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INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS

IAPMO GUIDE CRITERIA FOR

STRUCTURAL ADHESIVE FITTING SYSTEMS FOR JOINING PVC, CPVC, ABS, PP, PE, PEX, AND COPPER TUBING

IAPMO IGC 251- 2008

1. PURPOSE

- 1.1** The purpose of this standard is to establish an acceptable standard for structural adhesive type fittings for installation on PVC, CPVC, ABS, PP, PE, PEX, and copper tube. Its purpose is to serve as a guide for producers, distributors, architects, engineers, contractors, installers, inspectors and users; to promote understanding regarding materials, manufacture and installation; and to provide identifying structural adhesive type fittings and structural adhesive materials for installation on PVC, CPVC, ABS, PP, PE, PEX, and copper tubing complying with this standard.
- 1.2** The provisions of this standard are not intended to prevent the use of any alternate material or method of construction, provided any such alternate meets the intent and requirements of this document and changes are amended to this standard.

2. SCOPE

- 2.1** This standard covers the minimum requirements for the materials and performance of a joining system that includes a structural adhesive and fittings, and prescribes the minimum test requirements for the performance of the fittings and adhesive when used with PVC, CPVC, ABS, PP, PE, PEX, and copper tube, together with methods of marking and identification.

3. REFERENCED STANDARDS

- 3.1** All standards referenced herein shall be the current edition of that standard.

ASME B1.20.1	Pipe Threads, General Purpose (inch)
ASTM D1002	Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens
ASTM D2556	Apparent Viscosity of Adhesives Having Shear-Rate Dependent Flow Properties
ASTM D 2000	Classification Systems for Rubber Products in Automotive Applications

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NSF/ANSI 61
ASTM F 1498

Drinking Water System Components – Health Effects
taper Pipe Threads 60° for Thermoplastic Pipe and Fittings

4. GENERAL REQUIREMENTS

- 4.1 Structural Adhesive.** The structural adhesive material shall comply with the minimum performance requirements within the Sections 5.1 of this standard.
- 4.2 Tubing** The tubing shall comply with the requirements of the applicable ASTM or ASME standard.
- 4.3 Fittings.** The fittings shall comply with the material requirements of the applicable ASTM or ASME standard. The dimensional requirements shall be in accordance with the manufacturer's specifications and shall be compatible with the tubing in Section 4.2 of this standard.
- 4.4 Seals.** Seals shall be made of an elastomer in accordance with ASTM D 2000.
- 4.4.1** The seals shall exhibit a compression set resistance value of less than 80% for predicted long term exposure for 30 years when tested at 73°F (23°C) and 212°F (100°C).
- 4.5 Threaded Ends.** Threaded ends shall comply with ASTM F 1498 or ASME B1.20.1.
- 4.6 Toxicity.** All materials that come in contact with potable water shall comply with NSF/ANSI 61.

5. TESTING REQUIREMENTS

- 5.1 Adhesive Material Tests.**
- 5.1.1 Lap Shear.** The adhesive shall be tested in accordance with ASTM D 1002 using a tensile pulling machine and a pull rate of 0.1 in/min (2.5 mm/min). The test coupons shall measure 1" wide x 4" long (25.4 mm x 101.6 mm). Copper coupons shall measure 1/16" (1.5 mm) thick and plastic coupons shall measure 1/8" (3.17 mm) thick. The bond line thickness shall be maintained at 0.005" (0.127 mm) minimum, with 1/2" (12.7 mm) overlap of the adhesive joint. The adhesive shall be allowed to cure in accordance with manufacturer's installation instructions. For copper, surface preparation shall include light abrasion with fine grit sandpaper followed by a dry wipe using a clean cloth. The test shall be performed at both 72 ± 5°F (22 ± 3°C) and 180 ± 5°F (82 ± 3°C), and the test specimens shall be conditioned at the desired test temperature for a minimum of 4 hours before testing. Five repetitions shall be performed for each material. The cured adhesive shall have an average peak pull stress of 1,600 psi (11.0 MPa) minimum at both temperatures.

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- 5.1.2 Lap Shear after Hot Water Immersion.** The cured adhesive shall be tested as described in Section 5.1.1 after subjecting the test specimens to a minimum of 1000 hours of immersion in $120 \pm 5^{\circ}\text{F}$ ($49 \pm 3^{\circ}\text{C}$) tap water. The adhesive shall be tested within one hour after removal from the high temperature water. The test shall be performed at $72 \pm 5^{\circ}\text{F}$ ($22 \pm 3^{\circ}\text{C}$). Five repetitions shall be performed for each material. The cured adhesive shall have an average peak pull stress of 1,600 psi (11.0 MPa) minimum.
- 5.1.3 Lap Shear after High Temperature and Humidity Exposure.** The adhesive shall be tested as described in Section 5.1.1 after subjecting the test specimens to a minimum of 1000 hours exposure in an environment of $120 \pm 5^{\circ}\text{F}$ ($49 \pm 3^{\circ}\text{C}$) and $80 \pm 5\%$ relative humidity. The adhesive shall be tested within one hour after removal from the environmental chamber. The test shall be performed at $72 \pm 5^{\circ}\text{F}$ ($22 \pm 3^{\circ}\text{C}$). Five repetitions shall be performed for each material. The cured adhesive shall have an average peak pull stress of 1,600 psi (11.0 MPa) minimum.
- 5.1.4 Viscosity.** The apparent viscosity of the adhesive components shall be individually tested in accordance with ASTM D 2556 at a temperature of $80 \pm 3^{\circ}\text{F}$ ($27 \pm 2^{\circ}\text{C}$). The weighted average viscosity of the mixed adhesive, according to its mix ratio, shall be in the range from 20,000 to 60,000 cP (14.4 to 40.3 lb/(ft·s)).
- 5.1.5 Long-Term Load Test.** Prepare lap shear specimens with the selected coupon material as described in Section 5.1.1 and allow adhesive to cure per manufacture's installation requirements. Using dead weights, springs, or other suitable equipment, apply a constant load of 50 ± 2 lbf (220 ± 10 N) to the test specimen at $72 \pm 5^{\circ}\text{F}$ ($22 \pm 3^{\circ}\text{C}$). The cured adhesive shall hold this force for a minimum of 1,000 hours.
- 5.2 System Test.** Structural adhesive fittings system covered under this standard shall comply with the following physical test requirements in Section 5.2.1 – 5.2.5 of this standard and shall be tested in accordance with piping standards previously listed in Section 4.2. Fittings shall be tested with each type of tubing that they are designed to join. For copper tubing use type L hard drawn copper tubing.
- 5.2.1 Tension Test.** The test sample shall contain a structural adhesive coupling joint cured in accordance with manufacturer's installation instructions. The sample shall be restrained on both tube ends and pulled with a tensile tester at 72°F (20°C) nominal room temperature. Pull product to failure or sustained force for a minimum of 1 minute. The joint shall comply with the minimum requirements listed below in Table 1.

Table 1: Force for Separation

Size	Fitting System Pressure Rating	
	80 psi (551 kPa)	250 psi (1723 kPa)

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