

INCH-POUND

MIL-DTL-8794E
22 September 2000
 SUPERSEDING
 MIL-H-8794D
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DETAIL SPECIFICATION

HOSE, ELASTOMERIC - HYDRAULIC FLUID, FUEL, AND OIL RESISTANT

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 type of elastomeric hose for use in hydraulic, fuel, and oil lines (see 6.1 and 6.4).

1.2 Classification. This hose is of one type used with detachable hose adapters conforming to MIL-DTL-5070. It is used to fabricate hose assemblies conforming to MIL-DTL-8795 and is of the sizes listed in table I (see 6.2).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 documents cited in sections 3 and 4 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-DTL-5070	-	Adapter, Hose To Tube, Pipe, And Flange, Reusable - Hydraulic, Fuel, And Oil Lines, General Specification for
MIL-H-5606	-	Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance
MIL-DTL-8795	-	Hose Assemblies, Elastomeric - Hydraulic Fluid, Fuel, and Oil Resistant, General Specification for

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be of use in improving this document should be addressed to: Defense Logistics Agency, Defense Supply Center, Columbus (DSCC-VAI), P.O. Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 4720

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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- MS27232 - Straight Flange Assembly Adapter, Hose to Tube, Reusable, Hydraulic, Fuel and Oil Lines
- MIL-PRF-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-737

STANDARDS

FEDERAL

- FED-STD-601 - Rubber: Sampling and Testing

(Unless otherwise indicated, copies of the above specifications and standards are available from the Document Automation and Production Service, Building 4/D, 700 Robbins Avenue, 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 the documents that are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM D380 - Standard Test Methods for Rubber Hose (DoD adopted)
- ASTM D413 - Standard Test Methods for Rubber Property-Adhesion to Flexible Substrate (DoD adopted)
- ASTM D471 - Standard Test Method for Rubber Property-Effect of Liquids (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

- ANSI/NCSL Z540-1 - Calibration Laboratories and Measuring and Test Equipment, General Requirements (DoD adopted)

(Application for copies should be addressed to the National Conference of Standards Laboratories, 1800 - 30th Street, Suite 305B, Boulder, CO 80301-1032.)

SAE INTERNATIONAL

- SAE ARP603 - Impulse Testing of Hydraulic Hose Tubing and Fitting Assemblies (DoD adopted)
- SAE AS1933 - Age Controls for Hose Containing Age-Sensitive Elastomeric Material (DoD adopted)
- SAE J1966 - Lubricating Oil, Aircraft Piston Engine (Nondispersant Mineral Oil) (DoD adopted)

(Application for copies should be addressed to SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. 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.

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3. REQUIREMENTS

3.1 Qualification. Hose furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.4 and 6.3). (See 4.6.1.)

3.2 Materials. Hose shall be uniform in quality and free from defects in materials. Materials shall conform to the requirements specified herein. (See 4.6.1.)

3.2.1 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 Construction. The hose shall consist of an inner elastomeric tube covered by a reinforcing material and a cover. (See 4.6.1.)

3.3.1 Elastomeric tube. The portion of the hose that is in contact with the fluids being transported shall be an elastomeric tube of seamless construction (see 6.4) and uniform gauge. The internal surface of the elastomeric tube shall have a smooth bore and shall be free from pitting, dirt, foreign material, and tooling lubricants. (See 4.6.1.)

3.3.2 Reinforcing material. Hose shall contain a reinforcing wire braid and may contain other layer or layers of reinforcing material or inner and outer braids to meet the requirements specified herein. The wire braid shall be protected against corrosion and shall be braided under tension so as to provide strength and limit expansion of the hose to a minimum. No length of hose shall contain broken or spliced wire braid or reinforcing material, or shall omit wire braid or reinforcing material. (See 4.6.1.)

3.3.3 Cover. The cover of the hose shall be oil and fungus resistant. If a fabric is used as the surface material, the fabric shall be impregnated or fully coated within the elastomeric or cement material. (See 4.6.1.)

3.4 Interface. Hose shall interface with adapters conforming to MIL-DTL-5070 to form hose assemblies conforming to MIL-DTL-8795. (See 4.3.4 and 4.6.1.)

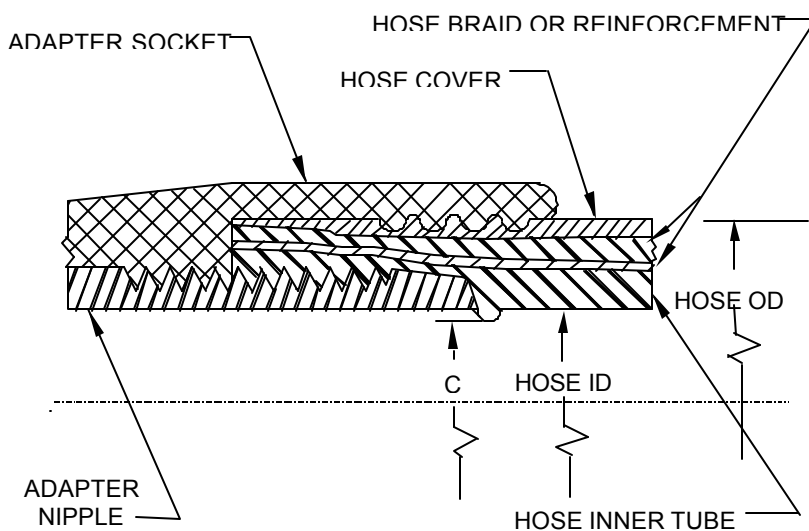
3.5 Fluids. Hose shall be capable of use with petroleum-based fluids (hydraulic fluids, fuels, and oils) and synthetic fluid MIL-PRF-83282. (See 4.6.10, 4.6.12, 4.6.14, and 4.6.16.)

3.6 Dimensions.

3.6.1 Diameter. The inside diameter (ID) and outside diameter (OD) of the hose shall be as specified in figure 1. (See 4.6.1.)

3.6.2 Concentricity. For hose sizes -8 and smaller, the outer surface of the hose shall be concentric with the inside bore of the elastomeric tube within 0.020-inch total indicator reading. For hose sizes larger than -8, this same concentricity shall be within 0.030-inch total indicator reading. The variation in concentricity between the inside bore of the elastomeric tube and the OD of the reinforcing material shall not exceed these same values. (See 4.6.1.)

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Hose Size number	Adapter size number	ID of hose (inches)		OD of hose (inches)		C ^{1/} Minimum Diameter (inches)
-3	-3	.125	+0.019 -0.000	.453	+0.023 -0.016	.080
-4	-4	.188	+0.026 -0.000	.516		.132
-5	-5	.250	+0.031	.578		.200
-6	-6	.313	-0.000	.672		.260
-8	-8	.406		.766	±0.023	.350
-10	-10	.500	+0.039 -0.000	.922		.450
-12	-12	.625	+0.042	1.078		.575
-16	-16	.875	-0.000	1.234	±0.031	.781
-20	-20	1.125	+0.047	1.500		1.015
-24	-24	1.375	-0.000	1.750		1.250
-32	-32	1.813		2.219	±0.047	1.719
-40	-40	2.375	+0.062	2.875		2.178
-48	-48	3.000	-0.000	3.563		2.803

NOTES:

- ^{1/} C diameter indicates maximum permissible bulge of inner elastomeric tube when hose is assembled with adapters.

FIGURE 1. Hose dimensions.

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3.7 Performance.3.7.1 Pressure.

3.7.1.1 Operating pressure. Hose shall withstand the operating pressures specified in table I without leakage or evidence of imperfections. (See 4.6.2.)

TABLE I. Physical requirements of hose assembled with adapters conforming to MIL-DTL-5070.

Size (dash number)	Length of hose assemblies for all tests (inches) ^{1/}	Minimum bend radius at inside of bend (inches)	Hydraulic		Fuel		Oil			Burst pressure (psi)
			Operating pressure (psi)	Proof pressure (psi)	Operating pressure (psi)	Proof pressure (psi)	Operating pressure (psi)	Surge pressure (psi)	Proof pressure (psi)	
-3 ^{2/}	14	3	N/A ^{2/}	N/A ^{2/}	1,000	1,500	50	400	600	4,000
-4	14	3	3,000	6,000	1,000	1,500	50	400	600	12,000
-5	16	3.375	3,000	5,000	1,000	1,500	50	400	600	10,000
-6	18	4	2,000	4,500	1,000	1,500	50	400	600	9,000
-8	21	4.625	2,000	4,000	1,000	1,500	50	400	600	8,000
-10	23.5	5.5	1,750	3,500	1,000	1,500	50	400	600	7,000
-12	27.5	6.5	1,500	3,000	1,000	1,500	50	400	600	6,000
-16	18	7.375	800	1,600	750	1,000	50	400	600	3,200
-20	18	9	600	1,250	500	750	50	400	600	2,500
-24	18	11	500	1,000	250	375	50	400	600	2,000
-32	18	13.25	350	700	200	300	50	400	600	1,400
-40	18	24	N/A	N/A	200	300	N/A	N/A	N/A	1,000
-48	18	33	N/A	N/A	200	300	N/A	N/A	N/A	800

NOTES:

1/ Except as otherwise specified in the individual test description.

2/ Size -3 shall not be used in hydraulic applications.

3.7.1.2 Proof pressure. Hose shall withstand the applicable hydraulic proof pressures specified in table I without leakage or evidence of imperfections. (See 4.6.2.)

3.7.2 Volumetric expansion. The volumetric expansion of size -3 and -4 hose shall be not greater than .06 cubic centimeter per inch of free length at 1,000 pounds per square inch (psi) pressure. The volumetric expansion of size -5 hose shall be not greater than .08 cubic centimeter per inch of free length at 1,000 psi pressure. There are no volumetric expansion limits for size -6 hose and larger. (See 4.6.17.)

3.7.3 Elongation and contraction. Hose shall not change in length more than +2 or -4 percent at the applicable hydraulic operating pressures specified in table I. (See 4.6.18.)

3.7.4 Reduction in diameter. After oil aging (see 4.3.2), the ID of the hose shall not decrease to less than 90 percent of the minimum ID specified in figure 1. (See 4.6.9.)

3.7.5 Elastomeric tube properties.

3.7.5.1 Water and alcohol resistance. After exposure to a mix of water and alcohol, the loss in tensile strength of the elastomeric tube shall not exceed 35 percent, based on the original cross-sectional area of the elastomeric tube. (See 4.6.13.)

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3.7.5.2 Fuel resistance. After exposure to fuel, the tensile strength shall not be less than 1,000 psi, the elongation shall be not less than 100 percent, and the volume increase shall not exceed 30 percent for hose sizes -12 and smaller, and shall not exceed 60 percent for hose sizes greater than size -12. (See 4.6.14.)

3.7.6 Adhesion. The original adhesion between the elastomeric tube and the inner layer of reinforcing material, and between layers of reinforcing material, shall be at least 10 pounds per inch, and 5 pounds per inch after oil aging (see 4.3.2). (See 4.6.8.)

3.7.7 Operating temperature. Hose shall be capable of operating in ambient temperatures as specified in table II. (See 4.6.16.)

TABLE II. Hose application conditions.

Hose size	Application/operating temperature range ^{1/}		
	Hydraulic	Fuel	Oil
-3	Cannot be used ^{2/}	-65 to 160 °F	-65 to 250 °F
-4	-65 to 160 °F		
-5			
-6			
-8			
-10			
-12			
-16	-40 to 160 °F	-40 to 160 °F	-40 to 160 °F
-20			
-24			
-32			
-40			
-48			

NOTES:

^{1/} Temperature range - ambient and internal fluid.

^{2/} Hydraulic applications for size -3 prohibited.

3.7.8 Leakage. There shall be no leakage of the hose or from the hose-to-adapter interface, and no seepage back through the fabric that might produce separation or swelling of the hose, when subjected to 70 percent of the burst pressure specified in table I. (See 4.6.4.)

3.7.9 Burst pressure. Hose shall not burst or cause adapters to loosen or separate from the hose, and there shall be no external leakage from the hose or hose-to-adapter interface, at any pressure up to the burst pressure specified in table I. (See 4.6.3.)

3.7.10 Bulge. The bulge of the elastomeric tube of the hose when assembled with adapters conforming to MIL-DTL-5070 shall not reduce the ID of the hose to less than the C dimension shown on figure 1. (See 4.6.5.)

3.7.11 Hydraulic impulse. Hose of sizes -4 through -16 shall withstand not less than 200,000 dynamic hydraulic impulse cycles, at a nominal rate of 70 pulses per minute at 125 percent of the hydraulic operating pressure specified in table I, without leakage, deformation, or separation from an adapter. Hose of sizes -16 through -32 shall withstand not less than 100,000 dynamic hydraulic impulse cycles, at a nominal rate of 70

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pulses per minute at 100 percent of the hydraulic operating pressure specified in table I, without leakage, deformation, or separation from an adapter. (See 4.6.10.)

3.7.12 Cold temperature flexing. Hose of sizes -3 through -12 shall be capable of being flexed through 180° of bend in approximately 4 seconds to the bend radius specified in table I at -65 °F without leakage. Hose sizes -16 and larger shall be capable of being flexed through 180 degrees of bend in approximately 4 seconds to the bend radius specified in table I at -40 °F without leakage. (See 4.6.11.)

3.7.13 Lubricating oil circulation. Hose shall be capable of circulating oil at fluid temperatures up to 250 °F (160 °F for hose size 16 and larger) and under surge conditions of 325 °F without leakage while operating at the oil operating pressures specified in table I. (See 4.6.16.)

3.7.14 Fuel immersion. Hose and the hose-to-adapter interface shall not leak after immersion in fuels. (See 4.6.12.)

3.7.15 Bending and vacuum. After bending to 180° at the minimum bend radius specified in table I, hose sizes -3 through -24 shall exhibit no more than an additional 10 percent reduction in OD, or 25 percent reduction in OD for sizes -32 and larger, at any section when an internal vacuum of 28 inches of mercury is applied. (See 4.6.7.)

3.7.16 Collapse. Hose sizes -3 through -10 shall not collapse to less than the minimum clearance specified in table III, and there shall be no ply separation, blistering, or other damage, when subjected to an internal vacuum of 28 inches of mercury. (See 4.6.6.)

TABLE III. Minimum clearance for collapse test.

Hose Size (Dash No.)	Clearance (inches, ±.001 in.)
-3	.070
-4	.125
-5	.188
-6	.250
-8	.343
-10	.406

3.7.17 Corrosion resistance. Hose shall resist corrosion by aqueous salt atmosphere. (See 4.6.15.)

3.8 Identification of product. Hose shall be identified with a gasoline, oil, and water-resistant marking on the cover. This marking shall include this specification number (MIL-DTL-8794) (see 6.2); size number; date of manufacture in quarter of year and year; and the manufacturer's Commercial and Government Entity (CAGE) Code, which shall be legible with normal vision at a distance of 3 feet. The marking shall be of a color contrasting with that of the hose cover, and shall be repeated every 12 inches or less along the entire length of hose. (Example: "MIL-DTL-8794-6-2Q99-xxxxx" designates hose size -6 manufactured during the second quarter of calendar year 1999 by the manufacturer whose CAGE Code is xxxxx.) (See 4.6.1.)

3.9 Age control. The age of the hose shall not exceed the age limits specified in SAE AS1933. (See 4.6.1.)

3.10 Workmanship. Hose shall be of uniform dimension and construction and free from voids. Hose shall be free from oil, grease, dirt, or other foreign materials both internally and externally, and free of defects that could adversely affect performance. (See 4.6.1.)

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4. VERIFICATION

4.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ANSI/NCSS Z540-1 or equivalent.

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

- a. Qualification inspection (see 4.4)
- b. Quality conformance inspection (see 4.5)
 1. Individual tests (see 4.5.2)
 2. Periodic tests (see 4.5.3)

4.2.1 Disposition of test specimens. Test specimens that have been subjected to qualification or periodic tests shall not be delivered on a contract or purchase order.

4.3. Inspection conditions. All inspections shall be performed in accordance with the test conditions specified herein. Room temperature shall be 68 °F to 78 °F.

4.3.1 Test fluid. The test fluid shall be water; lubricating oil conforming to SAE J1966, grade 50; hydraulic fluid conforming to either MIL-H-5606 or MIL-PRF-83282; or fuel conforming to ASTM D471, ASTM Reference Fuel B. Water is an acceptable test fluid only for the leakage, proof pressure, and burst tests. If water is used, the test article must be thoroughly dried before use in further testing or prior to delivery.

4.3.2 Oil-aging. For tests that require a hose assembly to be oil-aged, the hose assembly shall be completely immersed in hydraulic fluid within a non-pressurized closed container or reflux condenser (to prevent distillation of the volatile matter in the fluid) and maintained at a temperature of 160±5 °F for 7 days prior to the start of the test. During the aging period, the bore of the hose assembly shall be open and no air shall be entrapped therein. No more than 10 hose assemblies shall be aged in a given quantity of test fluid.

4.3.3 Air-aging. For tests that require a hose assembly to be air-aged, the hose assembly shall be maintained in air at a temperature of 160±5 °F for 7 days prior to the start of the test.

4.3.4 Hose assemblies for hose testing. The hose assemblies used for hose testing shall be assembled using adapters conforming to MIL-DTL-5070 of the applicable size in accordance with the adapter manufacturer's instructions. Hose assemblies shall be examined to verify that there has been no degradation of the hose or adapters resulting from the assembly process. Unless otherwise specified, hose assembly lengths shall be as specified in table I. (See 3.4.)

4.4 Qualification inspection. Qualification inspection shall be performed on units produced with equipment and procedures used in production.

4.4.1 Samples for qualification. Samples for qualification shall be representative of the products proposed to be furnished to this specification. Samples, consisting of 29 hose and hose assemblies of each size and of the lengths specified, shall be subjected to qualification testing as specified in table IV.

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TABLE IV. Qualification inspection.

Hose assembly number	Hose assembly type	Test sequence – paragraph numbers				
1 and 2	Strip specimen	4.6.8				
3 and 4	Hose	4.6.9				
5 through 7	Elastomeric tube	4.6.13				
8 through 10		4.6.14				
11 through 16	Hose assembly	4.6.1	4.6.2	4.6.10		
17		4.6.1	4.6.2	4.6.6		
18		4.6.1	4.6.2	4.6.7		
19 and 20		4.6.1	4.6.2	4.6.18	4.6.15	4.6.3
21 and 22		4.6.1	4.6.2	4.6.11		
23 through 25		4.6.1	4.6.2	4.6.5		
26		4.6.1	4.6.2	4.6.12		
27		4.6.1	4.6.2	4.6.16		
28		4.6.1	4.6.2	4.6.17		
29		4.6.1	4.6.2	4.6.4		

4.4.2 Failures. One failure shall be cause for refusal to grant qualification approval.

4.4.3 Retention of qualification. To retain qualification, the contractor shall forward a report at 12-month intervals to the qualifying activity. The qualifying activity will establish the initial reporting date. The report shall consist of:

- a. A summary of the results of the sampling tests performed and completed during the 12-month period, including as a minimum the number of lots and the quantities that have passed and the number that have failed. The results of tests of all reworked sampling lots shall be identified and accounted for.
- b. A summary of the results of all periodic control tests performed and completed during the 12-month period, including the number and mode of failures.

If the summary of test results indicates nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the qualified products list.

Failure to submit the report within 30 days after the end of each 12-month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the contractor shall immediately notify the qualifying activity at any time during the 12-month period that the inspection data indicate failure of the qualified product to meet the requirements of this specification. In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during two consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit his qualified products to testing in accordance with the qualification inspection requirements.

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4.5 Quality conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of individual and periodic tests.

4.5.2. Individual tests. Each production lot of bulk hose (see 4.5.2.1) for a given size shall be subjected to and pass all the individual tests specified in table V. Any hose, which fails any test criterion in the individual test sequence, shall be removed from the lot at the time of observation or immediately at the conclusion of that test in which the failure was observed.

4.5.2.1 Production lot. A production lot shall consist of bulk hose manufactured on the same production line by means of the same production techniques, materials, controls, and design during the same production run.

4.5.3 Periodic tests.

4.5.3.1 Periodic 1 (P1) tests. P1 tests shall consist of the tests specified in table V in the quantity shown. P1 tests shall be performed on hose for each size at least once per year regardless of the total produced. The only exception is that P1 tests do not need to be performed for a specific size if there has been no production during the past year for that size. The hose selected shall be as representative as possible of those produced during the period in terms of hose sizes.

4.5.3.2 Periodic 2 (P2) tests. P2 tests shall consist of the tests specified in table V in the quantity shown. P2 tests shall be performed on lengths of hose at least once per year regardless of the total feet of hose produced. The only exception is that P2 tests do not need to be performed if there has been no production during the past year. The hose may be of any size. The hose shall be as representative as possible of the size produced during the period and based on an engineering decision of the size produced that would be most likely to fail if there was a defect.

Table V. Quality conformance inspection table.

Title	Requirement	Inspection	Sample quantity for quality conformance inspection		
			Individual tests ^{1/}	P1 tests ^{2/}	P2 tests ^{3/}
Examination of product	3.1, 3.2, 3.3, 3.6.1, 3.6.2, 3.8, 3.9, 3.10	4.6.1	all	1	
Proof pressure	3.7.1.2	4.6.2	all		
Elongation and contraction	3.7.3	4.6.18		2	
Burst pressure	3.7.9	4.6.3		Same 2 of 4.6.18	
Leakage	3.7.8	4.6.4		1	
Bulge	3.7.10	4.6.5		3	
Collapse	3.7.16	4.6.6		1	
Bending and vacuum	3.7.15	4.6.7		1	
Adhesion	3.7.6	4.6.8		1	
Reduction in diameter	3.7.4	4.6.9			2
Hydraulic impulse	3.7.11	4.6.10			6
Cold temp. flex	3.7.12	4.6.11			2

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Table V. Quality conformance inspection table - Continued.

Title	Requirement	Inspection	Sample quantity for quality conformance inspection		
			Individual tests ^{1/}	P1 tests ^{2/}	P2 tests ^{3/}
Fuel immersion	3.7.14	4.6.12			1
Water and alcohol resistance	3.7.5.1	4.6.13			1
Fuel resistance	3.7.5.2	4.6.14			1
Corrosion resistance	3.7.17	4.6.15			2

Notes:

- 1/ 100% inspection is required on all hose supplied to this specification.
- 2/ P1 tests for cumulative production of up to 20,000 feet, for either a single government procurement or a combination of government procurement and private sector support for hose conforming to this specification.
- 3/ P2 tests for cumulative production of 20,000 to 100,000 feet, for either a single government procurement or a combination of government procurement and private sector support for hose conforming to this specification.

4.5.3.3 Nonconformance. If a hose sample fails to pass either periodic test, the manufacturer shall immediately notify the qualifying activity and cognizant inspection activity of such failure and take corrective action of the materials or processes, or both, as warranted, and on all units of product that can be corrected and that were manufactured under essentially the same conditions, with essentially the same materials and processes, and that were considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken. After that corrective action has been taken, the periodic test shall be repeated on additional samples (all inspections, or the inspection that the original sample failed, at the option of the qualifying activity). Periodic tests may be re-instituted; however, final acceptance shall be withheld until the periodic tests have shown that the corrective action was successful. In the event of failure after inspection, information concerning the failure and corrective action taken shall be furnished to the cognizant inspection activity and the qualifying activity.

4.6 Test methods.

4.6.1 Examination of product. Hose shall be examined to verify conformance with the requirements of this specification with respect to materials, construction, dimensions, concentricity, identification of product, age, and workmanship. When verifying the dimensions of the hose, the measurements shall be made at least 0.5 inch from the end of the hose and with the hose being held straight at the point measured. (See 3.1, 3.2, 3.3, 3.3.1, 3.3.2, 3.3.3, 3.4, 3.6.1, 3.6.2, 3.8, 3.9, and 3.10.)

4.6.2 Proof pressure test. The length of hose or hose assembly, as applicable, shall be subjected to the applicable hydraulic proof pressure of table I. The test shall be conducted in accordance with the Proof Pressure Tests of ASTM D380 using water or hydraulic fluid as the test fluid. The proof pressure shall be held for not less than 30 seconds and not more than 5 minutes. There shall be no leakage or damage of the hose. If water is used, all hose shall be thoroughly dried after testing. (See 3.7.1.1 and 3.7.1.2.)

4.6.3 Burst pressure test. The hose assembly shall be subjected to the burst pressure of table I and the test conducted in accordance with the Straight Burst Test of ASTM D380 using water or hydraulic fluid as the test fluid, except that pressure shall be applied at a rate between 15,000 and 25,000 psi per minute. The hose shall not leak or burst and the adapter shall not separate from the hose at pressures up to the burst pressure of table I. (See 3.7.9.)

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4.6.4 Leakage test. The hose assembly shall be subjected to 70 percent of the burst pressure shown in table I and held for 5 minutes using water or hydraulic fluid as the test fluid. The pressure shall then be reduced to 0 psi, after which the pressure shall again be raised to 70 percent of the burst pressure and held for an additional 5 minutes. The surface of the hose shall be carefully checked during this period for any wicking or leakage of the test fluid that might indicate leakage of the hose. (See 3.7.8.)

4.6.5 Bulge test. Hose assemblies shall be measured for bulging of the elastomeric tube and resulting reduction of ID caused by the attachment of the hose to the adapter. The hose shall be conditioned in air at a temperature of 160 ± 5 °F for a minimum of 16 hours prior to assembly. The hose and adapters shall be assembled in accordance with procedures recommended by the adapter manufacturer for hand assembly and the bulge measured. The hose assembly shall then be oil aged (see 4.3.2) for 7 days for qualification inspection (20 to 24 hours for conformance inspection) and the bulge again measured. A ball-end-type gauge is recommended for the bulge measurement. If used, the diameter of the ball type gauge shall be within .001 inch of the minimum bulge diameter C shown in figure 1. Holding the hose in a vertical position, the gauge is inserted into the end of the hose assembly at the bulge inspection point C shown in figure 1. The gauge must fall through the section at the end of the adapter insert under its own weight without lubrication and without forcing the gauge through the adapter-to-hose interfacing section. The weight of the gauge shall be equal in ounces to the dash number of the hose for which designed. (See 3.7.10.)

4.6.6 Collapse test. The collapse test shall be conducted on a hose assembly, of size -3 through -10 only, that has been oil-aged in accordance with 4.3.2. The hose assembly shall not be dried or washed after oil aging, and the test shall be conducted within 1 hour after removal of hose from the oil-aging fluid. A steel ball, with the diameter specified in table III and adequately perforated to prevent being affected by a vacuum, shall be installed within the hose assembly. The hose assembly shall be bent over a form to the radius specified in table I and a vacuum of 28 inches of mercury applied and held for 5 minutes, during which time the hose assembly shall be rotated and rebent over the form at 90 degree intervals throughout 360 degrees. With vacuum still applied, the hose assembly shall be straightened and held in a horizontal position and gradually tilted to 30 degrees in each direction. The test is passed if the ball rolls through the hose assembly. After release of the vacuum, the hose shall be dissected longitudinally and examined for evidence of ply separation, blistering, collapse, or other damage. (See 3.7.16.)

4.6.7 Bending and vacuum test. The bending and vacuum test shall be conducted on a hose assembly that has been oil-aged (see 4.3.2). The hose assembly shall be bent over a form to the radius specified in table I and the OD measured at the flattened section. While still bent in this radius, a vacuum of 28 inches of mercury shall be applied to the hose assembly and held for 5 minutes, during which time the hose shall be checked for additional flattening. After release of the vacuum, the hose shall be dissected longitudinally and examined for evidence of ply separation, blistering, collapse, or other damage. All sizes of hose shall not flatten or otherwise deform at any section in an amount greater than 10 percent reduction in OD (25 percent for size -32) before the vacuum is applied. This test does not apply to hose sizes -40 and -48. (See 3.7.15.)

4.6.8 Adhesion test. The adhesion test is applicable for hose sizes -12 through -48 only. Verification of adhesion for hose sizes smaller than -12 may be accomplished on the basis of similarity to larger sizes. An unaged and an oil-aged (see 4.3.2) strip specimen shall be tested for adhesion between the elastomeric tube and inner layer of reinforcing material, and between the inner and outer layer of reinforcing material, in accordance with the Machine Method of ASTM D413 using a Type A specimen. The oil-aged strip specimen shall be tested for adhesion within one hour after removal from the oil-aging fluid. (See 3.7.6.)

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4.6.9 Reduction in diameter test. A length of hose 3 inches long that has been oil-aged (see 4.3.2) shall be measured at least 0.5 inch inside the hose from each end to verify that the ID of the hose has not been reduced to less than 90 percent of the minimum ID specified in figure 1. (See 3.7.4.)

4.6.10 Hydraulic impulse test. Six hose assemblies of the length specified in table I shall be subjected to hydraulic impulse testing in accordance with SAE ARP603. Two assemblies shall be oil-aged (see 4.3.2), two shall be air-aged (see 4.3.3), and two shall be unaged. All hose assemblies shall be subjected to and successfully withstand the applicable hydraulic proof pressure specified in table I prior to impulse testing. Hose assemblies in sizes -4 through -16 shall be connected to a manifold and installed in an impulse test machine that shall produce dynamic impulses in the manifold of the magnitude and frequency required by SAE ARP603. The peak pressure shall be 125 percent of the hydraulic operating pressure specified in table I. Hose assemblies in size -20 through -32 shall be impulse tested in a similar manner, except that the hose assembly shall be subjected to a peak pressure of 100 percent of the hydraulic operating pressure specified in table I. In all cases, the backpressure shall be a maximum of 75 psi. There shall be no evidence of leakage or separation of the adapter from the hose. Any retightening of adapters or other maintenance on the adapters or hoses during this test shall be recorded. The fluid used for this test shall conform to either MIL-H-5606 or MIL-PRF-83282, except that the test fluid may contain up to 25 percent by volume of SAE J1966, grade 50, lubricating oil. The fluid shall be held to a temperature of 120 ± 10 °F measured at the test manifold. Hose sizes -4 through -12, when installed on the impulse test machine, shall be bent into a "U" shape with a bend radius as specified in table I. Hose sizes -16 through -32 may be installed straight. Both ends of the bent hose assembly shall be connected to a rigid support and one end of the straight hose assembly shall be free. Sizes -4 through -16 shall be subjected to 200,000 impulse cycles, and sizes -20 through -32 shall be subjected to 100,000 impulse cycles. There shall be no evidence of leakage or separation of the hose from the adapter. Impulse testing of sizes -40 and -48 is not required. (See 3.5 and 3.7.11.)

4.6.11 Cold temperature flexing test. Two hose assemblies shall be subjected to the cold temperature flexing test. For hose sizes -16 and larger, the hose assembled with adapters shall be 30 inches in length. One assembly shall be oil-aged (see 4.3.2), and the other assembly shall be air-aged (see 4.3.3). These assemblies shall be placed in a cold chamber, the temperature of which shall be controlled for 24 hours at -65, -5, +0 °F (72 hours for qualification inspection). After this time, and while still at the specified temperature, the two assemblies shall be removed from the cold chamber and immediately each assembly shall be flexed through 180° to the bend radius specified in table I in approximately 4 seconds. Hose assemblies of size -16 and larger may be tested at -40 °F in lieu of -65 °F. The hose assemblies shall then be subjected to the applicable hydraulic proof pressure in accordance with 4.6.2, after removal from the cold temperature flexing test. (See 3.7.12.)

4.6.12 Fuel immersion test. A hose assembly having 9 inches of free hose between the adapters shall be immersed in fuel conforming to ASTM D471, ASTM Reference Fuel B, for 72 hours at room temperature. Upon completion of this period, the assembly shall be subjected to the proof pressure specified for fuel in table I and held for 5 minutes. The test fluid used for pressure checking shall be lubricating oil conforming to SAE J1966, grade 50, or either MIL-H-5606 or MIL-PRF-83282 hydraulic fluid. The hose shall then be dissected longitudinally, and there shall be no indication of disintegration, such as ply separation, solubility of component parts, porosity, blistering, or collapse. (See 3.5 and 3.7.14.)

4.6.13 Water and alcohol resistance test. Test specimens of the elastomeric tube shall be tested as outlined in Method 6121 of FED-STD-601, except that the test specimens shall be immersed in a solution of half alcohol and half water at a temperature of 158 ± 5 °F for 24 hours and the tensile strength shall be measured within 15 minutes after removal from the solution. (See 3.7.5.1.)

4.6.14 Fuel resistance test. The tensile strength and elongation samples shall be tested in accordance with Method 6121 of FED-STD-601, except that the test specimens shall be immersed in fuel conforming to ASTM D471, ASTM Reference Fuel B, for 72 hours at room temperature, and the tensile strength and elongation shall be measured within 5 minutes after removal from the test fluid. Specimens of the

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elastomeric tube shall be subjected to the swelling tests specified in Method 6211 of FED-STD-601, except that the specimens shall be immersed for 72 hours at room temperature in fuel conforming to ASTM D471, ASTM Reference Fuel B, and the volume increase shall be measured within 5 minutes after removal from the test fluid. (See 3.5 and 3.7.5.2.)

4.6.15 Corrosion resistance test. With the ends plugged, the hose assembly shall be immersed in a vertical position into a 2.5 percent aqueous solution of sodium chloride for a period of 5 minutes. The hose assembly shall then be air-dried for 25 minutes at a temperature of 140 ± 5 °F. This immersion and drying cycle shall be repeated for a total of 168 hours. Upon completion of this test, the hose assembly shall be subjected to the applicable burst pressure in accordance with 4.6.3. (See 3.7.17.)

4.6.16 Lubricating oil circulation test. A hose assembly shall be subjected to lubricating oil circulation testing. The test fluid used for this test shall be SAE J1966, grade 50 oil, or either MIL-H-5606 or MIL-PRF-83282 hydraulic fluid. A hose assembly smaller than size -24 shall have 9 inches of free-length hoses between adapters. For a hose assembly of size -24 and larger, the ratio of free length hose between adapters to the nominal hose size in inches shall be six to one. The following sequence of steps shall be performed:

- a. The hose assembly shall be filled with test fluid while at room temperature. The hose assembly shall remain filled for the duration of the test. The hose assembly shall be installed in a temperature-controlled box. The temperature of the ambient air shall be reduced to -40 ± 5 °F and held for a minimum of 3 hours. Circulation of the fluid shall then be started at the specified operating pressure for oil in table I at a minimum flow rate of 3 gallons per minute. A 400-psi surge pressure shall be applied for the first 30 seconds of fluid circulation while the ambient temperature is at -40 °F.
- b. The temperature of the fluid shall then be increased within 1 hour to the specified circulation temperature of 250 ± 5 °F. The ambient air temperature shall be increased to 140 ± 10 °F.
- c. Circulation shall be continued for a minimum of 20 hours. The temperature of the fluid shall be raised to $325, +0, -5$ °F, for 15 minutes during the last 30 minutes of each 20-hour cycle. The ambient air temperature shall be maintained at 140 ± 10 °F. Fluid circulation shall then be stopped.
- d. Steps a, b, and c shall be accomplished a total of 10 times to obtain a minimum of 200 hours fluid circulation.
- e. Upon completion of the above test sequence, the hose assembly shall be subjected to a proof pressure test at the pressure specified for oil in table I and held for 5 minutes. (See 3.5, 3.7.7, and 3.7.13.)

4.6.17 Volumetric expansion test. Hose of size -3, -4, and -5 only shall be subjected to the Volumetric Expansion Test of ASTM D380. (See 3.7.2.)

4.6.18 Elongation and contraction test. A hose assembly of not less than 15 inches in length shall be subjected to the Elongation and Contraction Test of ASTM D380. After assembly, a measured hose length of not less than 10 inches shall be marked on the hose. The test pressure shall be the hydraulic operating pressure specified in table I. (See 3.7.3.)

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5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point packaging activity within the Military Department or Defense Agency, or within the Military Department's Systems Command. Packaging data retrieval is available from the managing Military Department or Defense Agency 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. This specification is being retained as a military detail specification because of the unique military requirements for use in systems operating in an environment from -65 °F to 250 °F. The elastomeric hose covered by this specification is intended for use with adapters conforming to MIL-DTL-5070 in fabricating flexible hose assemblies conforming to MIL-DTL-8795. The hose assemblies are intended for use in hydraulic, fuel, and oil lines.

6.2. Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Hose size (see 1.2 and table I), length, and lot size to be acquired. Unless otherwise specified in the solicitation, hose shall be furnished in lengths of from 20 to 65 feet, except that on such orders, up to 10 percent may be furnished in random lengths over 10 feet and an additional 10 percent may be furnished in random lengths over 3 feet. When hose is ordered in specified lengths, a tolerance of ± 1 percent of the specified length should be allowed.
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- d. The period of time, if any, for which a waiver will be granted allowing delivery of hose marked "MIL-H-8794" in lieu of the new designation "MIL-DTL-8794" (see 3.8).
- e. Packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List No. 8794, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the qualifying activity (Defense Logistics Agency, Defense Supply Center, Columbus (DSCC-VQP), P.O. Box 3990, Columbus, OH 43216-5000).

6.4 Definitions.

Elastomer. A material that 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)

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

6.5 Subject term (key word) listing.

Hose assembly

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

CONCLUDING MATERIAL

Custodians:

Army - AT
Navy - AS
Air Force - 99
DLA - CC

Preparing activity:

DLA - CC

(Project 4720-0144)

Review activities:

Army - AV, MI
Navy - MC, SA
Air Force - 11, 82

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-8794E	2. DOCUMENT DATE (YYYYMMDD) 20000922
3. DOCUMENT TITLE Hose, Elastomeric, Hydraulic Fluid, Fuel, and Oil Resistant		
4. NATURE OF CHANGE <i>(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)</i>		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME <i>(Last, First, Middle Initial)</i>		b. ORGANIZATION
c. ADDRESS <i>(Include zip code)</i>	d. TELEPHONE <i>(Include Area Code)</i> (1) Commercial (2) DSN <i>(if applicable)</i>	7. DATE SUBMITTED <i>(YYYYMMDD)</i>
8. PREPARING ACTIVITY		
a. NAME Defense Logistics Agency Defense Supply Center, Columbus		b. TELEPHONE <i>(Include Area Code)</i> (1) Commercial (614) 692-0538 (2) DSN 850-0538
c. ADDRESS <i>(Include Zip Code)</i> DSCC-VAI P.O. Box 3990 Columbus, Ohio 43216-5000		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6621 Telephone (703) 767-6888 DSN 427-6888