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Superseding J2006 SEP1995

Marine Exhaust Hose

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

2.1.1 **ASTM PUBLICATIONS**—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 9428-2959.

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

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 Plastic 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.

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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 $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ($73\text{ }^{\circ}\text{F} \pm 3.6\text{ }^{\circ}\text{F}$) 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 $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ($73\text{ }^{\circ}\text{F} \pm 3.6\text{ }^{\circ}\text{F}$). The mounted specimen shall be placed in a test chamber with an ozone concentration of $50\text{ mPa} \pm 5\text{ mPa}$ at a temperature of $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ($104\text{ }^{\circ}\text{F} \pm 3.6\text{ }^{\circ}\text{F}$). After 70 h of exposure, the specimen shall be removed and allowed to cool to a temperature of $23\text{ }^{\circ}\text{C} \pm 2$ ($73\text{ }^{\circ}\text{F} \pm 3.6$) 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 $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ($73\text{ }^{\circ}\text{F} \pm 3.6\text{ }^{\circ}\text{F}$) and 50% \pm 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 $80\text{ rpm} \pm 2\text{ rpm}$. 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 $25\text{ x }75\text{ mm} \pm 5\text{ mm}$ ($1\text{ x }3\text{ in} \pm 0.25\text{ in}$) firmly affixed to a hard surface which will cycle back and forth $75\text{ mm} \pm 5\text{ mm}$ ($3\text{ in} \pm 0.25\text{ in}$) in each direction.

A constant normal force of $45\text{ N} \pm 0.5\text{ N}$ ($10\text{ lb} \pm 2\text{ oz}$) 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.

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.

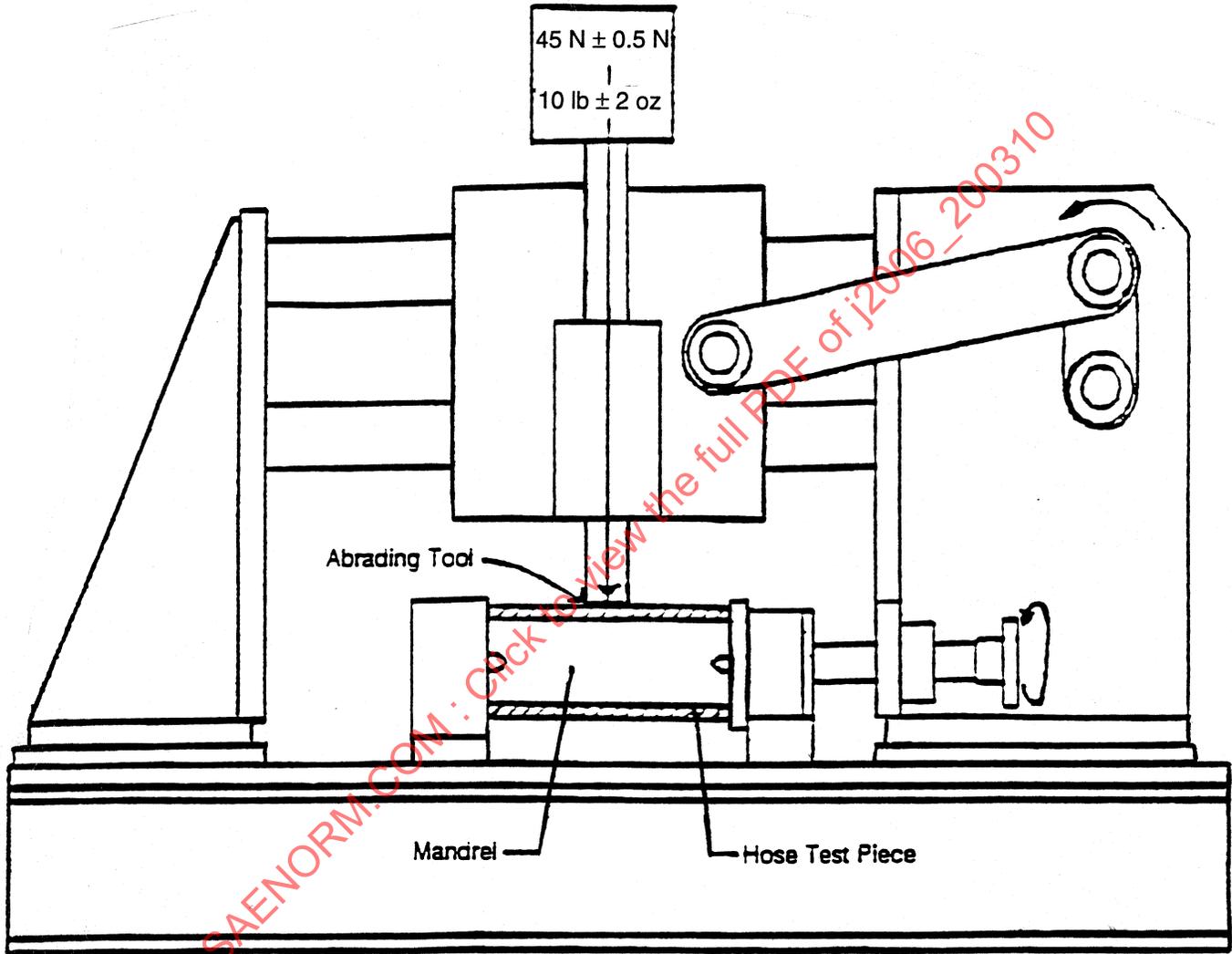


FIGURE 1—TYPICAL TEST APPARATUS

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.

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10. Markings—The outer surface of the hose shall be continuously marked with the following information in block capitals and numerals at least 3 mm (0.12 in) high.

10.1 SAE J2006.

10.2 The words “MARINE WET EXHAUST.”

10.3 The year in which the hose was manufactured.

10.4 The manufacturer's or private labeler's name or registered trademark.

11. Notes

11.1 Marginal Indicia—The change bar (I) located in the left margin is for the convenience of the user in locating areas where revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE MARINE TECHNICAL COMMITTEE

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