

specified as having a diameter that is 75 percent of the nominal inside diameter of the hose. This would allow for testing of any and all sizes of hose. NHTSA welcomes public comments on this issue.

The agency notes that it is proposing to specify use of a plug gauge rather than a steel ball for constriction testing of other types of hose to which FMVSS No. 106 applies. For the adhesion test, however, it would not be possible to use a plug gauge because the hose is closed off at both ends during the test. Accordingly, NHTSA proposes to specify the use of a steel ball to test air brake hose for adhesion. Finally, the agency proposes to update the ASTM tension testing machine reference in S8.9 from the 1964 version currently in FMVSS No. 106 to the latest revision of that standard, *Standard Practices for Force Verification of Testing Machines*, Designation E4-99.

#### 11. Air Pressure (Leakage)

FMVSS No. 106 specifies that an air brake hose assembly be subjected to a 200-psi pressure test. Once the target pressure is reached, the hose is sealed and the pressure drop over a five-minute period may not exceed 5 psi.

SAE J1402 has two test procedures to evaluate the leakage from air hose assemblies. In the first test, two hose assemblies are tested as follows. One hose assembly is subjected to the high temperature resistance test described above, and is then subjected to a 300-psi pressure test using air or nitrogen, under water, with no visible leakage for 30 seconds. The second hose assembly is subjected to the low temperature resistance test described above, and is then subjected to a 300-psi pressure test using air or nitrogen, under water, with no visible leakage for 30 seconds.

In the second test, a flexure test is performed as follows. A test hose assembly is prepared to the length shown in Figure 2 of that standard. The hose is preconditioned by exposure to a salt spray for 24 hours with the ends sealed, followed by high-temperature aging at 212 degrees F for 70 hours with the ends open and, within 168 hours of completion of the preconditioning, the hose is subjected to the flex test. The hose is mounted on the flex test fixture as described in Figure 2, with the hose being subjected to a 6-inch stroke while the air pressure in the hose is cycled between 0 psi for one minute and 150 psi for one minute. With the flexure machine stroking at 100 cycles per minute, the hose is subjected to 1 million stroke cycles. Upon completion of the 1 million cycles, the hose must be capable of maintaining 150-psi  $\pm$ 10 psi

when air is supplied through a 1/16-inch diameter orifice.

The SAE J1402 specifications for hose leakage are more severe than those presently in FMVSS No. 106, and NHTSA proposes incorporating them into Standard 106, with the following modifications. SAE J1402 specifies that upon completion of the high-temperature aging test, the hose assembly must be flex tested within 168 hours. NHTSA tentatively concludes there could be variability introduced in the test results if, for example, the hose was immediately flex tested after the high-temperature test, or if the hose were allowed to cool before being flex tested. Therefore, NHTSA proposes that upon completion of the high-temperature aging test, the hose assembly be cooled at room temperature for two hours, and the flex test then be initiated within 166 hours from that time.

NHTSA also proposes to modify SAE J1402's testing procedures by specifying the thickness of the orifice during the final leak check because the thickness of the orifice, and not only the diameter of the orifice, affects the rate at which air can be supplied to the hose. This would be critical if a small amount of hose leakage is present during the final leakage test. NHTSA proposes specifying an orifice thickness of 0.032 inches (1/32-inch), which is the same thickness specified for the orifice in FMVSS No. 121 S5.3.5, *Control signal pressure differential for converter dollies and trailers designed to tow another vehicle equipped with air brakes*. NHTSA tentatively concludes that this proposed orifice dimension would supply air at a greater rate than any thicker orifice while still providing sufficient mechanical strength to withstand the test conditions. NHTSA welcomes comments on this proposal.

With respect to the amount of leakage that is permitted after the flex test is conducted, SAE J1402 is not absolutely specific. SAE J1402 defines failure as the hose's inability to be repressurized to 150-psi  $\pm$ 10 psi, supplied through the 0.062-inch orifice, within 2 minutes. SAE J1402 specifies that the supply air pressure to the orifice is 150 psi  $\pm$ 10 psi. Accordingly, a hose supplied with up to 160-psi supply air pressure and resulting in 140-psi pressure in the hose assembly could conceivably be construed as passing the test. On the other hand, the specifications could be construed as permitting no leakage, that the pressure in the hose assembly must equal the supply pressure, within a range of 140 psi to 160 psi. If that were the case, however, there would be no

need for an orifice to be included in the test apparatus.

NHTSA proposes to specify a supply pressure of 150 psi and to further specify that the pressure in the hose assembly must reach 140 psi within 2 minutes. NHTSA notes that this is consistent with the existing requirements in FMVSS No. 106, S7.3.8 *Air pressure*, which permits a small amount of leakage in an air brake hose assembly, albeit without prior conditioning. NHTSA welcomes comments on these proposed leakage specifications.

#### 12. Burst Strength

FMVSS No. 106 requires that an air brake hose assembly shall not rupture when subjected to a hydrostatic pressure of 800 psi. SAE J1402 specifies that a hose assembly be first subjected to a 24-hour salt spray test, with no resulting corrosion other than as permitted by that standard, and then shall not burst or separate from an end fitting at a hydrostatic pressure of 900 psi. SAE J1402's burst strength specifications/requirements are more severe than those in FMVSS No. 106. NHTSA proposes to incorporate SAE J1402's burst strength specifications/requirements into Standard No. 106.

#### 13. Tensile Strength

FMVSS No. 106 specifies that a hose assembly for use between either the frame and the axle or between a towed and towing vehicle meet a longitudinal pull test, at a 1 inch per minute force application rate, and not separate from its end fittings at the following force levels: 250 pounds for 1/4 inch or less, or 6mm or less, nominal ID; 325 pounds for more than 1/4 inch or 6mm nominal ID. A hose assembly used in any other application must withstand force levels of: 50 pounds for 1/4 inch or less (or 6 mm or less) nominal ID; 150 pounds for 3/8 inch, 1/2 inch, or 10 mm to 12 mm, nominal ID; and 325 pounds if the hose assembly is larger than 1/2 inch (or 12 mm) nominal ID. A coiled nylon tube assembly can either meet these requirements or, alternatively, can meet the requirements in FMCSR § 393.45.

The distinction between a brake hose used between a frame and axle or between a towed and towing unit, and hose used for other purposes, was added to Standard No. 106 on February 26, 1974 (39 FR 7425), in response to petitions for reconsideration of certain brake hose requirements. This distinction was introduced in response to the inclusion of plastic tubing as an air brake hose, and permitted lower tensile strength requirements for plastic tubing used in chassis applications.