SAE International™ SURFACE VEHICLE STANDARD

SAE J1037 REAF. MAR2006

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Superseding J1037 AUG2001

Windshield Washer Tubing

1. ***Scope***—This SAE Standard covers nonreinforced, extruded, flexible tubing intended primarily for use as fluid lines for automotive windshield washer systems which conform to the requirements of SAE J942.

1.1 Rationale—This document has been reaffirmed to comply with the SAE 5-Year Review policy.

2. ***References***

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J942—Passenger Car Windshield Washer Systems
SAE J1231—Formed Tube Ends for Hose Connections

2.1.2 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 573—Test for Rubber—Deterioration in an Air Oven
ASTM D 925—Test Method for Rubber Property—Staining of Surfaces
ASTM D 1149—Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber
ASTM D 2240—Test Method for Rubber Property Durometer Hardness

3. ***Dimensions***—Typical available sizes are noted in Table 1. The Nominal Tube Size is for reference purposes only. Tubing should be made to the ID Dimensions and Tolerances shown in Table 1.

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SAE WEB ADDRESS: http://www.sae.org

TABLE 1—TUBE ID DIMENSIONS AND TOLERANCES(1)

Nominal Tube Size mm	Nominal Tube Size in	ID Dimension mm	Tolerance mm
3	1/8	2.54	±0.25
4.5	3/16	3.96	±0.40
6	1/4	5.56	±0.40

1. Dimensions and tolerances, others than those shown in Table 1, must be agreed upon by both the manufacturer and customer.

4. Requirements—The following tests shall be conducted on full sections of tubing, except when noted otherwise. All test values indicated herein are based on samples conditioned at standard laboratory test conditions of 23 °C ± 2 °C and 50% ± 5% relative humidity for not less than 24 h prior to testing and tested under the same conditions unless otherwise specified.

4.1 Hardness Durometer A (ASTM D 2240)—70 points ± 5 points.

4.2 Tensile Strength

a. Tensile Strength—7.0 MPa, minimum
b. Elongation—200%, minimum

4.2.1 TEST METHOD—Tubing 250 mm long is fastened to the jaws of a tensile tester by means of knots tied in both ends with two washers located between the knots and the washers fastened in the jaws. The jaw separation rate shall be 500 mm ± 25 mm per minute until failure occurs. If the tubing fails in the knots or within 25 mm of the knots, then the tests should be rerun until failure occurs in the section between the knots. To obtain the cross-sectional area of tubing, an optical comparator or similar instrument may be used.

4.2.2 ALTERNATE TEST METHOD—If the tubing continues to fail in the knot, the tensile strength and elongation may be obtained by testing of cured slabs according to ASTM D 380. The test method used should be recorded with the results.

4.3 Burst Pressure (ASTM D 380)—0.70 MPa, minimum

4.4 Formed Tube End or Connector Pull-Off Force

TABLE 2—PULL-OFF FORCE(1)

Nominal Tube Size mm	Beaded Tube Fitting Dimension SAE J1231 Fitting OD Dimension E mm	Beaded Tube Fitting Dimension SAE J1231 Fitting Bead Diameter Dimension F mm	Pull-Off Force N
3	3.17	3.77	22
4.5	4.78	5.59	44
6	6.35	7.37	66

1. For Tube Sizes other than the ones in Table 2, refer to SAE J1231. If the Tube Size is not included in SAE J1231, it is recommended that the Beaded Tube Fitting OD should be 20% greater than the Tube ID Dimension and the Bead Diameter should be 35% greater than the Tube ID Dimension. For Tube Sizes other than those in Table 2, the manufacturer and customer shall agree upon the Pull-Off Force.

4.4.1 TEST METHOD—150 mm specimen lengths of tubing shall be installed on the respective size beaded tube or plastic connector fitting as described in SAE J1231. The beaded tube ends or plastic connectors used shall be clean and dry. The tubing specimens shall be as received with no preparation of the bore. If a lubricant is required to facilitate installation, only isooctane or similar evaporative petroleum derivative may be used. After installation, the specimens shall be allowed to stabilize at standard laboratory test temperature for 48 h. Using a suitable tensioning device at a pull rate of 500 mm per min ± 25 mm per min, the rubber tubing shall not be pulled from the fitting with less than the specified force in Table 2.

4.5 Vacuum Collapse Test—30%, maximum.

The collapse of the OD of the tubing under internal vacuum of 610 mm of mercury for 5 min shall be 30% max. The test shall be made with the tubing curved to a radius equal to five times the maximum OD.

4.6 Wax Bloom—There shall be no visible evidence of wax or any other contaminants exuding from the inside or outside diameter of the tubing.

4.6.1 TEST METHOD—Condition a 150 mm section of tubing for 45 min at –40 °C. Remove the specimen from the cold chamber and permit recovery to room temperature for 1 h. The tubing shall then be twisted 360 degrees for 10 successive cycles, after which the center 50 mm section shall be compressed 10 successive cycles by finger pressure or utilization of a compression device to full closure of the ID. The tubing shall then be sectioned longitudinally and examined for evidence of wax bloom or other contaminants.

4.7 Tear Test—The tubing shall not tear when expanded to a minimum internal diameter of two times the nominal ID by forcing the tubing over a 30 degree tapered, clean metal rod which has been lubricated with a silicone parting agent. The metal rod shall have a finish of 20 rms maximum.

4.8 Formed Tube End Pull-Off Force After Sequential Heat Aging/Ozone Exposure

4.8.1 TEST METHOD—150 mm specimen lengths of tubing shall be installed on formed tube ends or plastic connector as described in Table 2. The tubing shall be heat aged as in accordance with ASTM D 573 for 70 h at 125 °C. After 24 h stabilization period at standard laboratory test conditions, the heat aged tubing shall be exposed in an ozone test chamber as described in 4.10. At the end of the exposure, the specimens shall be allowed to cool to standard laboratory test conditions for minimum of 16 h. Using a suitable tensioning device at a pull rate of 500 mm per min ± 25 mm per min, the rubber tubing shall not be pulled from the formed tube end with less than the specified force in Table 3.

TABLE 3—PULL-OFF FORCE AFTER SEQUENTIAL HEAT AGING/OZONE EXPOSURE(1)

Nominal Tube Size mm	Pull-Off Force N
3	18
4.5	35
6	53

1. For dimensions other than those in Table 3, the Pull-Off Force should be 80% of the unaged Pull-Off Force as agreed upon by the manufacturer and customer.