SAE International

SURFACE VEHICLE STANDARD

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Marine Exhaust Hose

RATIONALE

This document is being modified in order to update the ozone test concentration to be consistent with other marine hose related test specifications. Specifications including SAE J1527 and ISO 7840 require an ozone test concentration of 100 mPa (100 pphm). This concentration will be incorporated into SAE J2006.

1. SCOPE

This SAE Standard covers the flexible components of marine engine wet exhaust systems from the connection at the engine exhaust manifold to the hull or overboard discharge fittings.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org

ASTM D 380 Standard Test Methods for Rubber Hose

ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension

ASTM D 413 Standard Test Methods for Rubber Property - Adhesion to Flexible Substrate

ASTM D 1149 Test Method for Rubber Deterioration Surface - Ozone Cracking in a Chamber

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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2.1.2 ISO Publications

Available from International Organization for Standardization, 1 rue de Varembe, 1211 Geneva 20, Switzerland. (Also available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036.)

ISO 1402 Rubber and Plastic Hoses and Hose Assemblies - Hydrostatic Testing

ISO 1817 Rubber, Vulcanized - Determination of the Effects of Liquids

ISO 7326 Rubber and Plastics Hoses - Assessment of Ozone Resistance Under Static Conditions

3. HOSE CONSTRUCTION

3.1 Style R1 (Softwall)

Construction of this hose embodies a smooth bore polymer tube, reinforced with one or more plies of synthetic fabric and finished with a cover which meets all the sections of this document except Section 8.

3.2 Style R2 (Hardwall)

Construction of this hose embodies a smooth bore polymer tube, reinforced with one or more plies of synthetic fabric and rigid helix imbedded within a polymeric media and finished with a cover which meets all the sections of this document.

3.3 Style R3 (Flexible Connectors)

Construction of this connector consists of a polymer resistant to ozone and heat, with or without reinforcing or abrasion resistant cover, which is intended for use in short sections in locations where the connector is protected from mechanical damage. These flexible connectors must meet Sections 4, 5, 6, 7, and 9 of this document.

4. BURST TEST

The minimum burst per ASTM D 380 or ISO 1402 shall be 250 kPa (36 psi).

5. TENSILE STRENGTH AND ELONGATION PER ASTM D 412 OR ISO 37

Test specimens shall be obtained from production hose samples.

a. Original tensile strength of cover: 7.0 MPa (1020 psi) minimum

b. Original tensile strength of tube: 8.0 MPa (1160 psi) minimum

c. Original elongation of tube and cover: 200% minimum

6. ADHESION TEST

The minimum load required to separate a 25 mm (1 in) width of tube, plies, and cover at 23 °C ± 2 °C (73 °F ± 3.6 °F) per ASTM D 413 shall be 54 N (12 lb).

7. OZONE RESISTANCE

Test procedure and apparatus shall be in accordance with ASTM D 1149 or ISO 7326 where applicable. Prepare a specimen by cutting a strip of whole hose 13 mm wide x 100 mm long (0.5 x 4 in), tie the specimen, cover out, around a mandrel with a diameter equal to approximately one-half the hose diameter. After mounting, the specimen shall be allowed to rest in an ozone-free atmosphere for 24 h at 23 °C ± 2 °C (73 °F ± 3.6 °F). The mounted specimen shall be placed in a test chamber with an ozone concentration of 100 mPa ± 5 mPa (100 pphm ± 5 pphm) at a temperature of 40 °C ± 2 °C (104 °F ± 3.6 °F). After 70 h of exposure, the specimen shall be removed and allowed to cool to a temperature of 23 °C ± 2 (73 °F ± 3.6) and then inspected. The specimen shall be visually inspected under 7X magnification and must meet a “zero” rating except for the area immediately adjacent to the wire, which shall be ignored. This test applies to the cover only of hose manufactured with a cover and Style R3 hose that does not have a cover. For hose with a cover, cracks in the exposed tube and cut edges of the cover shall be ignored.

8. ABRASION TEST

Style R2 Only

8.1 Principle

Three individual 38 mm (1-1/2 in) ID hoses of identical construction shall be selected for a test lot. These hoses shall incorporate a cover compounded and constructed the same as for all other sizes to be qualified by this test lot. Hose to be qualified by this test lot shall not have a cover thickness less than those of the test lot. After 1000 test cycles, each hose in the test lot shall not have any rigid helix exposed.

8.2 Procedure

The test hoses shall be preconditioned for at least 24 h at 23 °C ± 2 °C (73 °F ± 3.6 °F) and 50% ± 5% relative humidity. Testing shall then be performed at the above temperature with an unused abrasive surface for each hose sample.

The test hose shall be mandrel supported and rotated at a constant speed of 80 rpm ± 2 rpm. The rotating hose shall be subjected to a laterally moving abrasive surface (80 grit, coarse, AL2O3 emery cloth) parallel to the longitudinal axis of the test hose.

The abrasive surface shall be 25 x 75 mm ± 5 mm (1 x 3 in ± 0.25 in) firmly affixed to a hard surface which will cycle back and forth 75 mm ± 5 mm (3 in ± 0.25 in) in each direction.

A constant normal force of 45 N ± 0.5 N (10 lb ± 2 oz) shall be applied to the abrasive surface.

One test cycle equals 360 degrees rotation of the outside diameter and one back and forth movement of the abrasive surface.

See Figure 1 for a typical apparatus.

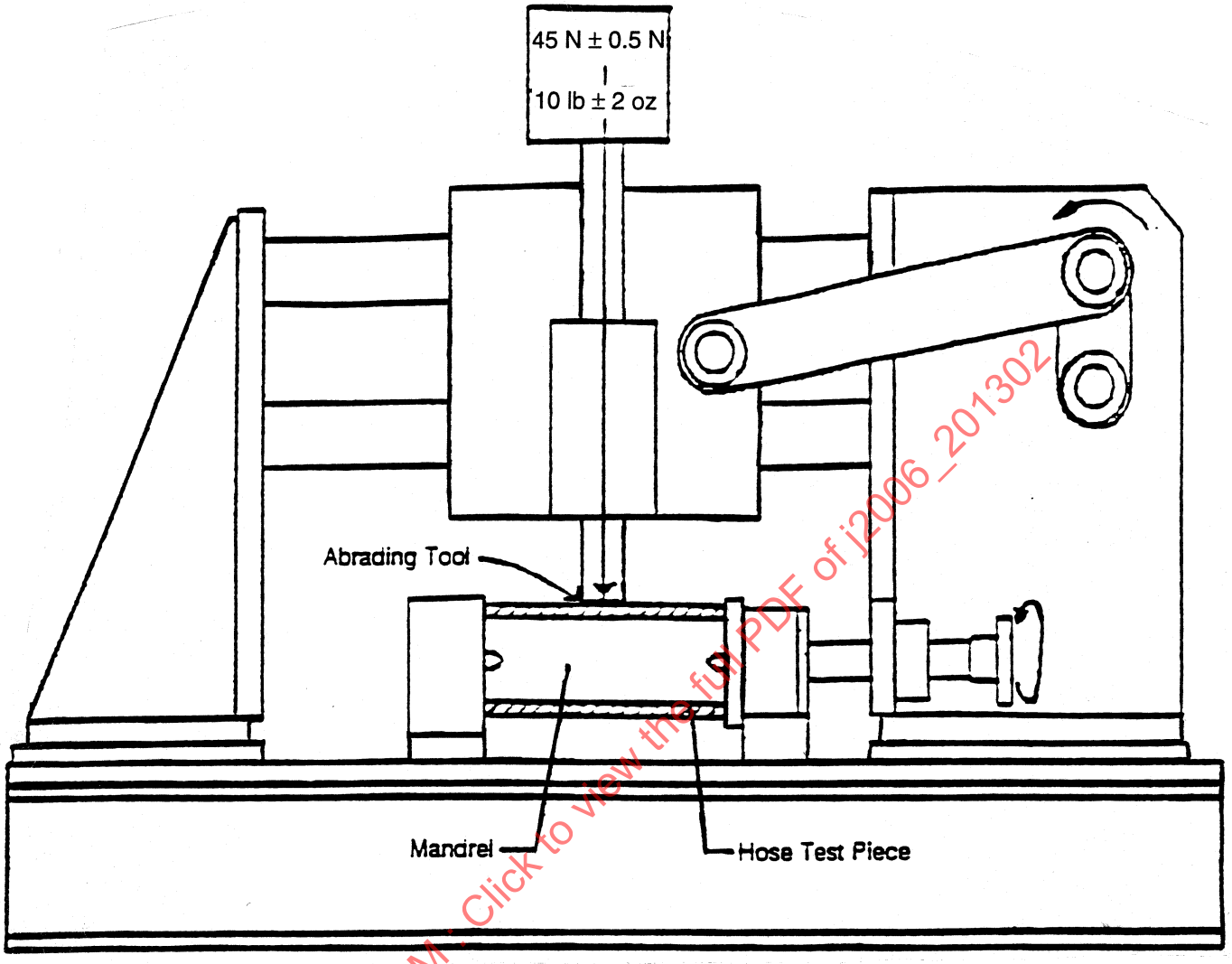

FIGURE 1 - TYPICAL TEST APPARATUS

9. HIGH TEMPERATURE TEST

9.1 Principle

Exhaust hoses shall withstand the following high temperature and pressure test without leakage, delamination, or exposure of the reinforcement that would release exhaust gas, flame, or burning particles to the atmosphere. The test may be conducted on a representative size of hose to qualify other sizes of similar construction with equal or greater wall thickness.

9.2 Procedure

A test exhaust hose shall be connected to an actual or simulated engine exhaust system. Unless the hose is a molded shape, it shall be installed as a straight section. The test hose shall be subjected to 2 min of exhaust gas flow of 580 °C (1075 °F) measured at the center and within 100 mm of the inlet to the hose. The exhaust gas velocity during the test shall not be less than 1500 m/min (4900 ft/min).

After the 2 min test, the hose shall be cooled with water or allowed to cool normally to room temperature and then subjected to an internal air pressure of 75 kPa (10 psi) per ASTM D 380 or ISO 1402 for 1 min without leakage.