METHODS FOR TESTING SNAP-IN TUBELESS TIRE VALVES—SAE J1206

SAE Standard

Report of Highway Tire Committee approved September 1977. Editorial change August 1978.

1. Scope—This standard contains recommended test methods for *snap-in* tubeless tire valves for use up to 60 psig (415 kPa) intended for, but not limited to, highway applications. A *snap-in valve* is a tire valve having a rigid housing adhered to a resilient body designed to retain and seal the valve in the rim hole.

2. References

2.1 Current Tire and Rim Association Yearbook.

2.2 ISO/DIS 3877/H—Tyres, valves, and tubes—List of equivalent terms.

3. General Requirements—Paragraph numbers of Section 4, Test Methods, of this document correspond to Section 4, Test Values, of SAE J1205, Performance Requirements for Snap-In Tubeless Tire Valves (August, 1978).

3.1 A snap-in valve is a unit free of rubber in the air passage, no rubber or cement above the second thread on the housing and without flow cracks, blisters, voids, or other molding defects. Mold parting line flash should not exceed 0.050 in (1.3 mm) in height and 0.006 in (0.15 mm) thickness at the outer edge.

3.2 Test Fixtures

Break both edges of the valve hole to approximately 0.005 in (0.13 mm) radius. Emery cloth or suitable tooling is recommended. It is recommended that material of the test fixture be representative of the material of the actual rim.

3.3 All valves, while wet with clean water as a lubricant, shall be installed in a proper test fixture by applying valve insertion force to the end of the valve metal insert, perpendicular to the plane of the valve mounting hole and directly through the center of the valve mounting hole. No valve assembly, however, shall be tested which has damage resulting from installation.

A valve shall be considered properly seated when all of the indicator ring is observed to be through the rim or fixture valve mounting hole.

After installation, valve assemblies must be thoroughly dried in the sealing area before continuing tests.

3.4 Definitions

3.4.1 Unused valves are those that have completed final manufacturing processing at least 24 h previously and have not been subjected to any test or service conditions (excluding the hardness test). Rubber compounds may change characteristics during their life expectancy.

3.4.2 Aged valves are those unused valves that have been subjected to 212 ± 5°F (100 ± 3°C) for 4 h in circulating hot air and cooled at 68–78°F (20–26°C) for a minimum of 4 h.

4. Test Methods

4.1 **Adhesion**—Subject unused molded valve to 212 ± 5°F (100 ± 3°C) for 4 h in a hot air circulating oven and allow to cool at 68–78°F (20–26°C) for 24 h. Make two axial, parallel cuts 180 deg apart through the full thickness of the rubber cover down the entire length of the valve. Pull each side of the button base away from the insert towards the cap thread end.

4.2 **Hardness**—The rubber hardness of unused and aged snap-in valves shall be tested midway on the button base on a smooth area with a Shore Type A-2 Durometer gauge. The recommended equipment for this test is a Shore CVXAMX Conveloader Type A-2 Durometer (see Fig. 1).

4.2.1 Hardness shall be measured on unused valves (see paragraph 3.4).

4.2.2 Hardness shall be measured on aged valves.

4.3 **Valve Core Seal**—Valve cores installed in snap-in valve assemblies within standard pin height tolerance, +0.010–0.035 in (+0.25–0.90 mm) with reference to valve mouth, and standard torque, 1.5–3 lb-in (0.17–0.34 N • m), shall be tested with valve caps removed as follows:

4.3.1 Room Temperature Test—Completely immerse valve assembly in clean water with mouth down vertically and not more than 4 in (100 mm) below the surface of the water (see Fig. 3). Pressure test—1. Cup gasket seal—Apply 5 psig (35 kPa) air pressure. 2. Barrel seal—Apply 60 psig (415 kPa) air pressure.

TEST	RIM OR TEST[a,b] PLATE THICKNESS	TEST HOLE DIA FOR NOMINAL HOLE DIA	
		0.453 in (11.51 mm)	0.625 in (15.88 mm)
Valve to Rim Seal Test—low and high temperature test (see paragraphs 4.4.1 and 4.4.2)	0.126 ± 0.002 in (3.20 ± 0.05 mm)	0.458 $^{+0.000\text{ in}}_{-0.002\text{ in}}$ (11.63 $^{+0.00}_{-0.05}$ mm)	0.633 $^{+0.000\text{ in}}_{-0.002\text{ in}}$ (16.08 $^{+0.00}_{-0.05}$ mm)
Burst or Unseating (see paragraph 4.6)	0.126 ± 0.002 in (3.20 ± 0.05 mm)	0.458 $^{+0.000\text{ in}}_{-0.002\text{ in}}$ (11.63 $^{+0.00}_{-0.005}$ mm)	0.633 $^{+0.000\text{ in}}_{-0.002\text{ in}}$ (16.08 $^{+0.00}_{-0.005}$ mm)
Installation Tests (see paragraphs 4.5.1 and 4.5.2)	0.126 ± 0.002 in (3.20 ± 0.05 mm)	0.448 $^{+0.002\text{ in}}_{-0.000\text{ in}}$ (11.38 $^{+0.05}_{-0.05}$ mm)	0.618 $^{+0.002\text{ in}}_{-0.000\text{ in}}$ (15.70 $^{+0.05}_{-0.00}$ mm)
Ozone Resistance (see paragraph 4.7)	0.126 ± 0.002 in (3.20 ± 0.05 mm)	0.448 $^{+0.002\text{ in}}_{-0.000\text{ in}}$ (11.38 $^{+0.05}_{-0.00}$ mm)	0.618 $^{+0.002\text{ in}}_{-0.000\text{ in}}$ (15.70 $^{+0.05}_{-0.00}$ mm)

[a] The primary external seal of a "snap-in" valve in a valve hole is obtained from the rubber compression of the valve body onto the internal surfaces of the valve hole. Secondary external sealing may be present by the contact of the remainder of the valve body exterior to the surface of the material around the valve hole. Either or both of these seals may be affected by the compound curvatures existing in the wheel rims and by stock thickness.

[b] At the time of this writing (1977), applications of "snap-in" valves to wheels of stock thicknesses at the valve hole of 0.059–0.157 in (1.50–4.00 mm) are operating successfully. It is recommended that when "snap-in" valves are to be used in wheels approaching or exceeding these wheel stock thickness limits, that extensive laboratory and field service tests be conducted to insure operating reliability.

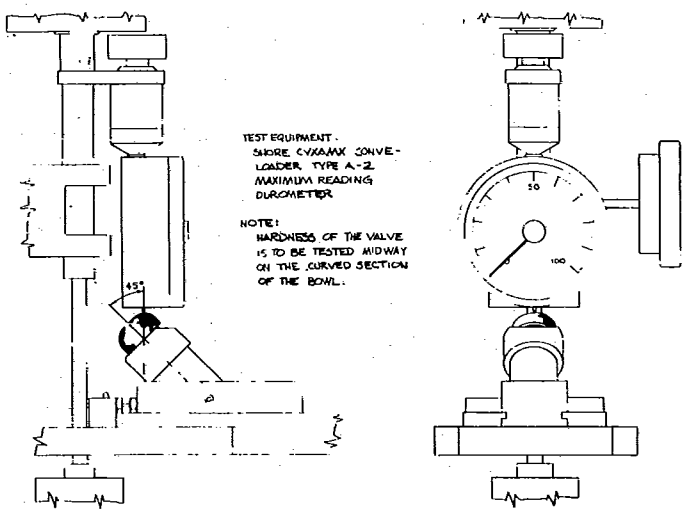

FIG. 1—DUROMETER TEST FIXTURE

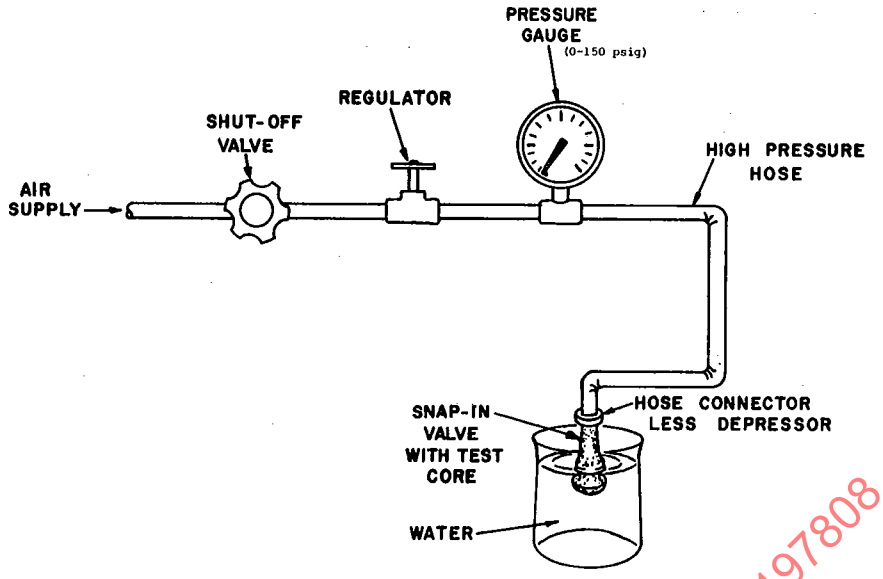

FIG. 2—TEST SET-UP—VALVE CORE OPENING OR UNSEALING PRESSURE

4.3.2 Low Temperature Test (may be conducted with paragraph 4.4.1)—Depress and release valve core pin once after a 4 h minimum exposure at −40 ± 5°F (−40 ± 3°C). Check for leakage with −40 ± 5°F (−40 ± 3°C) methanol 1 in (25 mm) above valve mouth with assembly pressurized to 26 psig (180 kPa). Begin leak detection after 1 min soak period.

4.3.3 High Temperature Test (may be conducted with paragraph 4.4.2)—If this test is not conducted with paragraph 4.4.2, pressure and temperature requirements shall be duplicated. Depress and release valve core pin once after 6 h minimum soak period at 212 ± 5°F (100 ± 3°C). Check for leakage with 150 ± 5°F (66 ± 3°C) clean water not more than 2 in (50 mm) above mouth of valve.

4.4 Valve to Rim Seal—Temperature tests are performed to subject the valves to extremes in temperature. Flexing of valves simulates possible operational conditions. The same valves and assemblies as shown may be used for both tests provided the low temperature test is conducted first. (See Fig. 4.)

4.4.1 Low Temperature—The test valve (or valves) shall be mounted in a test plate (or actual wheel rim) as specified in paragraphs 3.2 and 3.3. The test assembly shall then be exposed to a temperature of −40 ± 5°F (−40 ± 3°C) for the period of 4 h minimum to insure that the valve seal area is at the test temperature. The valve assembly, pressurized to 26 ± 2 psig (180 ± 15 kPa) shall then be immersed valve mouth up in methanol at −40 ± 5°F (−40 ± 3°C).

With respect to the axis of the valve mounting hole, the immersed valve shall be flexed to angle of 25 ± 3 deg. The cap end of the valve shall then be revolved one complete turn around the axis of the mounting hole. This single revolution shall be executed at a uniform rate without the application of torque to the valve body and shall be accomplished within 15–45 s.

Conduct the above procedure at 0.5 h intervals for a total of five times.

4.4.2 High Temperature—The assembly shall be pressurized to 26 ± 2 psig (180 ± 15 kPa) at 68–78°F (20–26°C) temperature. The procedure in paragraph 4.4.1 is repeated except that the soak temperature is at 212 ± 5°F (100 ± 3°C) for 72 h in a hot air circulating oven to simulate aging. The assembly is completely immersed valve mouth up in water at not less than 150°F (66°C) during flexing. This procedure is performed twice in every 24 h period with a minimum of a 6 h interval between tests for a total of 6 cycles. The last test shall be performed at the end of the 72 h. The assembly shall be returned to the hot air oven after each test.

4.5 Installation Tests

4.5.1 Force to Seat—The valve shall be installed into a fixture as specified in paragraphs 3.2 and 3.3 at a rate of 6 ± 0.5 in (150 ± 15 mm) per minute with a method of measuring the force required.

4.5.2 Force to Pull Out—After the valve is installed as in paragraph 4.5.1, additional force shall be applied as in paragraph 4.5.1 and the force to break the valve or pull it out of the hole shall be measured.

4.6 Burst—The valve shall be installed into a fixture as specified in paragraphs 3.2 and 3.3; hydrostatic pressure shall be applied to the valve base at a rate to attain a pressure of 180 psig (1240 kPa) over a 1 min interval. This test shall be conducted at 68–78°F (20–26°C). This maximum pressure shall be maintained for two additional minutes.

4.7 Ozone Resistance—The unmounted valve shall be aged for 72 h at 212 ± 5°F (100 ± 3°C) (alternate equivalent aging 18 h at 250 ± 5°F (121 ± 3°C)) in a hot air circulating oven. The aged valve is installed in a test fixture as specified in paragraphs 3.2 and 3.3. With respect to the axis of the mounting hole, the valve is deflected 10 deg from its axis and retained in that position for the duration of the test. The retained valve is placed into a darkened enclosure at 68–78°F (20–26°C) for a minimum of 24 h. The valve shall then be tested in ozone circulating chamber, maintaining 100 ± 5 parts of ozone to 100 million parts of air for three days at 100 ± 5°F (38 ± 3°C).

4.8 Valve Core Opening or Unsealing Pressure—Depress core pin and release same. Install valve assembly in test fixture (Ref. paragraph 4.3 and Fig. 2). Raise pressure until core opens to allow 10–25 bubbles per minute flow. Record pressure.

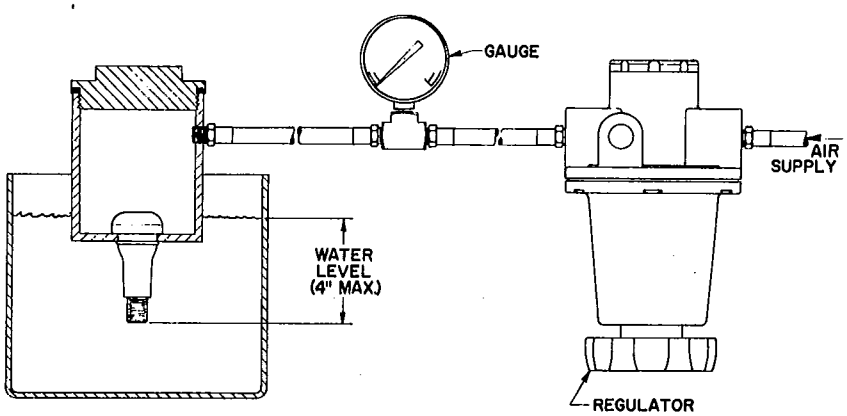

FIG. 3—TEST SET UP—ROOM TEMPERATURE LEAK TEST