

INCH-POUND

MIL-PRF-7061D
19 August 2013
SUPERSEDING
MIL-PRF-7061C
15 May 1998

PERFORMANCE SPECIFICATION

HOSE, ELASTOMERIC, AIRCRAFT, SELF-SEALING, AROMATIC FUEL

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers requirements for one grade of self-sealing, elastomeric fuel hose for aircraft use.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to Oklahoma City Air Logistics Center/ENSDAA, 3001 Staff Drive, Suite 1AB81A, Tinker AFB, OK 73145 or emailed to af71@tinker.af.mil . Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil/ .
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FEDERAL STANDARDS

FED-STD-595	- Colors Used in Government Procurement
FED-STD-601	- Rubber: Sampling and Testing
FED-STD-791	- Testing Method of Lubricants, Liquid Fuels, and Related Products

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-5624	- Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-DTL-83133	- Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37)

DEPARTMENT OF DEFENSE STANDARDS

MS28753	- Fitting End, Self-Sealing Fuel Hose, Swivel Detachable, Flanged, Straight
MS28754	- Fitting End, Self-Sealing Fuel Hose, Swivel, Detachable, Flanged, 45 DEG
MS28755	- Fitting End, Self-Sealing Fuel Hose, Swivel, Detachable, Flanged, 90 DEG

(Copies of these documents are available online at <http://quicksearch.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM-D380	- Hose Rubber
ASTM-D412	- Rubber, Vulcanized and Thermoplastic Elastomers Tension
ASTM-D471	- Rubber Property-Effects of Liquids

(ASTM documents may be obtained at www.astm.org or addressed to the American Society for Testing and Material, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE-AS1933	- Hose Containing Age-Sensitive Elastomeric Material, Age Controls For
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SAE-AS5131	- Tube End – Beaded, Design Standard
SAE-AS5132	- Fitting End – Hose Connection, Design Standard
SAE-AS5183	- Fitting, Adapter, Hose to Straight Pipe

(SAE documents may be obtained at <http://www.sae.org> or addressed to Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

AEROSPACE INDUSTRIES ASSOCIATION (AIA)

NAS1925	- Clamp, Hose (DoD-adopted)
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(AIA NAS documents may be obtained at <http://www.aia-aerospace.org/> or addressed to Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

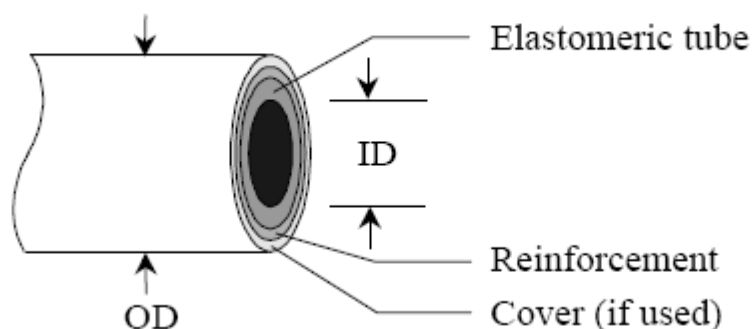
3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Materials. Hose material shall be uniform in quality and free from defects.

3.3.1 Elastomeric tube. The portion of the hose that is in contact with the fluids being transported shall be an elastomeric tube (see figure 1) of seamless construction and uniform gauge (see 6.3). The internal surface of the elastomeric tube shall have a smooth bore and shall be free from pitting, dirt, foreign material, and tooling lubricants.

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Figure 1. Hose cross-section

3.3.2 Reinforcing material. Hose may consist of a layer or layers of reinforcing material to meet the performance requirements specified herein.

3.3.3 External surface. The external surface of the hose shall be abrasion-resistant, mildew inhibiting, and free from pitting.

3.4. Interface. The hose shall be constructed as to permit ready assembly with standard hose fitting connection ends, tubing ends, pipe threaded adapters, and hose clamps conforming to MS28753, MS28754, MS28755, SAE-AS5132, SAE-AS5131, SAE-AS5183, and NAS1925.

3.4.1 Dimensions. The hose code shall be identified in the solicitation (see 6.2). The inside diameter (ID) and outside diameter (OD) of the hose shall be as specified in table I.

Table I. Hose Requirements.

Size Code	ID (inches)	OD (inches)	Burst pressure (psi)	Minimum bend radius (in.)	Collapse vacuum (in.Hg)
062	0.625 ± 0.016	1.531 ± 0.062	400	4.0	20
075	$0.750 \pm .031$	1.625 ± 0.062		4.5	
100	$1.000 \pm .031$	1.891 ± 0.062		5.5	
125	$1.250 \pm .031$	2.219 ± 0.062	250	8.0	12
150	$1.500 \pm .031$	2.438 ± 0.062		9.0	6
200	$2.000 \pm .031$	2.938 ± 0.062	150	12.5	4
250	$2.500 \pm .031$	No requirement		No requirement	2
300	$3.000 \pm .031$	No requirement		No requirement	

3.4.2 Fluids. Hose shall be capable of use with hydrocarbon-based fuels.

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3.5 Performance.

3.5.1 Proof pressure. Hose shall not leak or blister when exposed to either an aerostatic proof pressure of 100 pounds per square inch (psi) or a hydrostatic proof pressure of 120 psi.

3.5.2 Reduction in ID. The ID of the hose shall not decrease to less than 84 percent of the minimum ID specified in Table I when exposed to hydrocarbon –based fuel.

3.5.3 Elastomeric tube properties.

3.5.3.1 Fuel resistance. When exposed to hydrocarbon-based fuel, the elastomeric tube shall have a minimum tensile strength of 400 psi. The elongation shall be minimum of 150 percent, the volume increase shall be a maximum of 90 percent.

3.5.3.2 Gum extraction. If a gum sealant is used, there shall be a maximum of 6000 milligrams of gum residue (10 milligrams of insoluble residue) per 100 milliliters of fuel extract. There shall be no sulfur or corrosive sulfur compounds in the fuel extract.

3.5.4 Adhesion. The original adhesion between the elastomeric tube and reinforcing material shall be at least 12 pounds per inch (6 pounds per inch after aging in Type II fuel). If a cover is used, the original adhesion between the reinforcing material and the cover shall be at least 8 pounds per inch (4 pounds per inch after aging in Type II fuel).

3.5.5 Cover properties. (If a cover is used).

3.5.5.1 Tensile strength. The tensile strength of the cover shall be minimum of 1,000 psi, and the hose cover elongation shall be minimum of 200 percent.

3.5.5.2 Fuel resistance. When exposed to hydrocarbon based fuels, the hose cover shall have volume increase of less than 90 percent.

3.5.6 Vacuum collapse. The hose shall not collapse when exposed to an internal vacuum as shown in Table I.

3.5.7 Performance of hose when assembled. The hose, when assembled with fittings or adapters conforming to those specified in paragraphs 3.4 above, shall meet the following requirements.

3.5.7.1 Hydrostatic burst pressure. The hose shall not burst or cause the fittings or adapters to loosen or separate from the hose, and there shall be no external leakage from hose to fitting or adapter interface, when subjected to the hydrostatic burst pressure specified in Table I.

3.5.7.2 Flexing. The hose shall withstand flexing a total of 0.250 inches (0.125 inches each side of center) at a rate of 1725 cycles per second. There shall be no leaking, tube separation, or progressive cracking of the hose.

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3.5.7.3 Electrical resistivity. When the hose is mated to adapters or fittings to form a hose assembly, the electrical resistivity of the hose assembly shall not exceed one ohm from adapter to adapter.

3.5.8 Gunfire. The hose shall be capable of withstanding gunfire up to and including 50 caliber armor piercing ammunition.

3.5.8.1 Grade JP-4 fuel. The hose shall completely seal within 2 minutes when punctured by gunfire at an ambient temperature of 75°F and filled with fuel conforming to MIL-DTL-5624, Grade JP-4 at an internal hose pressure of 40 psi. The hose shall completely seal within 5 minutes when punctured by gunfire at a temperature of -20°F and filled with fuel conforming to MIL-DTL-5624, Grade JP-4 at an internal hose pressure of 40 psi. The hose shall not shatter as a result of gunfire when tested as specified in 4.5.3.1.

3.5.8.2 Grade JP-8 fuel. The hose shall seal within 2 minutes when subjected to gunfire at an ambient temperature of 75°F and filled with fuel conforming to MIL-DTL-83133, Grade JP-8 at an internal hose pressure of 40 psi. Slight seepage, but no spurting, after the first 30 seconds will be permitted when the hose is punctured by gunfire at -20°F and filled with fuel conforming to MIL-DTL-83133, Grade JP-8 at an internal hose pressure of 40 psi. The hose shall not shatter as a result of gunfire when tested as specified in 4.5.3.2.

3.6 Identification of product. A red or yellow stripe, parallel to the longitudinal axis, shall be along the entire length of the hose. The color shall approximate color 1136 or 13538 of FED-STD-595. Parallel to the colored stripe, a marking shall give this specification number (MIL-PRF-7061), size code, date of manufacture in quarter of year and year, Julian day of the year on which the hose was cured (see 6.3), and the manufacturer's Commercial and Government Entity (CAGE) Code. (Example: "MIL-PRF-7061-062-1Q98-046-xxxxx" designates hose size 062 manufactured during the first quarter of calendar year 1998, cured on February 15th of that year, by the manufacturer whose CAGE Code is xxxxx.) The marking shall be repeated every 12 inches or less along the entire length of hose, and shall be legible with normal vision at a distance of three feet.

3.7 Age control. The age of the hose shall conform to the limits specified in SAE-AS1933.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

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4.1.1 Requirements cross-reference matrix. Table II provides a cross-reference matrix of the section 3 requirements tested or verified in the paragraphs below.

TABLE II. Requirements cross-reference matrix.

REQUIREMENT	VERIFICATION	REQUIREMENT	VERIFICATION
3.3	4.5.1	3.5.3.1	4.5.10
3.3.1	4.5.1	3.5.3.2	4.5.6 and 4.5.6.1
3.3.2	4.5.1	3.5.4	4.5.11
3.3.3	4.5.1	3.5.5.1	4.5.7
3.4	4.5.4.1 and 4.5.4.2	3.5.5.2	4.5.10
3.4.1	4.5.1	3.5.6	4.5.12
3.4.2	4.5.3.1, 4.5.3.2, 4.5.4.1, 4.5.4.2, 4.5.6, 4.5.6.1, 4.5.7, 4.5.9, 4.5.10, and 4.5.11	3.5.7.1	4.5.4.1 and 4.5.4.2
		3.5.7.2	4.5.5
		3.5.7.3	4.5.8
		3.5.8.1	4.5.3.1
		3.5.8.2	4.5.3.2
3.5.1	4.5.2	3.6	4.5.1
3.5.2	4.5.9	3.7	4.5.1

4.2 First article inspection. Unless otherwise specified in the acquisition documents (see 6.2). First article inspection shall be conducted on size code 100 hose and shall consist of all examinations and tests specified in 4.5. Test articles requiring assemblies shall be assembled using hose and specified adapters (see 4.5.4.1 and 4.5.4.2) of the applicable size. Assembled test articles shall be examined to verify there has been no degradation of the hose or the adapters resulting from the assembly process. The First Article Tests may be waived for bidders that have satisfactorily tested hose assembly to these MIL-PRF-7061 specification requirements within twelve months of submittal of bid, or with the approval of the preparing activity.

4.3 Conformance inspection. Conformance inspection shall consist of individual inspection and sampling tests specified in Table III.

TABLE III. Inspection matrix.

Examination or test	Conformance Inspection	
	Individual inspection (see 4.3.1)	Sampling inspection (see 4.3.2 and 4.3.2.1)
4.5.1	X	
4.5.2	X	
4.5.7		X
4.5.8		X
4.5.9		X
4.5.10		X
4.5.11		X
4.5.12		X

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4.3.1 Individual inspections. All hose shall be subjected to the individual examination and proof pressure test.

4.3.2 Sampling inspections. A five-foot sample of hose shall be selected from at least each 10,000 feet of hose of the same size produced consecutively, and subjected to the tests specified in Table III.

4.3.2.1 Continuous production. If hose is being produced continuously, only one 5 foot sample need be selected from each day's production.

4.4 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in applicable paragraphs in the specification.

4.4.1 Test fluids. Unless otherwise specified in the test description, the test fluid shall conform to ASTM-D471, Type I, Type II, or Type III.

4.4.2 Hose assemblies. Hose used for determining performance as a hose assembly shall be assembled with adapters in accordance with the adapter manufacturer's instructions.

4.5 Examination and tests.

4.5.1 Examination of product. Hose shall be examined to verify conformance with the requirements of this specification with respect to materials, construction, dimensions, identification of product, and age. Dimensions shall be measured in accordance with ASTM-D380

4.5.2 Proof pressure. Hose shall be subjected to an aerostatic proof pressure of 100 ± 15 , -0 psig in accordance with the aerostatic pressure test of ASTM-D380 or a hydrostatic proof pressure of 120 ± 5 psig. The proof pressure shall be held for a minimum of 5 minutes for the aerostatic test and minimum of 30 sec, for the hydrostatic test.

4.5.3 Testing of product. The hose shall be tested as specified herein, any failure of the tests shall be cause for rejection of the lot.

4.5.3.1 Grade JP-4 Fuel. Two hoses of each size as specified in Table I shall be filled with fluid MIL-DTL-5624, JP-4 fuel and aged for 7 days at $75^\circ \pm 5^\circ\text{F}$. One each hose shall then be attached to a manifold at $75^\circ \pm 5^\circ\text{F}$ and $-20^\circ \pm 5^\circ\text{F}$ and at the appropriate pressure specified in paragraph 3.5.8.1. Each hose shall then be subjected to three or more impacts of caliber 0.50 ball M-2 ammunition at a distance of 5, 30 and 60 yards. The impacts shall take effect at least 2 inches apart.

4.5.3.2 Grade JP-8 Fuel. Two hoses of each size as specified in Table I shall be filled with fluid MIL-DTL-5624, JP-8 fuel and aged for 7 days at $75^\circ \pm 5^\circ\text{F}$. One each hose shall then be attached to a manifold at $75^\circ \pm 5^\circ\text{F}$ and $-20^\circ \pm 5^\circ\text{F}$ and at the appropriate pressure specified in paragraph 3.5.8.2. Each hose shall then be subjected to three or more impacts of caliber 0.50 ball

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M-2 ammunition at a distance of 5, 30, and 60 yards. The impacts shall take effect at least 2 inches apart.

4.5.4 Burst pressure test. Burst pressure test shall be conducted in accordance with ASTM-D380 with the hydrostatic pressure applied at the rate of 1000 psi per minute.

4.5.4.1 Hose assemblies with SAE-AS5183 adapters. Six one-foot lengths of hose shall be assembled with an SAE-AS5183 adapter and an NAS1925 clamp applied 0.250 inch from the extreme end of the hose and tightened to 25 inch pounds torque on the thumb screw. Two of these hose assemblies shall be subjected to the burst test within 1 hour after original tightening of the clamp. Two of these assemblies shall be filled with Type II fluid and two shall be filled with Type I fluid, stoppered with leak-proof plugs and allowed to stand for four weeks and then subjected to the burst pressure test.

4.5.4.2 Hose assemblies with detachable end fittings. Two one-foot lengths of hose shall be assembled with applicable detachable end fittings of the appropriate size conforming to MS28753, MS28754, MS28755, SAE-AS5132, and SAE-AS5131 (total of ten assemblies). One assembly of each type fitting shall be subjected to the burst pressure specified in Table I, using fuel conforming to ASTM-D471, or water. The remaining assemblies shall be filled with Type II fluid, stoppered with leak-proof plugs, and allowed to stand for 4 weeks. The assemblies shall then be subjected to the burst pressure test without retightening the assembly.

4.5.5 Flexing. Two 16 to 17 inch-lengths of hose shall be equipped with an adapter conforming to SAE-AS5183, and one clamp conforming to NAS1925, applied 0.250 inch from the end of the hose and tightened to 25 inch pounds of torque on the thumbscrew. The hose assembly shall then be installed on a flexing machine which shall flex the hose a total amplitude of 0.250 inch (0.125 inch on each side of the center) at 1725 complete cycles per minute (3450 reversals). One length of hose shall be subjected to fuel under 15 psi pressure. The other length shall be subjected to fuel under 8 inches of mercury vacuum. Both hoses shall be flexed a total of 1000 hours.

4.5.6 Gum extraction. A 14-inch length of size 100 hose shall be filled with 150 milliliters of Type II fuel and stoppered with leak-proof plugs. The hose shall then be aged at a temperature of $75^{\circ} \pm 5^{\circ}\text{F}$ for a period of 24 hours. A copper strip shall then be suspended in a sample of this solution in accordance with the method for detection of free sulfur and corrosive sulfur compounds in gasoline in accordance with FED-STD-791, except that the time of immersion shall be 20 hours. No dark brown or black corrosion shall be present. The extract shall then be tested according to the method for gum content of gasoline (copper dish method) of FED-STD-791, except that a glass dish shall be used instead of a copper dish and the oven drying time shall be 30 minutes at 212°F .

4.5.6.1 Insoluble residue. The nonvolatile material remaining in the glass dish after evaporation of the fuel shall be washed ten times with 50 milliliter portions of Type II fuel. After each 50 milliliters of liquid is added to the gum in the dish, the mixture shall be allowed to stand for not more than 5 minutes. The washings shall be filtered through a weighed Gooch crucible.

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The Gooch crucible and evaporating dish shall then be dried and reweighed. The increase in weight of the Gooch crucible plus the weight of the gum remaining in the dish shall be considered the weight of the insoluble residue.

4.5.7 Cover tensile strength and elongation. The cover tensile strength and elongation shall be tested in accordance with ASTM-D412.

4.5.8 Electrical resistance. A standard ohmmeter having a suitable range shall be used to determine the electrical resistance between the fittings or adapters at each end of a hose assembly. The resistance is to be measured from “cone seat” to “cone seat” (i.e., from seal to seal).

4.5.9 Reduction in ID. A 14-inch length of hose shall be filled with Type II fuel, stoppered with leak-proof plugs and held at a temperature of $75^{\circ} \pm 5^{\circ}\text{F}$ for 4 weeks. The fuel shall then be removed and the reduction in hose ID determined by dropping spherical balls through the bore of the hose while hose is held in a vertical position. The spherical balls shall have a diameter equal to 84 percent of the nominal ID for the hose tested as specified in Table I.

4.5.10 Fuel resistance. Specimens of elastomeric tube and cover shall be subjected to the swelling tests specified in Method 6211 of FED-STD-601, except that the specimens shall be immersed for 24 hours at room temperature in fuel conforming to ASTM-D471, Type II. Nine test specimens (only one for sampling test) shall be cut from elastomeric tube and their tensile strength measured. The test specimens shall then be immersed in fuel conforming to ASTM-D471, Type II at a temperature of $75^{\circ} \pm 5^{\circ}\text{F}$ for periods varying from 1 to 14 days (24 hours for sampling test specimen). One specimen shall be removed from the liquid each day for 7 days and the tensile strength tested within 5 minutes. Additional specimens shall be tested at the end of 10 and 14 days. The tensile strength, after immersion, shall reach equilibrium within 6 days.

4.5.11 Adhesion (Type II fuel). A 6-inch length of hose shall be filled with Type II fuel, stoppered with leak proof plugs, and maintained at a temperature of $75^{\circ} \pm 5^{\circ}\text{F}$ for 7 days (24 hours for sampling test). Specimens shall be cut from the center of the length of hose and tested for adhesion as set forth in FED-STD-601 within 25 minutes after removal of the fuel.

4.5.12 Vacuum collapse. One end of a 2-foot section of hose shall be capped and the opposite end connected to a vacuum pump. Unless otherwise specified in Table I, the hose shall be bent in a radius of six times the ID of the specimen (1 inch ID tested on a 6 inch radius) and the specified vacuum applied for 20 minutes after which the OD shall be measured to determine the degree of collapse. The radius shall be measured to inside of the coil.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the

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Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The elastomeric hose covered by this specification is intended for use in aromatic fuel lines where self-sealing performance is required.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Hose size code (see 3.4.1).
- c. Minimum acceptable hose length and lot size acquired (see 1.1).
- d. Issue of ASSIST to be cited in solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- e. If first article inspection is required (see 4.2).
- f. Packaging requirements (see 5.1).
- g. Fire resistance, if required (see 6.5).

6.3 Definitions.

6.3.1 Cure date. The date a compounded, uncured elastomer is vulcanized to produce an elastomeric product.

6.3.2 Elastomer. A material which possesses elastic properties similar to those of natural rubber in the vulcanized state. At room temperature, an elastomer can be stretched repeatedly to at least twice its original length and will, upon release of stress, return to its approximate original length. (Source: SAE-AS1933)

6.3.3 Seamless construction. Construction by any method that results in absence of seams or discontinuities in the material.

6.4 Subject term (key word) listing.

Adapter
Assembly
Fitting

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6.5 Fire resistance. Fire resistance, if required, will be specified in the solicitation. Testing for fire resistance should be in accordance with SAE-AS1055 for appropriate type and class of the appropriate Technical Standard Order (TSO) issued by the Federal Aviation Administration (FAA).

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:

Army - AR

Navy - AS

Air Force - 71

Preparing Activity:

Air Force - 71

(Project 4720-2009-023)

Reviewer Activities:

Navy - SA

Air Force - 99

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil/>.