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SAE The Engineering Society For Advancing Mobility Land Sea Air and Space

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

HIGHWAY VEHICLE STANDARD

Submitted for recognition as an American National Standard

SAE J191

Issued August 1970
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Superseding J191 AUG70

(R) POWER STEERING PRESSURE HOSE - LOW VOLUMETRIC EXPANSION TYPE

FOREWORD: This document represents 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. SCOPE:

This document covers hose fabricated from fabric braid and synthetic rubber, assembled with end fittings for use in automotive power steering applications at pressures as indicated in Table 1, as flexible connections within the temperature range of -40°C (-40°F) to 121°C (250°F) average, 149°C (300°F) maximum peaks.

These hoses are intended for use in applications where reduction in amplitude of pump pressure pulsations is not required.

2. HOSE CONSTRUCTION:

The construction of this hose embodies a smooth bore inner tube of suitable synthetic rubber material, reinforced with two plies of braided fabric and covered with a synthetic rubber outer cover.

3. DIMENSIONS:

Hose must be within the tolerances shown in Table 1. In addition, the concentricity based on full indicator reading between the inside bore and the outer surface of the hose shall not exceed 0.030 in.

4. TEST PROCEDURES:

Procedures described in ASTM D 380, Methods of Testing Rubber Hose, shall be followed wherever applicable.

TABLE 1

Nominal ID, in	Nominal OD, in	ID Tolerance, in	OD Tolerance, in	Working Pressure, max, psi	Proof Pressure, psi	Burst Strength, min, psi	Tensile Strength, min, lb
1/4	9/16	0.275/0.240	0.592/0.552	1300	2000	6000	450

5. QUALIFICATION TESTS:

To qualify hose under this document, all of the requirements shown in Section 8 must be met.

6. 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 that 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 (8.7) followed by Bursting Strength (8.5)	3
2. Tensile (8.2)	3
3. Adhesion (8.4)	1
4. Low Temperature Flexibility (8.3)	1
5. Impulse (8.1)	6

7. 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 20 000 ft of bulk hose. The lot size for impulse testing shall not exceed 100 000 ft of bulk hose.

8. TEST REQUIREMENTS:

8.1 Impulse Test:

8.1.1 Test Conditions:

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

8.1.2 Hydraulic Fluid and Test Fixture: As specified by the original equipment manufacturer.

8.1.3 Cycle Life: Samples submitted to this test shall exceed 100 000 cycles for inspection acceptance and 225 000 cycles for qualification testing, without failure.

8.2 Tensile Test: When tested in accordance with ASTM D 380, hose assemblies shall withstand a minimum tensile load as specified in Table 1 without the fittings pulling off or rupture of the hose.

8.3 Low Temperature Flexibility: Samples shall be subjected to a temperature of -40°C ± 1 (-40°F ± 2) for a period of 24 h, after which the hose shall be flexed in the cold chamber through 180 deg from the centerline around a mandrel whose diameter is eight times the nominal hose OD. Flexing shall be accomplished within 4 s. Hose shall not fracture or show any cracks, checks, or breaks in the tube or cover.

8.4 Adhesion Test: When tested in accordance with ASTM D 413, Tests for Adhesion of Vulcanized Rubber (Friction Test), a pull of not less than 10 lb shall be required to separate a 1 in wide ring section of the bond between any adjacent layers of the hose.

8.5 Bursting Strength: Samples shall meet the minimum bursting strength requirements shown in Table 1.

8.6 Ozone Resistance: The outer cover of the hose shall show no cracking when examining the cover of the hose under 7X magnification, ignoring the areas immediately adjacent to or within the area covered by the binding.

Bend the hose around a cylinder, the diameter of which shall be seven times the nominal outside diameter of the hose, and bind the ends. The cylinder and binding shall be made of metal or materials that prevent the consumption of ozone. If the hose collapses when bent around the cylinder, provide for internal support of the hose.

Condition the hose, on the cylinder, for 24.0 h ± 0.5 at room temperature, and then place it in an exposure chamber containing air mixed with ozone in the proportion of 50 ppm ± 5 ozone in air by volume, for 70 to 72 h. Ambient air temperature in chamber during test shall be 40°C ± 3 (104°F ± 5).

8.6 (Continued):

Examine the cover of the hose for cracks under 7X magnification, ignoring the areas immediately adjacent to or within the area covered by the binding.

8.7 Length Change: Hose shall not change in length more than +2%, -4% when pressure is increased from 0 psi to the maximum working pressure shown in Table 1.

8.8 Tensile Strength and Elongation:

Original tensile strength of cover:	1000 psi min
Original tensile strength of tube:	1000 psi min
Original elongation of cover:	175% min
Original elongation of tube:	150% min

8.9 Dry Heat Resistance: After oven aging for 70 h at a temperature of 100°C (212°F), the reduction in tensile strength and elongation of specimens taken from tube and cover material shall not exceed the following values:

Original tensile strength:	20%
Original elongation:	50%

8.10 Oil Resistance: After 70 h immersion in ASTM No. 3 oil at a temperature of 121°C (250°F), the reduction in tensile strength and elongation of specimens taken from the tube material shall not exceed the following values:

Original tensile strength:	65%
Original elongation:	50%

In addition, the volume change of specimens taken from the tube and cover material shall not exceed 0 to +100%.

8.11 Identification Marking: Hose shall be identified with the SAE number, type, size of inside diameter in fractions, date code in days of the year, and last digit of the year (for example, 1707 represents the 170th day of 1987), and hose manufacturer's and/or coupling manufacturer's code marking. This marking shall appear on the outer cover of the hose at intervals of not greater than 10 in. Additional identification may be added as agreed on by user and supplier.

8.12 100% Proof Pressure Test: Each hose assembly shall be proof pressure tested using air, oil, or water as the pressure medium. Hose shall be tested at the maximum working pressure when air is used or at the proof pressure shown in Table 1 when tested with oil or water. Care should be taken when testing with air due to its explosive nature at high pressure.

The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

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RATIONALE:

The purpose of this task force was to update SAE J188, J189, and J191 to the current state-of-the-art.

Members of the task force included the major automotive companies, hose manufacturers and hose assembly fabricators for original equipment and the aftermarket.

The work on this project started several years ago.

These documents were last revised in August 1970. The task force has updated the documents to include the current OEM temperature and pressure requirements for the impulse test, revised the ozone test procedure and eliminated one hose size in SAE J191 that is no longer used. There were several other minor changes.

These changes were unanimously approved by the task force.

RELATIONSHIP OF SAE STANDARD TO ISO STANDARD:

Not applicable.

REFERENCE SECTION:

ASTM D 380, Methods of Testing Rubber Hose

ASTM D 413, Tests for Adhesion of Vulcanized Rubber (Friction Test)

APPLICATION:

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COMMITTEE COMPOSITION:

DEVELOPED BY THE SAE POWER STEERING HOSE STANDARDS COMMITTEE:

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