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INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS

MATERIAL and PROPERTY STANDARD FOR

HOT WATER CIRCULATING DEVICES WHICH DO NOT USE A PUMP

PS 116-99

1. PURPOSE

- 1.1** The purpose of this standard is to establish an acceptable standard for hot water circulating devices which do not use a pump and are installed in potable water piping systems. Its purpose is to serve as a guide for producers, distributors, architects, engineers, contractors, installers, inspectors and users; to promote an understanding regarding materials, manufacture and installation; and to provide for identifying potable hot water circulating system devices that conform to 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 that any such alternate meets or exceeds the requirements of this standard.

2. SCOPE

- 2.1** This standard covers definitions, performance requirements, tests and describes a method of marking and identification for a hot water circulating device which does not use a pump and is installed in potable water piping systems.

3. DEFINITIONS

- 3.1 Hot Water Circulating Devices which do not use a pump.** Any device which, circulates or allows circulation of hot water continuously from a water heating device to the fixtures where the hot water will be used, without the use of a pump. The circulating device will effectively limit crossover between the hot and cold water lines.
- 3.2 Nominal pressure (PN).** An alphanumeric designation related to the mechanical characteristics of the components of a piping system and used for reference purposes. This is normally referred to as pressure rating.

4. REQUIREMENTS

- 4.1 For non pumped systems without a return line(s).** The device must prevent crossover between the hot and cold water lines when the valve mechanism is closed.
- 4.2 For non pumped systems that use a return line(s).** The device must prevent flow of water in the return line in the direction of the fixtures.

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- 4.3 Working Pressures and Temperatures.** Hot water circulating systems shall be designed to function at working pressures within the acceptable range of domestic potable water systems. Minimum pressure ratings shall be 150 psi at 73°F and 100 psi at 140°F.
- 4.4 Potable Water Requirement.** Products intended for contact with potable water shall be evaluated, tested and certified for conformance with NSF Standard No. 61 or the applicable health effects portion of NSF Standard No. 14 by an acceptable certifying organization when required by the regulatory authority having jurisdiction.
- 4.5 Dimensions.**
- 4.5.1 Device End Connections.** End connections shall meet the dimensional requirement contained within the appropriate nationally recognized standard as referenced in Table 14-1 of the Uniform Plumbing Code corresponding to the material of construction for the end connections.
- 4.6 Pressure Drop Across The Device.** When tested in accordance with Section 5.4 the pressure drop across the device shall be within $\pm 10\%$ of the manufacturer's published values at 25, 50, 75, and 100% of maximum flow. The maximum flow rate shall be either as specified by the manufacturer, or the flow achieved when tested in accordance with Section 5.4 when initially set up with 80 psig inlet pressure (at no flow condition) and using pipe of the same nominal size as the device.
- 4.7 Leak Through Reverse Direction of Valve Mechanisms.** This requirement is applicable to valves with a specified flow direction, and check valves. The reverse flow rate (leakage) through the valve shall not exceed .01% of the flow that would exist if the valve were not installed, when tested in accordance with Section 5.5.
- 4.8 Sampling.**
- 4.8.1** For qualification of a new design or new material, a representative sample shall be used for all tests in Section 5.
- 4.8.2** For routine testing, sampling shall be in accordance with ASTM D1898, based on sampling for attributes, random sampling, and the sample size based on the lot size of finished products using General Inspection Level II. Regardless of sample size, any failure of any test means the lot does not meet the requirements of this specification.
- 4.9 Sampling Conditioning.**
- 4.9.1** Prior to testing, all samples shall be conditioned at $73 \pm 3.6^\circ\text{F}$ for not less than 40 hours immediately preceding testing.
- 4.10 Workmanship, Finish, and Appearance.**
- 4.10.1** The requirements of this section are verified by visual (non-magnified) inspection of the components and surfaces.

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- 4.10.2** The surfaces of all thermoplastic and metallic components shall be free from grooves, pinholes, or other defects which will affect the performance and service of the device or assembly.
- 4.10.3** The thermoplastic materials, after molding or fabrication, shall be as uniform as commercially practical in color and opacity.

5. TEST REQUIREMENTS

5.1 Resistance to Hydrostatic Pressure

- 5.1.1** Test Specimen assemblies shall consist of devices, fittings, and pipe, using pipe sufficient to withstand internal hydrostatic pressure until failure occurs in the device. Each assembly shall contain the same devices, fittings, and pipe in the same configurations.
- 5.1.2** Hydrostatic pressure testing shall be conducted in accordance with the method and at the times, temperatures, and pressures given in Table 1.
- 5.1.3** Failure is defined as any loss of pressure in the assembly, due to failure of any component of the devices or fittings under test.
- 5.1.4** All devices and fittings used to construct the assemblies shall be considered in compliance upon successful completion of this test. The lot from which this representative sample was drawn will also be considered in compliance upon successful completion of this test.

5.2 Dimensioning

- 5.2.1** Dimensions shall be measured in accordance with ASTM D2122. For those part dimensions that are not covered by ASTM D2122, the method of determining dimensions shall be noted on the test report.
- 5.2.2 Threads.** All thermoplastic taper pipe threads shall be gauged in accordance with Specification F1498. All plastic threads shall be molded, male threads. No female or cut threads are permitted. All metal taper pipe threads shall be gauged in accordance with ASME B1.20.1.

5.3 Joint Tightness

- 5.3.1** Conduct testing on 3 specimens of the same size/configuration.
- 5.3.2** Water shall be used as the internal pressurizing fluid. The water temperature shall be the maximum temperature for which the device nominal pressure was verified with a tolerance of $\pm 3.6^{\circ}\text{F}$.
- 5.3.3** The device shall be subjected to 20 psig for 1 hour, and then raised to 2.5 times the nominal pressure of the device and maintained for 1 hour.
- 5.3.4** Any leakage or failure of the device during the full test duration constitutes failure of this test.

5.4 Pressure Drop Across Devices

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