Designation: D622 – 99 (Reapproved 2012)

Standard Test Methods for Rubber Hose for Automotive Air and Vacuum Brake System[1]

This standard is issued under the fixed designation D622; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense. These test methods were prepared jointly by the Society of Automotive Engineers and the American Society for Testing and Materials.

1. Scope

1.1 These test methods are intended for use in testing the conventional types of hose employed for the operation of air brake and vacuum brake systems,[2] either on a single motor vehicle or as connecting or transmission lines in a combination of vehicles. The hose may be assembled with suitable metal couplings or may be as fabricated for use with detachable fittings. The term "rubber" as used in these test methods includes synthetic compounds as well as compounds of natural rubber.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D380 Test Methods for Rubber Hose

D413 Test Methods for Rubber Property—Adhesion to Flexible Substrate

D471 Test Method for Rubber Property—Effect of Liquids

D573 Test Method for Rubber—Deterioration in an Air Oven

D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment

D2240 Test Method for Rubber Property—Durometer Hardness

E4 Practices for Force Verification of Testing Machines

2.2 *SAE Standards:*[2]

J1402 Automotive Air Brake Hose and Hose Assemblies

J1403 Vacuum Brake Hose

3. Significance and Use

3.1 The purpose of these test methods are to provide nationally recognized test methods for air brake and vacuum brake hose, in particular the hose specifications SAE J1402 and SAE J1403, and to provide producers, distributors, and users with a basis for evaluating the characteristics of these hose products.

4. General Methods

4.1 The special tests described in these test methods shall be applied as required in order to comply with the detailed specifications for these types of hose. Otherwise, the general methods in Test Methods D380 shall be used and are hereby made a part of these test methods.

4.2 In case of a conflict between the provisions of these general test methods and those of detailed specifications or test methods for a particular hose, the latter shall take precedence.

5. Sampling

5.1 One representative sample of each lot to be tested shall be taken. The total length of hose required for all tests is as follows:

Air brake hose	approximately 3 m (9 ft)
Vacuum brake hose	approximately 5 m (15 ft)

5.2 Each test specimen shall be prepared from the original sample without having been subjected to any previous test.

5.3 In the interest of safety, any hose remaining intact after these tests shall be destroyed.

[1] These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.31 on Rubber Hose and Belting.

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[2] For specifications covering hose of these types, reference should be made to the Air Brake Hose (SAE J1402) and for Vacuum Brake Hose (SAE J1403) of the Society of Automotive Engineers, SAE Handbook. Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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TABLE 1 Ball Size for Testing Adhesion of Wire Reinforced Hose

Hose Inside Diameter	mm	4.8	6.4	7.9	9.5	10.3	11.1	12.7	15.9
	in.	3/16	1/4	5/16	3/8	13/32	7/16	1/2	5/8
Ball Size	mm	3.6	4.8	6.0	7.1	7.5	8.3	9.5	11.9
	in.	9/64	3/16	15/64	9/32	19/64	21/64	3/8	15/32

6. Test Conditions

6.1 The temperature of the testing room shall be maintained at 23 ± 5°C (73 ± 9°F). The temperature of the test samples shall be stabilized at the testing room temperature prior to testing.

TESTS APPLICABLE TO BOTH AIR BRAKE AND VACUUM BRAKE HOSE

7. Hydrostatic Bursting Test

7.1 Conduct the hydrostatic bursting test in accordance with Test Methods D380.

8. Adhesion Test

8.1 *Fiber Reinforced Hose*—Conduct the adhesion test between component parts of fiber reinforced hose in accordance with Test Methods D413, Machine Method.

8.2 *Wire Reinforced Hose*—Conduct the adhesion test on specimens with a minimum length of 380 mm (15 in.) prepared from the original sample without having been subject to previous tests.

8.2.1 *Procedure*—Place a steel ball of the size specified in Table 1 in the bore of the hose. Completely close one end against air leakage and connect the other end to a vacuum pump. Subject the bore of the hose to a reduced pressure (vacuum) of 85 kPa (25 in. Hg) for a period of 5 min while in an essentially straight position. At the end of this period and while still under the reduced pressure, bend the hose 3.14 rad (180°) to the minimum radius specified in Table 2 in each of two directions 3.14 rad (180°) apart.

8.2.1.1 After bending and returning to an essentially straight position and while still under reduced pressure, the ball shall be rolled from end to end of the hose. Failure of the ball to pass freely from end to end shall be an indication of separation of the tube from the carcass due to inadequate adhesion. Report any separation.

9. Ozone Resistance Test

9.1 Bend a specimen of hose of full circumference around a mandrel and tie the ends together where they cross one another with tie wire. The mandrel shall be a diameter twice the minimum bend radius specified in Table 2 for air brake hose and 8 times the nominal outside diameter for vacuum brake hose. The specimen length shall be about 250 mm (10 in.) longer than the mandrel circumference. Seal the ends of the hose with plugs on caps in such a manner that the reinforcement and inner tube will not be exposed to ozone.

9.2 Condition the hose for 24 ± ½ h in air at room temperature and while still on the mandrel place in an exposure chamber in accordance with Test Method D1149, containing air mixed with ozone, with ozone at a partial pressure of 50 ± 5 mPa (formerly expressed as pphm, see Test Method D1149 for explanation). The ambient air temperature in the chamber during the test shall be 40 ± 2°C (104 ± 3.6°F). Expose the specimen to the ozone and air mixture for a period of 70 ± 2 h. To determine conformance to this requirement, examine the cover of the specimen under 7× magnification, ignoring areas immediately adjacent to or within the area covered by the tie wire.

9.3 Report any cracks.

10. Oil Immersion Test

10.1 When required by the detailed specification, determine the changes in volume, tensile strength, ultimate elongation, and hardness of the tube and cover in accordance with Test Method D471, using IRM 903 oil[4] at a temperature of 100 ± 2°C (212 ± 3.6°F) and an immersion period of 70 ± 2 h. Prepare the test specimen from samples taken from the hose. They shall be as near the size specified in Test Method D471 as can be obtained from the hose being tested.

TESTS APPLICABLE TO AIR BRAKE HOSE

11. Proof Pressure Test

11.1 Assemble a specimen of hose 450 mm (18 in.) in length, with service couplings and connect to a source of air or nitrogen pressure. Submerge the hose and couplings entirely in water such that visual observation of the assembly is permitted, apply an internal pressure of 2070 ± 70 kPa (300 ± 10 psi) and maintain for 5 min. Report any evidence of leakage from the hose or couplings. Initial appearance of bubbles may be indications of air entrapped in hose wall. Agitate the hose after 2 min to break air bubbles from surface. Following this, a persistent stream of bubbles from any location shall be considered failure to meet test.

12. Assembly Tension Test

12.1 *Apparatus*—A tension testing machine conforming to the requirements of Practices E4 and provided with an indicating device to give the total force in newtons (or pounds-force) at the conclusion of the test.

12.2 Assemble a specimen of hose 450 mm (18 in.) in length, with service couplings. Hold the assembly in the testing machine so that the hose and couplings will have a straight center line corresponding to the direction of the machine pull. Apply a steady tension force to the hose assembly at a speed such that the moving head travels at the rate of 0.4 ± 0.04 mm/s (1.0 ± 0.1 in./min) until failure occurs, either by

[4] IRM 903 oil is described in Test Method D471.

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