SAE International™ SURFACE VEHICLE STANDARD

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Power Steering Pressure Hose—Wire Braid

1. ***Scope***—This specification covers hose fabricated from wire braid and synthetic rubber, assembled with end fittings for use in automotive applications up to 10.3 MPa (1500 psi) maximum pressure, as flexible connections within the temperature range of –40 °C to 121 °C (–40 °F to +250 °F) average, 13.5 °C (275 °F) maximum peaks.

The specification in this SAE Standard originated in the SAE-ASTM Technical Committee on Automotive Rubber (other than tires). They represent the correlation of the best information available from research investigation and production experience on the minimum constructional and performance characteristics essential for new power steering assemblies used as original or replacement equipment. This standard applies to passenger cars. It may prove useful to truck manufacturers, but it is not to be presented as present practices.

They also represent the minimum quality recognized by original equipment manufacturers and hose suppliers as essential for satisfactory and safe operation by the hose itself and other coacting parts of the power steering system. The original equipment manufacturer may, at his option, add or alter tests through OEM specifications.

1.1 Rationale—This document has been designated noncurrent by the Automotive Brake and Steering Hose Committee. There have been no changes to the document since the last revision (MAY1998) due to the absence of technical experts for the standard on the committee. Care should be taken by those using this standard and recognize its noncurrent designation.

2. ***References***

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein.

2.1.1 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 380—Methods of Testing Rubber Hose
ASTM D 413—Tests for Adhesion of Vulcanized Rubber (Friction Test)
ASTM D 571—Testing Automotive Hydraulic Brake Hose
ASTM D 1149—Test for Accelerated Ozone Cracking of Vulcanized Rubber

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3. ***Hose Construction***—The construction of this hose embodies a smooth bore inner tube of suitable synthetic rubber material, reinforced with one ply of wire braid and covered with a synthetic rubber outer cover.

4. ***Dimensions***—Hose must be within the tolerances shown in Tables 1A and 1B. In addition, the concentricity, based upon full indicator reading, between the inside bore and the outer surface of the hose shall not exceed 0.076 cm (0.030 in).

TABLE 1A—HOSE DIMENSIONS (METRIC)

Nominal ID, cm	Nominal OD, cm	ID Tolerance, cm	OD Tolerance, cm	Wire OD, cm	Working Pressure, max, MPa	Proof Pressure, MPa	Burst Strength, min, MPa	Tensile Strength, min, N	Bend Radius, min, cm
0.952	1.984	1.011/0.932	2.062/1.905	1.567/1.450	10.3	13.8	62	4448.2	12.7
1.27	2.302	1.349/1.232	2.383/0.223	1.905/1.748	10.3	13.8	55.2	5337.9	17.78

TABLE 1B—HOSE DIMENSIONS (ENGLISH)

Nominal ID, in	Nominal OD, in	ID Tolerance, in	OD Tolerance, in	Wire OD, in	Working Pressure, max, psi	Proof Pressure, psi	Burst Strength, min, psi	Tensile Strength, min, lb	Bend Radius, min, in.
3/8	25/32	0.398/0.367	0.812/0.750	0.617/0.571	1500	2000	9000	1000	5
1/2	29/32	0.531/0.485	0.938/0.875	0.750/0.688	1500	2000	8000	1200	7

5. ***Test Procedures***—Procedures described in ASTM D 380 shall be followed wherever applicable.

6. ***Qualification Tests***—To qualify hose under this specification, all of the requirements shown under Test Requirements must be met.

7. ***Inspection Tests***—Production shipments or lots of qualified hose shall be tested in accordance with Table 2 and shall conform to the applicable test requirements, but the user may test hose or hose assemblies from any or all such production shipments or lots to all the test requirements. Fourteen sample hose assemblies, selected at random, as listed in Table 2 are required to conduct a complete test. In the event of a failure, the test or tests which have failed shall be retested using twice the number of samples indicated in Table 2. Failure of any of the retested samples shall be cause for rejection of the entire lot.

TABLE 2—INSPECTION TESTS

Test	Samples Required
1. Length Change (paragraph 9.7) followed by Bursting Strength (paragraph 9.5)	3
2. Tensile (paragraph 9. 2)	3
3. Adhesion (paragraph 9.4)	1
4. Low Temperature Flexibility (paragraph 9.3)	1
5. Impulse (paragraph 9.1)	6

8. ***Frequency of Testing for Inspection***—All inspection tests except Impulse shall be performed on either a bulk hose lot or a coupled hose lot basis or tests may be split between a bulk hose lot and a coupled hose lot.

A coupled hose lot shall not exceed 10,000 hose assemblies and a bulk hose lot shall not exceed 6096 m (20 000 ft) of bulk hose. The lot size for Impulse testing shall not exceed 30 480 (100 000 ft) of bulk hose.

9. Test Requirements

9.1 Impulse Test

9.1.1 TEST CONDITIONS

a. Oil Temperature—135 °C ± 2 °C (275 °F ± 5 °F).
b. Ambient Temperature—104 °C ± 11 °C (220 °F ± 20 °F).
c. Cycle Rate—30 to 40 per minute.
d. Cycle Data—Pressure rise time, 0.20 s ± 0.10 s. High pressure hold time, 0.65 s ± 0.20 s. Pressure drop time, 0.20 s ± 0.10 s.
e. Pressure Variation—0 to 0.69 MPa (0 to 100 psi) to maximum working pressure listed in Table 1B.

9.1.2 HYDRAULIC FLUID AND TEST FIXTURE——As specified by the original equipment manufacturer.

9.1.3 CYCLE LIFE——Samples submitted to this test shall exceed 100 000 cycles for inspection acceptance and 225 000 cycles for qualification testing, without failure.

9.2 Tensile Test—When tested in accordance with ASTM D 571, hose assemblies shall withstand a minimum tensile load as specified in Table 1B without the fittings pulling off or rupture of the hose.

9.3 Low Temperature Flexibility—Hose and/or hose assemblies shall be subjected to –40 °C ± 1 °C (–40 °F ± 2 °F) for 24 h. After this time and while still at –40 °C ± 1 °C (–40 °F ± 2 °F), the samples shall be flexed over a mandrel having a diameter equal to twice the minimum bend radius specified in Table 1B in 4 s or less. Hose shall be bent through 180 degrees over the mandrel. After flexing, the sample shall be allowed to warm to room temperature and be visually examined for cover cracks and subjected to the proof test. There shall be no cover cracks or leakage.

9.4 Adhesion Test—When tested in accordance with ASTM D 413, a pull of not less than 44.48 N (10 lb(shall be required to separate a 2.54 cm (1 in) wide ring section of the bond between the cover and the reinforcement.

9.5 Bursting Strength—Samples shall meet the minimum bursting strength requirements shown in Table 1B.

9.6 Ozone Resistance—Test procedure and apparatus shall be in accordance with ASTM D 1149, where applicable. A specimen of the hose shall be bent around a mandrel having an outside diameter seven times the nominal outside diameter of the hose under test. The two ends of the hose shall be tied where they cross one another with enameled copper or aluminum wire. After mounting, the specimens shall be permitted to rest in a relatively ozone-free atmosphere for 24 hr at room temperature. The mounted specimen shall be placed in a suitable ozone test chamber that is maintained at an ozone concentration of 50 ± 5 parts ozone per 100 million parts of air (by volume) and a chamber ambient temperature of 38 °C ± 1 °C (100 °F ± 2 °F).

After 72 hr of exposure, specimens shall be removed from the chamber and permitted to cool to room temperature and then, while still on the mandrel, shall be visually inspected for signs of cracking under 7X magnification. There shall be no evidence of cracking of the cover.

9.7 Length Change—Hose shall not change in length more than +2%, –4% when pressure is increased from 0 MPa (0 psig) to maximum working pressure shown in Table 1B.

9.8 Tensile Strength and Elongation

a. Original Tensile Strength of Tube—6.9 MPa (1000 psi) min
b. Original Elongation of Cover—175% min
c. Original Elongation of Tube—100% min