipe shall conform to manufacturer specifications for outside diameter, wall thickness and inner/outer aluminum wall thickness.
- 5.3.2 CPVC bushing shall conform to manufacturer specifications for entrance outside diameter, bottom outside diameter, minimum wall thickness and minimum length.
- 5.3.3 CPVC fittings shall conform to dimensions per ASTM D2846.
- 5.4 **Health Effects:** CPVC/AL/CPVC pipe and CPVC fittings shall conform to requirements of NSF/ANSI Standard 61.
- 5.5 **Ring Tensile:** The pipe rings, when tested in accordance with 5.5.1, shall meet the minimum strength specifications defined in Table 1.
- 5.5.1 Cut rings of the CPVC/AL/CPVC pipe so that the two sides are parallel and at $90 \pm 2^\circ$ to the pipe axis. The width of each ring shall be 25 ± 1 mm (1 ± 0.04 in.). Cut a minimum of 15 samples consecutively along the axis of the pipe. Test the 15 consecutively cut samples using a tensile testing machine. Arrange the rings so that the aluminum weld is at 90° to the tensile axis. The crosshead speed shall be 50 ± 2.5 mm/min (2 ± 0.1 in./min). Mount the rings of pipe on two steel rods of minimum diameter of 4 mm (0.16 in.). Record the peak force.

TABLE 1 Minimum Pipe Ring Strengths and 23°C (73.4°F) Burst Pressure of CPVC/AL/CPVC Pipe

Nominal Pipe Size, mm (in.)	Minimum Pipe Ring Strength
1216 (1/2)	2300 (515)
2025 (3/4)	2500 (560)
2532 (1")	2500 (560)

- 5.6 **Burst Pressure:** The minimum burst pressure for CPVC/AL/CPVC pipe shall be as given in Table 2, when tested in accordance with 5.6.1
- 5.6.1 Select a length of PEX-AL-PEX pipe at random and prepare five consecutive lengths of 300 ± 5 mm (12 ± 0.2 in.). Seal samples at the ends with the appropriate fittings and test either free- or fixed-end. Test samples at a temperature of $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$). Contain samples either in a temperature controlled water bath or in air (at standard laboratory atmosphere). For samples contained in a water bath, 1 h conditioning is required. For samples tested in air, a 16 h conditioning period is required. Determine the burst pressure in accordance with the procedure in Test Method D 1599.

TABLE 2 Minimum Burst Pressure of CPVC/AL/CPVC Pipe

Nominal Pipe Size, mm (in.)	Minimum 23°C (73.4°F) Burst Pressure, kPa (psi)
1216 (1/2)	6000 (880)
2025 (3/4)	4000 (580)
2532 (1")	4000 (580)



- 5.7 **Sustained Pressure:** Pipe and fittings shall be tested as assemblies and shall meet the minimum hydrostatic sustained pressure requirements of Section 6.2 of ASTM D2846. Table 3 summarizes the test conditions.

TABLE 3 Minimum Hydrostatic Sustained Pressure Requirements Tested at 180°F [82°C]

Test Condition	Test Duration	Hydrostatic Test Pressure in air
A	6 min	551 psi [3 800 kPa]
B	4 h	403 psi [2 780 kPa]

- 5.8 **Adhesion:** Two 5/8-inch (16 mm) long rings shall be cleanly and squarely cut from the pipe. Each of these rings shall be cut in half to form two semicircular, arc-shaped samples. The cuts in the second ring shall be at 90 degrees from those of the first ring so that each sample represents one quadrant of the full circumference of the pipe wall. Each of the halves shall be bent back, in a vise or by hand using an appropriate tool, so that the outside surfaces of the pipe are in full contact with each other, beginning at a distance equal to one wall thickness from the crotch of the bend. When visually inspected while in the bent condition, there shall be no indication of any cracking or crazing on the original inner surface of the pipe wall.
- 5.9 **Flattening:** Flatten three specimens of the pipe, 2 in. [50-mm] long, between parallel plates in a suitable press until the distance between the plates is 40 % of the outside diameter of the pipe or the walls of the pipe touch, whichever occurs first. The rate of loading shall be uniform and such that the compression is completed within 5 minutes. Upon removal of the load, examine the specimens for evidence of splitting, cracking, or breaking.
- 5.10 **Fitting requirements:** CPVC Fittings shall conform to requirements of ASTM D2846.
- 5.11 **Solvent Cement:** Solvent cement shall conform to the requirements of ASTM F493.

6. Product Marking:

- 6.1 All product marking shall be applied in such a manner that they remain legible under normal handling and installation.
- 6.2 Pipe lengths shall be marked with the following as a minimum:
- 6.2.1 Nominal tubing size
 - 6.2.2 Material designation - CPVC / AL / CPVC
 - 6.2.3 Pressure Rating and Temperature
 - 6.2.4 Corporate Name or trademark and production code
 - 6.2.5 Trade designation
 - 6.2.6 NSF pw – SE
 - 6.2.7 NSF-U.P.Code
- 6.3 Fittings shall be individually marked per ASTM D2846.
- 6.4 Insert Bushings are not required to be marked.
- 6.5 Solvent Cement container or labels shall each be marked per ASTM F493.

7. **Joining Method:** The joining method is a solvent welding between CPVC / AL / CPVC, CPVC insert bushings and CPVC Fittings. Assemble per manufacturers installation instructions.



8. In-plant Q.C. Requirements:

8.1 The following tests are to be performed at start-up and designated frequencies thereafter.

Test	Frequency
Dimensions and Tolerances – Insert Bushings	
- Entrance Outside Diameter	Weekly
- Bottom Outside Diameter	Weekly
- Minimum Wall Thickness	24-hours
- Minimum Length	Weekly
Dimensions and Tolerances – Pipe	
- Outside Diameter	2-hour
- Wall Thickness	2-hour
- Inner/Outer Aluminum Wall Thickness	2-hour
Burst Pressure – assembly ¹	24-hour
Adhesion – Pipe	24-hour
Sustained Pressure	Annually
Ring Tensile Strength	Annually
¹ - If one material is continuously used in several machines or sizes, and when a steady-state operation is obtained on each machine, sample selection shall be from a different extruder each day and rotated in sequence among all machines and sizes.	

Note: Fitting Pattern Laying Length dimensions are to be checked at each Mold Tooling Qualification. Tooling Qualifications are made to each new mold tool and after any alterations or repairs to the tool.

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