

INCH-POUND

MIL-DTL-13531D

22 April 1998

SUPERSEDING

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11 February 1982

## DETAIL SPECIFICATION

HOSE, RUBBER AND HOSE ASSEMBLY, RUBBER  
(HYDRAULIC, FLEXIBLE)

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

## 1. SCOPE

1.1 Scope. This specification covers the performance requirements and tests for wire-reinforced rubber hydraulic hose and hose assemblies (see 6.1).

1.2 Classification. Hose and hose assemblies will be of the following types and classes as specified (see 6.2).

1.2.1 Types. The types of hose and hose assemblies will consist of the following:

Type I	Single wire braid reinforced.
Type II	Double wire braid reinforced.
Type III	Double spiral and single wire braid reinforced.

1.2.2 Classes. The classes of hose and hose assemblies will consist of the following:

Class A	With heavy cover.
Class B	With thin cover.

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This 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.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center Columbus, ATTN: DSCC-VAI, 3990 East Broad Street, Columbus, Ohio 43216-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the following 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

## FEDERAL

FF-N-836	-	Nut, Square, Hexagon, Cap slotted, Castellated, Clinch, Knurled, Welding and Single Ball Sect.
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## DEPARTMENT OF DEFENSE

MIL-H-6083	-	Hydraulic Fluid, Petroleum Base, For Preservation and Operation.
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## STANDARDS

## FEDERAL

FED-STD-H28/2	-	Screw Thread Standards for Federal Services.
FED-STD-162	-	Hose, Rubber, Visual Inspection Guide for.
FED-STD-601	-	Rubber: Sampling and Testing.

## DEPARTMENT OF DEFENSE

MIL-STD-810	-	Environmental Test Methods.
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(Unless otherwise indicated, copies of the above specifications, standards and handbooks are available from the Defense Printing Service Detachment Office, Bldg. 4D (Customer Service), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which 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 B 633	-	Standard Specification for Electrodeposited Coating of Zinc on Iron and Steel.
ASTM D380-80	-	Rubber Hose.

(Applications for copies of ASTM publications should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

## AMERICAN SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

J516	-	Hydraulic Hose Fittings, Standard.
J517	-	Hydraulic Hose, Standard.
AS 1933	-	Age Controls for Hose Containing Age-Sensitive Elastomeric Material.

(Application for copies should be addressed to the American National Standard Institute, 11 West 42<sup>nd</sup> Street, New York, NY 10018.)

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/NCSL Z540-1-1994	-	Calibration Laboratories and Measuring and Test Equipment, General Requirements.
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(Application for copies should be addressed to the American National Standard Institute, 1430 Broadway New York 10018-3308.)

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 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheets, the latter shall govern.

3.2 Qualification. The hose and hose assemblies furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.3 Critical interface materials (see 6.10). Materials shall be as specified herein and in reference specifications, standards, drawings, or recognized industry equivalent standards. If materials other than those specified are used, the contractor shall certify to the qualifying activity that the substitute material(s) enables the hose or hose assemblies to meet the performance requirements of this specification. Acceptance of any constituent materials shall not be construed as a guaranty of the acceptance of the product. When a definite material is not specified, a material shall be used which will enable the hose or hose assembly to meet the performance requirements of this specification.

3.3.1 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, and promotes economically advantageous life cycle costs.

3.3.2 Critical interface fitting materials (see 6.10). Steel fittings, except stainless when furnished, shall be zinc plated type II, class 2, in accordance with ASTM B 633.

3.3.3 Inner tube. The inner tube shall consist of an oil-resistant compound seamless and uniform gauge. The inner tube shall have a smooth bore, shall be free of pitting and other defects, and shall be cleaned free of dirt, foreign material and mandrel lubricants.

#### 3.3.4 Reinforcement.

3.3.4.1 Type I. Reinforcement of type I hose shall be similar to SAE J517, type 1OOR1 and consist of one braid of high tensile steel wire.

3.3.4.2 Type II. Reinforcement of type II hose shall be similar to SAE J517, type 1OOR2 and consist of two or more braids of high strength steel wire.

3.3.4.3 Type III. Reinforcement of type III hose shall be similar to SAE J517, type 1OOR2B and consist of one braid of high tensile steel wire covering two spiral plies of high strength steel wire.

3.3.5 Outer cover. The outer cover shall utilize a polymerized chloroprene (or equivalent material) as the basic material, and shall be of such strength as to meet the performance requirements of this specification.

3.3.6 Configuration and features. Hose shall be constructed similar to SAE J517. Hose assemblies shall consist of hose with fittings assembled on each end. Unless otherwise specified, one fitting in each hose assembly shall be of the male type and one of the female type similar to SAE J516. The female type shall incorporate a swivel. Dimensions and materials of fittings shall conform to the applicable drawings (or equivalent industry standards), see 6.2 and 6.7.

#### 3.4 Critical hose interface dimensions.

3.4.1 Hose diameters. Inside diameter and outside diameter of the hose and outside diameter of the wire braid shall be as specified in table I for the specified nominal hose size.

3.4.1.1 Hose lengths. Unless otherwise specified (see 6.2), bulk hose shall be furnished in lengths of 20 to 65 feet, except that not more than 10 percent may be furnished in random lengths between 10 to 20 feet and not more than an additional 10 percent may be furnished in random lengths between 3 and 10 feet. When hose length is specified, tolerance shall be +.25 inch and -.125 inch for lengths less than 3 feet, and  $\pm 1\%$  for lengths of 3 feet or more.

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TABLE I. Critical interface hose dimensions.

Nominal hose size (inches)	Inside diameter Classes A and B	Wire braid outside diameter		Overall outside diameter			
		Type I Classes A and B (inches)	Types II and III Classes A and B (inches)	Type I Class A (inches)	Type I Class B (inches)	Types II and III Class A (inches)	Types II and III Class B (inches)
.188	0.188+.023 -.008	0.375 ± .023	0.438 ± .023	0.500 ± .031	0.465 ± .023	0.625 ± .031	0.535 ± .027
.250	0.250+.023 -.008	0.438 ± .023	0.500 ± .023	0.625 ± .031	0.527 ± .023	0.687 ± .031	0.593 ± .027
.313	0.313+.023 -.008	0.500 ± .023	0.563 ± .023	0.688 ± .031	0.590 ± .023	0.750 ± .031	0.660 ± .027
.375	0.375+.023 -.008	0.594 ± .023	0.656 ± .023	0.781 ± .031	0.684 ± .023	0.843 ± .031	0.754 ± .027
.500	0.500+.031 -.015	0.719 ± .031	0.781 ± .031	0.906 ± .031	0.805 ± .031	0.968 ± .031	0.874 ± .031
.625	0.625+.031 -.015	0.844 ± .031	0.906 ± .031	1.031 ± .031	0.930 ± .031	1.093 ± .031	1.000 ± .031
.750	0.750+.031 -.015	1.000 ± .031	1.063 ± .031	1.187 ± .031	1.086 ± .031	1.250 ± .031	1.156 ± .031
.875	0.875+.031 -.015	1.125 ± .031	1.188 ± .031	1.313 ± .031	1.211 ± .031	1.375 ± .031	1.281 ± .031
1	1.000+.040 -.015	1.313 ± .031	1.375 ± .047	1.500 ± .046	1.430 ± .031	1.562 ± .046	1.500 ± .031
1.250	1.250+.047 -.015	1.594 ± .047	1.750 ± .047	1.812 ± .062	1.741 ± .047	2.000 ± .062	1.867 ± .047
1.500	1.500+.047 -.015	1.844 ± .047	2.000 ± .047	2.062 ± .062	1.968 ± .047	2.250 ± .062	2.148 ± .047
2	2.000+.047 -.015	2.375 ± .047	2.500 ± .047	2.625 ± .062	2.500 ± .047	2.750 ± .062	2.648 ± .047

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3.4.2 Critical fitting interface dimensions (see 4.8.2)

3.4.2.1 Threaded parts. Screw threads of the form, number per inch and class 2 or as specified on the applicable drawing or military standard shall be in accordance with FED-STD-H28/2.

3.4.2.2 Wrench flats. The nominal distance across wrench flats (hexagon or other) shall be in multiples of .0625 inch. The tolerance shall not exceed the tolerance across flats for the semi-finished hexagon nut, nearest the fitting wrench flat size, as specified in FF-N-836.

3.4.3 Swivel fittings. Swivel fittings shall swivel freely with applied hand torque.

3.5 Performance requirements

3.5.1 Resistance to impulse pressure (see 4.8.3). Hose and hose assemblies shall withstand specified impulse pressures and cycling (see table II and figure 1) without hose leakage, leakage between the fitting and hose, leakage at the threaded connection, cracking, rupture or detachment of the fitting

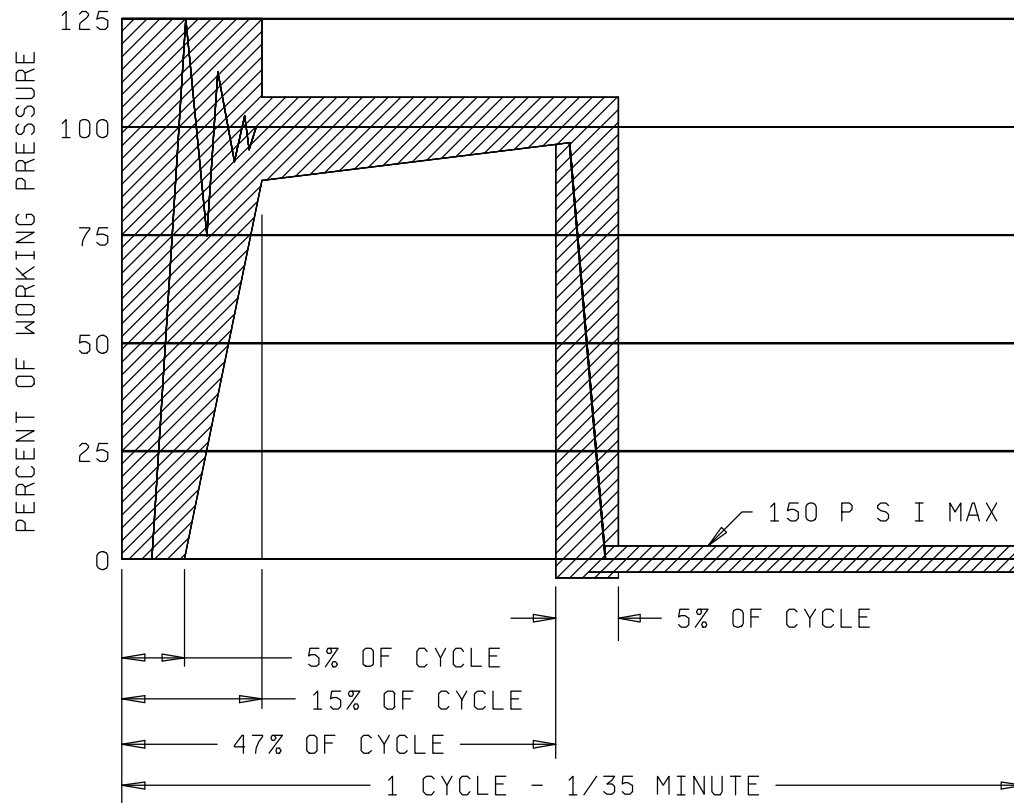
3.5.2 Length change (see 4.8.4). After being subjected to the applicable working pressure of table II, hose length change shall not exceed the limit specified in table III.

3.5.3 Burst pressure (see 4.8.5). Hose or hose assemblies shall withstand, without evidence of leakage, rupture or detachment of any applicable fittings, the applicable burst pressures specified in table II.

TABLE II. Pressure requirements

Nominal hose size (ID) in inches	Burst pressure (psi)		Proof pressure (psi)		Recommended working pressure (maximum) (psi)	
	Type I	Type II and type III	Type I	Type II and type III	Type I	Type II and type III
.188	12,000	20,000	6,000	10,000	3,000	5,000
.250	11,000	20,000	5,500	10,000	2,750	5,000
.313	10,000	17,000	5,000	8,500	2,500	4,250
.375	9,000	16,000	4,500	8,000	2,250	4,000
.500	8,000	14,000	4,000	7,000	2,000	3,500
.625	6,000	11,000	3,000	5,500	1,500	2,750
.750	5,000	9,000	2,500	4,500	1,250	2,250
.875	4,500	8,000	2,250	4,000	1,125	2,000
1	4,000	8,000	2,250	4,000	1,125	2,000
1.250	2,500	6,500	1,250	3,250	625	1,625
1.500	2,000	5,000	1,000	2,500	500	1,250
2	1,500	4,500	750	2,000	375	1,000

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FIGURE 1. Impulse pressure cycle.

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3.5.4 Low temperature flexibility (see 4.8.6). Hose or hose assemblies, the latter with a free length between fittings as specified in table III, shall exhibit no cracks in the cover when bent over the applicable mandrel specified in table III after having been conditioned for not less than 70 hours at  $-67^{\circ}\text{F} \pm 5^{\circ}\text{F}$  ambient air temperature. The specimens shall subsequently meet the requirements of 3.5.5.

TABLE III. Physical requirements.

Nominal hose size	Allowable length change (percent)	Minimum bend radius (mandrel radius) Types I, II and III (inches)	Hose length impulse test (inches)	Hose length for heat resistance and low temperature flexibility (inches)
.188	+0 -6	4	18	18
.250	+0 -6	4	18	18
.313	+2 -4	4.5	18	18
.375	+2 -4	5	18	18
.500	+2 -4	6	23	23
.625	+2 -4	8.5	28	28
.750	+2 -4	9.5	31	31
.875	+2 -4	10.5	18	33
1	+2 -4	11	18	36
1.250	+2 -4	16	18	42
1.500	+2 -4	20	18	42
2	+2 -4	22	18	42

3.5.5 Proof pressure (see 4.8.7). Hose and hose assemblies shall withstand the applicable proof pressure specified in table II without leakage, rupture or detachment from a fitting. Fittings shall withstand the applicable proof pressure specified in table II without rupture, crack, leakage between fittings and hose, or leakage at a threaded junction.

3.5.6 Oil resistance (see 4.8.8). Hose inner tube and outer cover specimens shall withstand immersion in oil conforming to MIL-H-6083 at a temperature of  $+158^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$  for  $168 \pm .5$  hours, with their average volume increasing not more than 30% and 100% respectively.

3.5.7 Ozone resistance (see 4.8.9). The hose outer cover elongated 12.5%, shall exhibit no cracking when examined under a 7 power magnification after having been exposed for a period of 168 hours at a temperature of  $+100^{\circ}\text{F} \pm 2^{\circ}\text{F}$  to an ozone concentration maintained at  $50 \pm 5$  parts of ozone per hundred million parts of air.

3.5.8 Fungus resistance (see 4.8.10). Hose and hose assemblies shall exhibit no evidence of fungus growth after exposure to fungus.

### 3.6 Marking.

3.6.1 Hose cover material. Hose cover material shall be marked with the PIN, type, class, date of manufacture, the manufacturers code symbol or name and the capital letters "OZ", at intervals of not more than 12 inches. The marking shall either be embossed or marked in white on the lay line of the hose. The marking shall be legible and permanently marked on the hose in such a way as not to deform or otherwise damage the hose covering.

3.6.2 Hose assemblies. A removable tag shall be attached to each hose assembly and shall contain the military part number (when applicable), date of assembly and specification number.

3.7 Age. The age of bulk hose and hose assemblies covered by this specification and furnished for use by the Government shall not exceed the limits established in SAE AR-1933.

3.8 Workmanship. All hose and hose assemblies shall be manufactured and processed in such a manner as to be uniform in quality and shall be free from burrs, die marks, chatter marks, foreign material and other defects that will affect life, serviceability, strength, assembly or durability. Workmanship shall be such as to enable the hose and hose assemblies to meet the applicable performance requirements of this specification.

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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 (i.e. Industry Standard, Military Standard, etc...) shall be IAW ANSI/NCSL Z540 -1 or equivalent.

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

- a. Qualification inspection (see 4.4).
- b. Quality conformance inspection (see 4.6).
- c. Periodic inspection (see 4.7).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in FED-STD-601, MIL-STD-810, and ASTM B 380.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government on sample 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 the Government.

4.4.1.1 Sample size (bulk hose). One sample lot, for qualification inspection of one type and nominal size of hose, shall consist of not less than 50 feet of bulk hose (see table IV).

4.4.1.2 Sample size (hose assemblies). One sample lot, for qualification inspection of hose assemblies consisting of one type and nominal size of hose with one or both types of fittings of corresponding size, shall consist of assemblies of lengths and quantities as specified in table IV for the applicable size and type, plus 6 feet of bulk hose.

TABLE IV. Qualification inspection sample size.

Test samples required						
Hose assemblies					Bulk hose <sup>1/</sup>	
ID size (inches) All types	Quantity	Free length (inches)	Bulk hose total length (feet)	Total length (feet)	Type	ID size (inches of same class as tested)
.25	15 8	18 26	6	50	I, II and III	.1875 through .5
1	10 8 6	18 26 37			I, II and III	.625 through 2

<sup>1/</sup> Bulk hose is qualified using fittings from the qualifying hose supplier.

4.4.2 Inspection routine. The sample(s) shall be subjected to the inspections specified in table V.

4.4.3 Failures. One or more failures shall be cause for refusal to grant qualification approval.

4.4.4 Retention of qualification. To retain qualification, the contractor shall verify in coordination with the qualifying activity the capability of manufacturing products which meet the performance requirements of this specification. Refer to the qualifying activity for the guidelines necessary to retain qualification to this specification. The contractor shall immediately notify the qualifying activity at any time the inspection data indicates failure of the qualified product to meet the performance requirements of this specification.

4.5 Test specimen conditioning. Test specimens to be conditioned shall consist of four untested hose assemblies. Test specimen lengths shall be as required for subsequent tests (see 4.8.3 and 4.8.6). Each test specimen shall be filled with hydraulic fluid conforming to MIL-H-6083 (or industry equivalent) and plugged at one end. The specimens shall be hung in an ambient air temperature of  $+ 250 \pm 5^{\circ}\text{F}$  for  $24 \pm 1/2$  hours. Following this heating, the specimens shall be allowed to cool to room temperature and the oil shall be drained.



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4.6 Quality conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A.

4.6.1.1 Unit of product. A unit of product shall be 10,000 feet of bulk hose or hose assemblies used in fabrication of each type and size (inner diameter) hose assembly produced for the Government except that not more than 2 sample units shall be selected in a 30-day period.

4.6.1.1.1 Inspection lot. The inspection lot consists of the number of units of product, offered for inspection at one time. All of the units of product in the inspection lot submitted shall have been produced during the same production period with the same materials and processes.

4.6.1.1.2 Sample unit. A sample unit shall be a unit of product selected at random from the inspection lot without regard to quality. Each sample unit shall consist of 6 feet of bulk hose and quantity of hose assemblies of lengths as specified in the applicable tests.

4.6.1.1.3 Test specimen. A test specimen shall be an individual length of hose or hose assembly as specified in table IV.

4.6.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table V in the order shown.

4.6.1.2.1 Sampling plan (group A conformance inspection). Table V tests shall be performed on a production lot basis. Random sample units shall be selected. If one or more defects are found, then the lot shall be screened for that particular defect and defects removed. A new random sample unit of parts shall be selected and all group A test again performed. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

4.6.1.2.2 Visual inspection (group A inspection). Each hose or hose assembly shall be visually examined for completeness, workmanship and identification requirements.

4.7 Periodic inspection.

4.7.1 Group B inspection (periodic). Group B inspection shall consist of the inspections specified in table V in the order shown, and shall be made on sample units which have been subjected to and passed the group A inspection.

4.7.2 Group B sampling plan. A sample of parts shall be randomly selected in accordance with table V. If one or more defects are found, the lot shall be screened for that particular defect and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected and subjected to all tests in accordance with table V. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

4.7.2.1 Failures. If one or more specimens fail to pass group B inspection, the inspection lot shall be considered to have failed.

4.7.2.2 Disposition of sample units (specimens). Sample units which have been tested to group B inspection shall not be delivered on the contract or purchase order.

4.8 Methods of inspection.

4.8.1 Test methods. The following identified tests and test methods assure hose and hose assembly integrity within typical operating conditions and applications. Alternate commercial industry standard test methods are allowed; however when an alternate method is used, the qualifying activity must be notified prior to the performance of the test. The test methods described herein are proven methods and shall be the referee method in case of dispute.

4.8.2 Configuration and features (see 3.4.2). Hose and hose assemblies shall be examined to verify that the design, construction, physical dimensions, marking and workmanship are in accordance with the applicable requirements.

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TABLE V. Inspection table.

Inspection or test	Qualification		Group A (Quality conformance)		Group B (Periodic)	
	Requirement	Test	Requirement	Test	Requirement	Test
Marking	3.6.1, 3.6.2		3.6.1, 3.6.2		3.6.1, 3.6.2	
Workmanship	3.8	4.6.1.2.2	3.8	4.6.1.2.2	3.8	4.6.1.2.2
Configuration	3.3.5	4.8.2	3.3.5	4.8.2	3.3.5	4.8.2
Proof pressure <u>1/</u>	3.5.5	4.8.7	3.5.5	4.8.7	3.5.5	4.8.7
Impulse pressure	3.5.1	4.8.3			3.5.1	4.8.3
Length change	3.5.2	4.8.4			3.5.2	4.8.4
Burst pressure <u>2/</u>	3.5.3	4.8.5			3.5.3	4.8.5
Low temperature flexibility <u>3/</u>	3.5.4	4.8.6			3.5.4	4.6.8
Oil resistance <u>3/</u>	3.5.6	4.8.8			3.5.6	4.8.8
Ozone resistance <u>3/</u>	3.5.7	4.8.9				
Fungus resistance <u>3/ 4/</u>	3.5.8	4.8.10				

1/ 100% inspection required on all hose and hose assemblies supplied to this specification.

2/ These are destructive test.

3/ These tests need only be done during initial qualification as long as materials, material supplier, and designs and manufacturing processes have not changed.

4/ Manufacturers may certify to the qualifying activity that the materials used are fungus resistant in-lieu-of performing this test.

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4.8.3 Resistance to impulse pressure (see 3.5.1). Test specimens shall consist of two hose assemblies, each with a free length between fittings as specified in table III, which have been conditioned in accordance with 4.5.

To determine conformance to 3.5.1, each test specimen of .75 inch inside diameter or less shall be mounted on the impulse test machine in a "U" shape with a bend radius as specified in table III. Each hose assembly of .875 inch inside diameter or larger shall be straight when mounted on the impulse test machine. One end of each test specimen shall be connected to a rigid support and the other end to a non rigid support to allow for specimen contraction in length. Hydraulic fluid conforming to MIL-H-6083 (or industry equivalent), maintained at a temperature of  $+120 \pm 10^\circ\text{F}$  shall be used as the impulse medium and shall circulate through the hose during the test.

Each impulse cycle shall consist of a pressure rise from 0 pounds per square inch (psi) (tolerance plus 150 psi, minus 0 psi) to  $125 \pm 5\%$  of the working pressure specified in table II (except that the maximum impulse pressure shall not exceed 3,750 psi) followed by a pressure drop to 0 psi (tolerance plus 150 psi, minus 0 psi). The shape of the pressure-time curve shall fall within the shaded area shown on figure 1. Cycles shall occur at the rate of  $35 \pm 5$  cycles per minute. The test pressure shall be 125% of the working pressure specified in table II for type III and the one inch and smaller ID type I hoses and 100% of the working pressure specified in table II for the larger than one inch ID type I hoses except the test pressure shall not exceed 5,000 psi. The number of impulse cycles shall be 150,000 for type I hoses and 200,000 for type II and III hoses. Nonconformance to 3.5.1 shall constitute failure of this test.

4.8.4 Length change (see 3.5.2). To determine conformance to 3.5.2, the length change test shall be conducted as specified in ASTM D380, except as modified herein. Test specimens shall consist of three hose assemblies, each not less than 12 inches between fittings. Final pressure shall be the working pressure specified in table II for the type and size hose tested. Rate of increase from initial (10 psi) pressure to final pressure shall be approximately 1,000 psi per minute. Measurement can be taken 2 minutes after required working pressure has been reached. Average change in length of the three specimens, expressed in percentage of the original length, shall be calculated and used to determine conformance to 3.5.2.

4.8.5 Burst pressure (see 3.5.3). To determine conformance to 3.5.3, the three test specimens used in 4.8.4 shall be subjected to the burst pressure test specified in ASTM D380, except as specified herein. The rate of pressure application shall be from 5,000 to 10,000 psi per minute. Pressure shall be increased until each specimen fails. Failure of the hose specimen shall consist of leakage, rupture, or detachment from a fitting. Failure of a hose assembly specimen shall consist of leakage or rupture of the hose or fitting, leakage between hose and fitting or leakage between fitting and test fixture connector. Average burst pressure for the three specimens shall be calculated and used to determine conformance to 3.5.3.

4.8.6 Low temperature flexibility (See 3.5.4). Test specimens shall consist of three hose assemblies, each with a free length between fittings as specified in table III. Two specimens shall be selected from those previously conditioned in accordance with 4.5 and one specimen shall be unconditioned.

To determine conformance to 3.5.4, test specimens and test fixture shall be temperature conditioned as specified in 3.5.4. The test shall then be conducted at the same temperature. Each specimen shall be tested by bending it around a mandrel until the full length of the hose is in contact with the mandrel circumference, then straightening the hose and bending it in the reverse direction about the mandrel circumference. Each bend shall be accomplished at a substantially uniform rate in  $12 \pm 3$  seconds. The mandrel radius shall be as specified in table III. Each specimen shall be examined during and after test to determine conformance to 3.5.4.

4.8.7 Proof pressure (see 3.5.5). To determine conformance to 3.5.5, the proof pressure test shall be conducted as specified in ASTM D380, except as specified herein. Control or qualification test specimens shall consist of three hose assemblies previously tested in accordance with 4.3.6. Acceptance tests shall be conducted on all bulk hose and hose assemblies submitted in lengths as received. Proof pressures shall be as specified in table II for the type and size tested. Proof pressure shall be held for not less than 30 seconds, nor more than 60 seconds, during which time each specimen shall be examined for conformance to 3.5.5.

4.8.8 Oil resistance (see 3.5.6). To determine conformance to 3.5.6, the oil resistance test shall be conducted as specified in method 6211 of FED-STD-601, except as specified herein. Three specimens shall be taken from the outer cover of untested hose, and three specimens shall be taken from the inner tube of untested hose. Each specimen shall be approximately 2 square inches in area. Each specimen shall be immersed in the hydraulic fluid, at the temperature specified in 3.5.6. The change in volume reported for the outer cover shall be the average of the values obtained from the three outer cover specimens tested. The change in volume of the inner tube shall be the average of the values obtained from the three inner tube specimens tested. The change in volume of the outer cover and inner tube shall each be calculated to determine conformance to 3.5.6.

4.8.9 Ozone resistance (see 3.5.7). To determine conformance to 3.5.7, a specimen of hose, of full circumference and approximately 10 inches longer than the circumference of the required mandrel, shall be bent around the mandrel, the diameter of which shall be as specified in 4.4., and bound with tape or twine where the ends cross one another. If collapse of the hose occurs when bent around the mandrel, provision shall be made to support the hose internally. This procedure will result in a 12.5 % elongation of the cover. The specimen shall be conditioned for 45 minutes in air at room temperature, and then while still on the mandrel, shall be placed in an exposure chamber. Length of time in the ozone chamber, temperature, and the ozone concentration therein shall be as specified in 3.5.7. The specimen shall be examined daily for cracking, with a 7 power magnification and without magnification, except area covered by tape or twine. The first observable cracking shall be recorded. After required exposure to ozone, the specimen shall again be examined with 7 power magnification to determine conformance to 3.5.7.

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4.8.9.1 Alternate test method. When the size of the hose is large, requiring too large a mandrel, it is permissible to bend the hose specimen around an arc of segment of a mandrel of the proper size, resulting in an elongation of 12.5%. The ends of the hose shall be tied to the ends of the segment with tape or twine. Examination after exposure shall be restricted to the surface within the 12.5% elongation.

4.8.10 Fungus resistance (see 3.5.8). To determine conformance to 3.5.8, test specimens shall consist of six hose assemblies, each with hose length between fittings of not less than 24 inches. Specimens shall be tested in accordance with MIL-STD-810, method 508, procedure I. Two specimens shall be subjected to the proof pressure test (see 4.8.7) after each of the incubation periods (30, 60 and 90 days) to determine conformance to 3.5.8.

## 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 material 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's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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 which may be helpful, but is not mandatory.)

6.1 Intended use. Hose and hose assemblies covered by this performance specification are intended for use in medium and high pressure hydraulic systems at temperatures between -65° to +200°F.

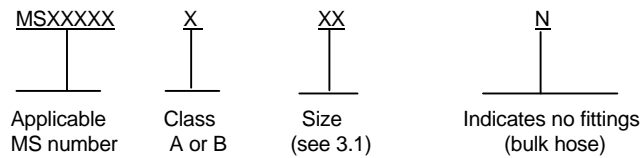
6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).
- c. Packaging requirements (see 5.1).
- d. Hose type, class and nominal size (see 1.2.1, 1.2.2 and table I).
- e. Title, number and date of applicable drawings (see 3.3).
- f. Fitting description where applicable (see 3.3).
  1. Male or female
  2. Fixed or swivel
  3. Thread size
  4. Hose to pipe or hose to tube
  5. Flare type (S.A.E. or J.I.C.) or flareless (compression) type where applicable
  6. Type of plating on fittings (see 3.3)
  7. Reusable screw-on type or reusable clamp-on type or permanently attached type
- e. Hose or hose assembly length where applicable (see 3.4.1.1)

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 the applicable Qualified Products List QPL NO.13531 whether or not such products have actually been so listed by that date. The attention of the contractor 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 orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus (DSCC-V), 3990 East Broad Street, Columbus, Ohio 43216-5000.

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6.4 Part of Identifying Number (PIN). For the hose assemblies see 3.1. For bulk hose the PIN is as follows.



6.5 Subject term (key word) listing.

Fittings  
Thread size  
Tube

6.6 Fittings. Fittings for bulk hose should be purchased from the manufacturer of the bulk hose being used.

6.7 References to superseded specifications. All the requirements of MIL-PRF-13531D are interchangeable with those of MIL-H-13531C, therefore, previously existing documents (OEM drawings, etc.) referencing MIL-H-13531 need not be changed.

6.8 Recycled materials. The use of recycled raw materials which meet the performance requirements of the applicable material specifications without jeopardizing the intended use of the item shall be encouraged. (see 3.2).

6.9 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.

6.10 References. Federal standards and military specification references:

MIL-H-6083     -     Hydraulic Fluid, Petroleum base, for Preservation and Operation

## CONCLUDING MATERIAL

Custodians:  
Army - AT  
Navy - MC  
Air Force - 99

Review activities  
Army - AR, AV, CR4, MI  
Air Force - 82

Preparing activity:  
DLA-CC

(Project 4720-0132)

# 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.
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-13531D

2. DOCUMENT DATE (YYMMDD)  
22 April 1998

3. DOCUMENT TITLE Hose and Hose Assembly, Nonmetallic (Hydraulic, Pneumatic, Flexible)

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

### 5. REASON FOR RECOMMENDATION

### 6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)  
(1) Commercial  
(2) AUTOVON  
(if applicable)

7. DATE SUBMITTED  
(YYMMDD)

### 8. PREPARING ACTIVITY

a. NAME Defense Supply Center Columbus  
ATTN: DSCC-VAI

b. TELEPHONE Include Area Code)  
(1) Commercial (614) 692-7707  
(2) AUTOVON 850-7707

c. ADDRESS (Include Zip Code)  
3990 East Broad St.  
Columbus, OH 43216

**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:**  
DEFENSE QUALITY AND STANDARDIZATION OFFICE  
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22401-3466  
Telephone (703) 756-2340 AUTOVON 289-2340