

DETAIL SPECIFICATION

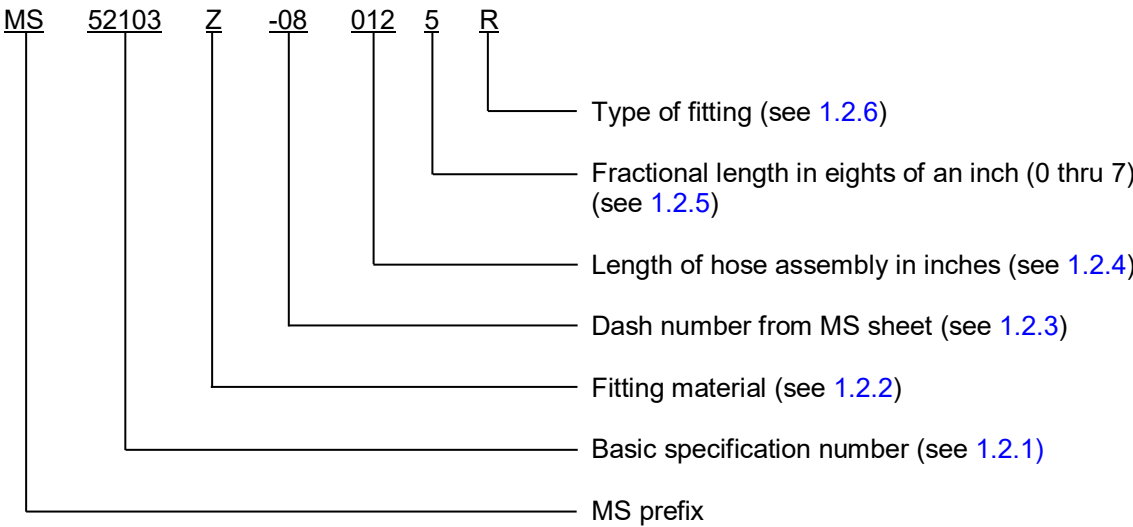
HOSE AND HOSE ASSEMBLIES, RUBBER: FUEL AND OIL

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

1. SCOPE

1.1 Scope. This specification covers hose and hose assemblies, rubber: fuel and oil. The hoses described in this specification consist of two types of fuel and oil hose, hose assemblies for military engine installations and other uses (see 6.1).

1.2 Part or Identifying Number (PIN). The PIN consists of the letters MS, the basic specification number, a forward slash, a detail specification number, a letter, a two digit number, a three digit number, a single digit number, and a letter.



PIN example: MS52103Z-080125R

Reference the respective MS sheets for additional PIN's used for ordering hose.

Comments, suggestions, or questions on this document should be addressed to: DLA Land and Maritime, ATTN: VAI, P.O. Box 3990, Columbus, Ohio 43218-3990, or emailed to FluidFlow@dla.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>.



1.2.1 Basic specification.

MS52103 (type III) MS52104 (type I)

1.2.2 Fitting material. Reference MS52103 and MS52104 for applicable fitting material and plating available.

A - Carbon steel, cadmium plated.
B - Brass.
C - Carbon steel.
H - Carbon steel, zinc-aluminum.
R - Carbon steel, zinc plating Fe/Zn8.
S - Stainless Steel.
Z - Carbon steel, zinc plated class 8.
ZN - Carbon steel, zinc-nickel.

1.2.3 Dash number. Dash number from MS sheet defines the hose inside diameter (I.D), hose outside diameter (O.D.) and fitting thread.

1.2.4 Length of hose assembly. Length of hose assembly in inches (3 digits).

1.2.5 Fractional length. Fractional length in eighths of an inch (0 through 7).

1.2.6 Type of fitting.

R - Reusable.
P - Permanent.

1.3 Classification. Hose and hose assemblies consist of the following types and nominal inside diameter (I.D.) sizes as specified in MS52103 and MS52104 (see 3.1 and 6.2):

Type I	-	Single fabric braid reinforcement.
Type III	-	Single fabric and single wire braid reinforcement covered with synthetic-rubber-impregnated fabric braid, medium pressure and high temperature resistant.

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.

2.1.1 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 issues of these documents are those cited in the solicitation or contract.

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DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-2104	-	Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service.
MIL-PRF-5606	-	Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance
MIL-PRF-21260	-	Lubricating Oil, Internal Combustion Engine, Preservative Break-In
MIL-PRF-83282	-	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, Metric, NATO Code Number H-537
MIL-PRF-87257	-	Hydraulic Fluid, Fire Resistant; Low Temperature, Synthetic Hydrocarbon Base, Aircraft and Missile
MS52103	-	Hose Assembly, Nonmetallic: Fuel and Oil, Medium Pressure, Flared Tube
MS52104	-	Hose Assembly, Rubber: Fuel and Oil, Low Pressure, flared Tube

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-810	-	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-889	-	Dissimilar Metals

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

2.2 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.

ASME INTERNATIONAL

ASME B1.1	-	Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B18.2.2	-	Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)

(Copies of these documents are available online at <https://www.asme.org>.)

ASTM INTERNATIONAL

ASTM A276/A276M	-	Standard Specification for Stainless Steel Bars and Shapes
ASTM A564/A 564M	-	Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
ASTM B117	-	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B633	-	Standard Specification for Electrodeposited Coating of Zinc on Iron and Steel
ASTM B695	-	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM D380	-	Standard Test Methods for Rubber Hose
ASTM D1149	-	Standard Test Methods for Rubber Deterioration-Cracking in an Ozone Controlled Environment
ASTM F1136/F1136M	-	Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners

(Copies of these documents are available online at <https://www.astm.org>.)

SAE INTERNATIONAL

SAE AS1933	-	Age Controls for Hose Containing Age-Sensitive Elastomeric Material
SAE AMS2417	-	Plating, Zinc-Nickel Alloy
SAE AMS2700	-	Passivation of Corrosion Resistant Steels
SAE J514	-	Hydraulic Tube Fittings

(Copies of these documents are available online at <https://www.sae.org>.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 17025/EC 17025	-	General Requirements for the Competence of Testing and Calibration Laboratories
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(Copies of this document is available online at <https://www.iso.ch>.)

NCSL INTERNATIONAL

NCSL Z540.3	-	Requirements for the Calibration of Measuring and Test Equipment
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(Copies of this document is available online at <https://www.ncsli.org>.)

2.3 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, (except for related specification sheets), 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 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. 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 manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.5 and 6.3).

3.3 Materials. Materials shall be as identified herein or as approved by the qualifying activity. However, when a definite material is not specified, a material shall be used which will enable the hose of hose assembly to meet the requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guarantee of acceptance of the finished product.

3.3.1 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased 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.

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3.3.1.1 Recovered materials. The term "recovered materials" means materials, which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. Unless otherwise specified, none of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification.

3.3.1.2 Used, rebuilt, or remanufactured components. No used, rebuilt, or remanufactured components, pieces, or parts shall be incorporated in the fittings.

3.3.1.3 Bulk hose. Bulk hose refers to hose that was produced on a large scale and which various lengths still exist from a spool. Using bulk hose lengths is acceptable provided it is within its shelf life requirements, see 6.2.1. Bulk hose is only used for hose and hose assemblies in which lengths in the PIN are expressed in inches (999 inches (83 feet)).

3.3.2 Ozone depleting substances (ODS). Class I and II ozone depleting substances (ODS) shall not be used in MIL-DTL-13444 or any referenced procedures.

3.3 Dissimilar metals. When dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. Dissimilar metals such as brass, copper or steel (except stainless steel passivated in accordance with SAE-AMS2700) shall not be used in intimate contact with aluminum or aluminum alloy. Protective measures for dissimilar metals shall be in accordance with MIL-STD-889.

3.4 Construction.

3.4.1 Hose. Hose shall be constructed of a seamless, smooth bore tube of flexible material, reinforcement, and an outer cover.

3.4.1.1 Hose outer cover.

3.4.1.1.1 Type I hose. The type I hose outer cover shall be compounded from oil resistant synthetic rubber polymer.

3.4.1.1.2 Type III hose. The type III hose outer cover shall consist of oil resistant rubber impregnated fabric.

3.4.2 Hose reinforcement.

3.4.2.1 Type I hose. Reinforcement of type I hose shall consist of a single braid of cotton, polyester, or other nonmetallic reinforcing material or plies of woven fabric of such strength as to meet the requirements of this specification.

3.4.2.2 Type III hose. Reinforcement of type III hose shall consist of an inner ply of fabric braid and an outer ply of single wire braid of such combined strength as to meet the requirements of this specification.

3.4.3 Inner tube. The inner tube shall be fabricated from oil resistant synthetic rubber polymer.

3.4.4 Hose assemblies. Hose assemblies shall consist of hose with fittings assembled on each end in accordance with MS52103 or MS52104 as applicable.

3.5 Hose assembly fittings. Unless otherwise specified on the applicable drawing, both fittings in each hose assembly shall be of the female type. The female type shall incorporate a swivel. Hose and hose assemblies shall conform to the applicable specification sheet (see 3.1).

3.5.1 Steel finishes. Not applicable for corrosion resistant steel, see 3.4.2.2. All steel plating's shall meet the 96-hour salt spray test, see 4.7.15.

- a. Cadmium plating. Cadmium plating in accordance with SAE-AMS-C-81562, type II, class 3 or SAE-AMS-QQ-P-416, type II, class 2. Fluid passages, other openings and internal threads shall not be subject to the plating thickness requirement and may have bare areas provided they are protected with a light film of oil. Cadmium shall not be used in oxygen or potable water systems. Cadmium is prohibited from use in NAVSEA owned shipboard systems, see 6.6.
- b. Zinc plating's. Not for use in aircraft, requires Program Office approval for all applications, see 6.6.2.
 - (1) ASTM B633; type II or III, Fe/Zn 8, or ASTM B695, type II, class 8
 - (2) ASTM B633; type III or V Fe/Zn 8, or ASTM B695, type II, class 8.
 - (3) Zinc-aluminum in accordance with ASTM F1136/F1136M, grade 3, NC.
 - (4) Zinc nickel shall be in accordance with SAE-AMS2417, type 2, grade B except the zinc-nickel alloy plate shall contain 12% to 16% nickel. The coating thickness shall be 315μ inches (8μm) minimum coating thickness.

NOTE: ASTM B633 type II, type III, and ASTM B695, type II finishes have a chromate conversion coating or chromic acid rinse, which includes hexavalent chromium and is not recommended.

3.5.2 Stainless steel fitting materials. Stainless steel fitting material shall be of the following types:

- a. XM-12 (15-5 PH) UNS designator S15500 in accordance with ASTM A564/A 564M.
- b. 603 (17-4 PH) UNS designator S17400 in accordance with ASTM A564/A 564M.
- c. 304 in accordance with ASTM A276.
- d. 316 in accordance with ASTM A276.
- e. 321 in accordance with ASTM A276.

3.5.3 Hose and hose assemblies lengths. Lengths of hose and hose assemblies shall be as specified on the applicable MS sheet, drawing, or procurement documents.

3.5.3.1 Cut length tolerances. When specified in the acquisition document (see 6.2), hose shall be furnished in cut lengths with a tolerance of plus or minus one percent for lengths of 3 feet (0.91 m) or greater and ±.25 inch (6.35 mm) for lengths of less than 3 feet (0.91 m).

3.5.4 Diameters. Inside and outside diameters shall conform to table I and table II, as applicable, for the type and size specified.

TABLE I. Inside and outside diameters (type I).

Dash No.	Nominal size, I.D inches (mm)	Nominal size, I.D decimal inches (mm)	Inside diameter		Outside diameter	
			minimum inches (mm)	maximum inches (mm)	minimum inches (mm)	maximum inches (mm)
- 2	1/8	.125 (3.18)	.109 (2.77)	.141 (3.58)	.328 (8.33)	.375 (9.53)
- 3	3/16	.188 (4.78)	.172 (4.37)	.203 (5.16)	.406 (10.31)	.468 (11.89)
- 4	1/4	.250 (6.35)	.234 (5.94)	.266 (6.67)	.469 (11.91)	.531 (13.49)
- 5	5/16	.313 (7.95)	.296 (7.52)	.328 (8.33)	.531 (13.49)	.593 (15.06)
- 6	3/8	.375 (9.53)	.359 (9.12)	.391 (9.93)	.594 (15.09)	.656 (16.66)
- 8	1/2	.500 (12.70)	.469 (11.91)	.531 (13.49)	.750 (19.05)	.812 (20.620)
- 10	5/8	.625 (15.88)	.593 (15.06)	.656 (16.66)	.937 (23.80)	1.000 (25.40)
- 12	3/4	.750 (19.05)	.718 (18.24)	.781 (18.84)	1.062 (26.97)	1.125 (28.58)

TABLE II. Inside and outside diameters (type III).

Dash No.	Nominal size, I.D. (inches)	Nominal size, I.D decimal inches (mm)	Inside diameter		Outside diameter	
			minimum inches (mm)	maximum inches (mm)	minimum inches (mm)	maximum inches (mm)
- 4	3/16	.188 (3.00)	.188 (3.00)	.216 (5.49)	.472 (11.99)	.510 (12.95)
- 5	1/4	.250 (6.35)	.250 (6.35)	.281 (7.14)	.535 (13.59)	.573 (14.55)
- 6	5/16	.313 (7.95)	.313 (7.95)	.344 (8.84)	.597 (15.16)	.635 (16.13)
- 8	13/32	.406 (10.31)	.406 (10.31)	.437 (11.10)	.714 (18.14)	.760 (19.30)
- 10	1/2	.500 (12.70)	.500 (12.70)	.539 (13.69)	.808 (20.52)	.854 (21.69)
- 12	5/8	.625 (15.88)	.625 (15.88)	.667 (16.94)	.933 (23.70)	.979 (24.87)
- 16	7/8	.875 (22.23)	.875 (22.23)	.917 (23.29)	1.175 (29.85)	1.237 (31.42)
- 20	1-1/8	1.125 (28.58)	1.125 (28.58)	1.172 (29.77)	1.456 (36.98)	1.518 (38.56)
- 24	1-3/8	1.375 (34.93)	1.375 (34.93)	1.422 (36.12)	1.691 (42.95)	1.753 (44.53)
- 32	1-13/16	1.813 (46.05)	1.812 (46.02)	1.859 (47.22)	2.096 (53.24)	2.190 (55.63)

3.5.5 Concentricity.

3.5.5.1 Concentricity 1/8 inch and 3/16 inch hose size. 1/8 (.125 inch) (3.18 mm) and 3/16 inch (.188 inch) (4.78 mm) hose sizes the inside diameter and the outside diameter shall be concentric within .030 inch (0.76 mm) total indicator reading.

3.5.5.2 Concentricity hose sizes greater than 3/16 inch. On hose sizes greater than 3/16 inch (.188 inch) (57.17 mm) the inside diameter and the outside diameter shall be concentric within .040 inch (1.02 mm) total indicator reading.

3.5.6 Bend radius. The hose shall be capable of "being bent" without collapse or damage to an inside bend radius specified in [table III](#).

TABLE III. Bend radius (hose assembly installation). 1/ 2/

Nominal size I.D. fraction	Nominal size I.D. inches	Nominal size I.D. mm	Type I inches (mm)	Type III inches (mm)
1/8	.125	3.18	1.75 (44.45)	2/
3/16	.186	4.72	2.00 (50.80)	.75 (19.05)
1/4	.250	6.35	2.25 (57.15)	1.00 (25.40)
5/16	.313	7.95	2.75 (69.85)	1.25 (31.75)
3/8	.375	9.53	3.00 (76.20)	2/
13/32	.406	10.31	3/	1.75 (44.45)
1/2	.500	12.70	3.75 (95.25)	2.25 (31.75)
5/8	.625	15.88	4.75 (120.65)	2.75 (69.85)
3/4	.750	19.05	5.50 (139.70)	2/
7/8	.875	22.23	2/	3.50 (88.90)
1-1/8	1.125	28.58	2/	4.50 (114.30)
1-3/8	1.375	34.93	2/	7.50 (190.50)
1-13/16	1.183	30.05	2/	14.00 (355.60)

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3/ Hose type not available in this size.

3.5.7 Fittings.

3.5.7.1 Screw threads. Screw threads of fittings shall be in accordance with ASME B1.1 for the size specified. Classes of fits for threads shall be in accordance with best commercial practice.

3.5.7.2 Wrench flats. Nominal distance across wrench flats (hexagon or other) shall be in multiples of 1/16 inch (.063 inch) (1.59 mm). Tolerance shall not exceed the tolerance across flats for the semi-finished hexagon nut nearest the fitting wrench flat size, in accordance with ASME B18.2.2.

3.5.7.3 Swivel fittings. Swivel fittings shall swivel freely with hand torque.

3.6 Performance. The following requirements shall be applicable to hose and hose assemblies of type I and type III except as differentiated herein. The term sample shall hereafter refer to either hoses or hose assemblies of both types.

3.6.1 Elongation and contraction.

3.6.1.1 Type I. Testing for type I hose and hose assemblies shall be in accordance with 4.7.4. After being subjected to the applicable working pressure of table IV the test samples shall change no more than plus or minus 5 percent. For hose assemblies the free length shall be the length between the fittings.

3.6.1.2 Type III. Testing for type III hose and hose assemblies shall be in accordance with 4.7.4. After being subjected to the applicable working pressure of table IV, the test sample elongation increase shall be not greater than 6 percent. For hose assemblies the free length shall be the length between the fittings.

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TABLE IV. Pressure requirements.

Nominal hose size (I.D.) (inch)	Burst pressure		Proof pressure		Working pressure	
	Type I (PSI)	Type III (PSI)	Type I (PSI)	Type III (PSI)	Type I (PSI)	Type III (PSI)
1/8	2000	<u>1/</u>	1000	<u>1/</u>	500	<u>1/</u>
3/16	1700	6000	850	3000	425	1500
1/4	1250	6000	625	3000	300	1500
5/16	1100	4000	550	2000	275	1000
3/8	1000	<u>1/</u>	<u>500</u>	<u>1/</u>	250	<u>1/</u>
13/32	<u>1/</u>	4000	<u>1/</u>	2000	<u>1/</u>	1000
1/2	750	3500	375	1750	200	875
5/8	700	3000	350	1500	175	750
3/4	500	<u>1/</u>	250	<u>1/</u>	125	<u>1/</u>
7/8	<u>1/</u>	1500	<u>1/</u>	750	<u>1/</u>	375
1-1/8	<u>1/</u>	1250	<u>1/</u>	625	<u>1/</u>	300
1-3/8	<u>1/</u>	1000	<u>1/</u>	500	<u>1/</u>	250
1-13/16	<u>1/</u>	750	<u>1/</u>	375	<u>1/</u>	200

See notes at end of table.

TABLE IV. Pressure requirements - Continued.

Decimal and metric <u>2/</u>						
Nominal hose size (I.D.) decimal (mm)	Burst pressure		Proof pressure		Working pressure	
	Type I (bar)	Type III (bar)	Type I (bar)	Type III (bar)	Type I (bar)	Type III (bar)
.125 (3.18)	137.90	<u>1/</u>	68.95	<u>1/</u>	34.47	<u>1/</u>
.186 (4.72)	117.21	413.69	58.61	206.84	29.30	103.42
.250 (6.35)	86.18	413.69	43.09	206.84	20.68	103.42
.313 (7.95)	75.84	275.79	37.92	137.90	18.96	68.95
.375 (9.53)	68.95	<u>1/</u>	34.47	<u>1/</u>	17.24	<u>1/</u>
.406 (10.31)	<u>1/</u>	275.79	<u>1/</u>	137.90	<u>1/</u>	68.95
.500 (12.70)	51.71	241.32	25.86	120.66	13.79	60.33
.625 (15.88)	48.26	206.84	24.13	103.42	12.07	51.71
.750 (19.05)	34.47	<u>1/</u>	17.24	<u>1/</u>	8.62	<u>1/</u>
.875 (22.23)	<u>1/</u>	103.42	<u>1/</u>	51.71	<u>1/</u>	25.86
1.125 (28.58)	<u>1/</u>	86.18	<u>1/</u>	43.09	<u>1/</u>	20.68
1.375 (34.93)	<u>1/</u>	68.95	<u>1/</u>	34.47	<u>1/</u>	17.24
1.183 (30.05)	<u>2/</u>	51.71	<u>1/</u>	25.86	<u>1/</u>	13.79

1/ Hose type not available in this size.2/ Metric equivalents are given for information only.

3.6.2 Proof pressure. When tested in accordance with 4.7.5, the test samples shall withstand the proof pressure up to and including that specified in table IV without leakage.

3.6.3 Burst pressure. When tested in accordance with 4.7.6, the test samples shall not burst at any pressure up to that specified in table IV. There shall be no leakage around the fittings of test samples below the specified minimum burst pressure.

3.6.4 Low temperature flexibility. The test samples shall show no evidence of breaks when subjected to the low temperature flexibility test specified in 4.7.7.

3.6.5 Ozone resistance. The covers of type I hose shall show no evidence of cracks or breaks when subjected to the ozone resistance test specified in 4.7.8.

3.6.6 Vacuum collapse resistance. The decrease in the outside diameter of type I hose shall be not greater than 15 percent when subjected to the vacuum collapse resistance test specified in 4.7.9.

3.6.7 Oil resistance. When tested in accordance with 4.7.10, the test samples shall be within the limits for volume change specified in table V.

TABLE V. Allowable volume change.

Condition	Tube		Cover
	Percent		Percent increase
	Decrease	Increase	
After oil immersion	---	---	---
Type I	5	25	100
Type III	0	30	---
After fuel immersion	---	60	110

3.6.8 Fuel resistance. When tested in accordance with 4.7.11, the test samples shall be within the limits of volume change specified in table V.

3.6.9 Vibration resistance. The test samples when subjected to the vibration resistance test specified in 4.7.12 shall not leak nor shall show any evidence of damage.

3.6.10 Fungus resistance. The test samples when subjected to the fungus resistance test specified in 4.7.13 shall show no evidence of damage affecting performance.

3.6.11 Hot oil circulation. The hose samples of type III shall exhibit no leaks, ruptures, or cracks, internally or externally when subjected to the hot oil circulation test specified in 4.7.14.

3.6.12 Salt spray testing. When fittings are exposed to salt spray testing specified in 4.7.15 the plating shall show no corrosion products of zinc or base metal corrosion products. The appearance of corrosion products visible to the unaided eye at normal reading distance shall be cause for rejection, except for white corrosion products at the edges of the specimens shall not constitute a failure.

3.7 Marking.

3.7.1 Hose cover material. The outer cover of hose, bulk hose, or hose in hose assemblies shall be marked with a water resistant, gasoline resistant, and oil-resistant, continuous yellow stripe. As a minimum, the hose cover material shall be marked with the following information at intervals of not more than 12 inches (305 mm):

- a. Military designator "MIL-H-13444" NOTE: The old specification designator "MIL-H-13444" number is used as the military designator to maintain backwards compatibility with existing parts.
- b. Type.
- c. Nominal ID size (fraction or dash no. in accordance with [table I](#) or [table II](#)).
- d. Date of manufacture (quarter of year and year).
- e. Capital letters "OZ" (type I only).
- f. Manufacturer's CAGE code.

Examples:

- a. MIL-H-13444 I 8 3Q19 OZ XXXX
- b. MIL-H-13444 III 1/2 3Q19 XXXX

3.7.2 Tagging of hose assemblies. A removable tag shall be attached to each hose assembly and shall contain the military PIN, date of assembly and specification number and name or code of assembly manufacturer.

3.8 Age limit. The age limit of hose, bulk hose, and hose assemblies covered by this specification and furnished for use by the Government shall not exceed the limits in accordance with SAE AS1933.

3.9 Workmanship. Workmanship shall be such as to produce hose and hose assemblies free from defects such as cracks, cuts, breaks, blisters, looseness, exposed braid, as well as restricted hole through end fittings or damaged or burred end fitting screw threads. Surface irregularities such as mold marks, laps, or air bubbles, as distinguished from cracks or cuts, shall not be cause for rejection.

4 VERIFICATION

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

- a. Qualification inspection (see [4.5](#)).
- b. Conformance inspection (see [4.6](#)).

4.2 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 ISO 17025/EC 17025 and NCSL Z540.3 as applicable.

4.3 Responsibility for compliance. All items shall meet all requirements of sections 3 and 4. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.4 Assembly distributor. Assembly distributors shall be listed on, or approved for listing on, the applicable qualified products list. The qualified hose manufacturer shall certify that the assembly distributor is approved for the distribution of the manufacturer's parts. The assembly distributor shall use only piece parts supplied by the qualified hose manufacturer. No testing other than configuration examination and proof testing is required of certified piece parts obtained from the qualified hose assembly manufacturer, except when there is cause for rejection. All assemblies produced at the assembly distributor's plant shall be subjected to examination of product to assure that the assembly process conforms to that established at the qualified manufacturing plant. Quality control requirements, including Government inspection surveillance, shall be the same as required for the qualified hose manufacturer. Any subsequent changes regarding the sources of a fitting, hose, or bulk hose used in a qualified assembly must be approved by the qualifying activity.

4.5 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the qualifying activity on sample units produced with equipment and procedures used in production. Qualification inspection shall be performed on type I and type III hose and hose assemblies. Each nominal hose size (I.D.) shall be qualified individually.

4.5.1 Samples for qualification. Samples for qualification are shown in the individual test methods and in [table VI](#). Samples for qualification shall be representative of the products proposed to be furnished to the Government. Samples shall be of one type and nominal size of hose and shall be of the quantity and length specified in the applicable test method.

4.5.2 Qualification inspection routine. All samples shall be subjected to qualification testing in accordance with [table VI](#) the sequence is at the manufacturer's discretion.

TABLE VI. Qualification inspection.

Inspection	Requirement paragraph	Inspection paragraph	Number of samples <u>4/</u>
Visual, configuration and mechanical inspection <u>1/</u>	<u>3.5, 3.7, 3.8, and 3.9</u>	<u>4.7.3</u>	All
Salt spray (fittings only) <u>1/</u> Visual examination	<u>3.6.12</u>	<u>4.7.15</u>	3 fittings
Proof pressure	<u>3.6.2</u>	<u>4.7.5</u>	All hose assemblies
Elongation and contraction <u>1/</u>	<u>3.6.1</u>	<u>4.7.4</u>	3 hose assemblies
Burst pressure <u>1/</u>	<u>3.6.3</u>	<u>4.7.6</u>	3 hose assemblies
Vacuum collapse resistance <u>1/</u>	<u>3.6.6</u>	<u>4.7.9</u>	1 hose
Low temperature flexibility <u>1/ 2/</u>	<u>3.6.4</u>	<u>4.7.7</u>	3 hose/ or hose assemblies
Ozone resistance <u>2/</u> Visual examination	<u>3.6.5</u>	<u>4.7.8</u>	1 hose
Oil resistance <u>1/ 2/</u>	<u>3.6.7</u>	<u>4.7.10</u>	<u>5/</u>
Fuel resistance <u>1/ 2/</u>	<u>3.6.8</u>	<u>4.7.11</u>	<u>5/</u>
Vibration resistance <u>2/</u>	<u>3.6.9</u>	<u>4.7.12</u>	6 hose assemblies
Hot oil circulation <u>1/ 2/</u>	<u>3.6.11</u>	<u>4.7.14</u>	2 type III hose assemblies
Fungus resistance <u>2/ 3/</u> Proof pressure (30, 60, 90 days)	<u>3.6.10</u>	<u>4.7.13</u>	6 hose assemblies

1/ These are destructive tests.

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

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

4/ Reference the inspection paragraph for specimen sizes and hose or hose assembly sample lengths.

5/ 3 specimens taken from the cover and 3 specimens taken from the inner tube.

4.5.3 Acceptance of qualification inspection data. Required qualification tests at the hose assembly level that were already performed at the hose level may be eliminated if documented approval has been obtained from the qualifying activity.

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

4.5.5 Test plans and qualification reports.

4.5.5.1 Test plans. Test plans shall be prepared and submitted in accordance with the requirements of the qualification activity. The method of qualification proposed by the contractor is subject to the approval of the qualification activity. Manufacturers shall discuss with the qualifying activity the test specimens and test plans. These plans shall state specifically the component requirement to be verified during the test, such as test fixtures, setup, conditions, and identification of the successor failure criteria shall be included as appropriate.

4.5.5.2 Qualification reports. Qualification reports shall be submitted in accordance with requirements of the qualifying activity. The visual and mechanical inspection and the hose assembly fitting inspection will be 100% unless another sampling plan is approved in writing by the qualifying activity.

4.6 Conformance inspection. Applicable to both hose and hose assemblies.

4.6.1 Individual inspection. Individual inspection shall consist of the inspections specified in [table VII](#) in the order shown.

TABLE VII. Individual inspections.

Inspections	Requirement paragraph	Inspection paragraph
Visual and mechanical inspection <u>1/</u>	3.5, 3.7, 3.8, and 3.9	4.7.3
Hose assembly fittings <u>2/</u>	3.5.7	4.7.3
Proof pressure <u>3/</u>	3.6.2	4.7.5

1/ 100 percent inspection unless an alternate sampling plan is approved in writing by the qualifying activity.

2/ 100 percent inspection.

3/ 100 percent inspection of hose and each hose assembly.

4.6.2. Individual inspections sampling plan. Individual inspection tests specified in [table VII](#) shall be performed on a production lot basis. Random samples shall be selected to form an inspection lot. If one or more defects are found in the inspection lot, then the production lot shall be screened for that particular defect and defects removed. An inspection lot shall be selected from the production lot and all individual inspections tests again performed. If one or more defects are found in the second inspection lot, the production lot shall be rejected and shall not be supplied to this specification.

4.6.3 Sampling inspection lot.

4.6.3.1 Sampling for hose. Sampling for hose shall be performed on each continuous run under essentially continuous conditions. Samples shall be selected at a rate of 1 sample for each full or partial increment of 750 feet (228.60 m) of hose produced in the continuous run, up to a maximum of 2 samples (for continuous runs greater than 1,500 feet (457.20 m), 2 samples will be selected, but they shall be representative of the entire production run). Sampling tests for length change and burst shall be performed in the listed order on each sample as applicable. When a hose assembly is specified in the test method, a hose assembly shall consist of the hose as specified herein, coupled with fittings as specified in [3.5.7](#). Any subsequent changes regarding the sources of a fitting, hose, or bulk hose used in a qualified assembly must be approved by the qualifying activity.

4.6.3.2 Hose assemblies. For hose assemblies, the inspection lot shall be 8 items tested for each 3000 assemblies produced (large lot option). At the option of the manufacturer, one item may be tested for each 375 assemblies produced (small lot option). If there has been some production, but the number hose assemblies produced has not reached 375 for a specific size within three years, the manufacture shall perform sampling tests on one hose assembly of that size unless documented approval to not perform the tests has been obtained from the qualifying activity.

4.6.4 Sampling and periodic inspection. Sampling and periodic inspections shall consist of the inspections specified in [table VIII](#) and shall be made on test samples from production lots which have been subjected to and passed the individual inspections (see [table VIII](#)).

TABLE VIII. Sampling and periodic inspections.

Inspections	Requirement paragraph	Inspection paragraph	Sampling	Periodic
Elongation and contraction 1/	3.6.1	4.7.4	X	---
Burst pressure	3.6.3	4.7.6	X	---
Vacuum collapse resistance 1/	3.6.6	4.7.9	---	X

1/ Elongation and contraction" and "vacuum collapse resistance" are for hose only.

4.6.4.1 Periodic testing sampling plan.

4.6.4.2 Periodic quality conformance inspection (QCI) (hose only). Periodic QCI will be 4 samples tested to each required periodic test for each produced 20,000 feet (6096 m) for hose specifications (large lot option). At the option of the manufacturer, 1 sample may be tested to each required periodic test for each produced 5,000 feet (1524 m) as applicable (small lot option).

4.6.4.2.1 Reduced production hose. If there has been some production, but the footage of hose produced has not reached 5,000 feet (1524 m) for a specific size within three years, the manufacturer shall perform periodic control tests on one sample of that size, for each required periodic test, unless documented approval to not perform the test has been obtained from the qualifying activity.

4.6.4.3 Periodic samples. Periodic samples may be subjected to more than one periodic test at the discretion of the manufacturer. However, the manufacturer assumes all risk that the effect of one test will not have a detrimental impact on the following test.

4.6.4.4 Disposition of test specimens. Test specimens that have been subjected to sampling and periodic inspection in [table VIII](#) shall not be delivered on the contract or purchase order.

4.6.5 Acceptance of conformance inspection data. Required conformance tests at the hose assembly level that were already performed at the hose level may be eliminated if documented approval has been obtained from the qualifying activity.

4.6.6 Nonconformance.

4.6.6.1 Failures. If a sample fails to pass sampling and periodic inspection, see [table VIII](#), the manufacturer shall immediately notify the qualifying activity and cognizant inspection activity of such failure. The manufacturer shall take corrective action on the materials or processes or both as warranted, on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials and processes, and which are considered subject to the same failure.

4.6.6.2 Acceptance and shipment. Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken. After the corrective action has been taken sampling and periodic inspection, see [table VIII](#), shall be repeated on additional samples. At the discretion of the qualifying activity this may include all inspections, or the inspection which the original sample failed. Individual and sampling and periodic inspections, if applicable, may be reinstituted. However final acceptance of the hose or hose assemblies shall be withheld until the sampling and periodic inspection has shown that the corrective action was successful.

4.6.7 Additional QPL test and reporting requirements.

4.6.7.1 Retention of qualification. To retain qualification, the contractor shall submit a test report to the qualifying activity at 24 month intervals. The qualifying activity shall establish the initial reporting date. Each report shall consist of a summary of test and inspection results required by this specification that were performed during the 24-month reporting interval. As a minimum, the report shall include the following:

- a. Number of lots produced and tested, including lot and sample sizes for each lot.
- b. Identify which tests were performed.
- c. Quantities passed.
- d. Quantities failed.
- e. All reworked sampling lots shall be accounted for and identified. A summary of corrective action taken shall be included.

4.6.8 Loss of product qualification.

4.6.8.1 Failure to meet test requirements. The manufacturer shall immediately notify the qualifying activity at any time during the 24-month reporting period when the qualified product fails to meet the test and inspection requirements of this specification. The manufacturer shall identify and indicate what corrective action will be taken to correct the problem. Failure to take corrective action acceptable to the qualifying activity may result in removal of the product from the QPL.

4.6.8.2 Failure to submit summary test data report. Failure to submit a report within 30 days after the end of the 24-month reporting period may result in loss of qualification for the product.

4.6.8.3 Change to manufacturing process, materials or equipment. The manufacturer shall notify the qualifying activity, in writing, of any changes in the manufacturing process, materials, or equipment used to manufacture a QPL product. Subsequently, the qualifying activity will notify the manufacturer, in writing, if a full re-qualification, partial re-qualification, or no additional testing is required as a result of these changes.

4.6.8.4 No production during reporting period. When no production occurs during the reporting period, a report shall be submitted to the qualifying activity certifying that the manufacturer still has the capability and facilities necessary to produce the QPL product. If during two consecutive 24 month reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit QPL products to a full qualification inspection in accordance with this specification.

4.6.8.5 Discontinuation and resumption of production of hose (three years or more). If there has been no production of a specific size for a period of three years or more, twelve (12) samples for each test shall be randomly selected from the first lot produced when production of that size has been resumed. Eight (8) of the samples shall be subjected to the sampling tests and four (4) samples shall be subjected to the periodic control tests (see [table VIII](#)).

4.6.8.6 Discontinuation and resumption of production of hose assemblies (three years or more). If there has been no production of a specific size for a period of three years or more, eight (8) samples shall be randomly selected from the first lot produced when production of that size has been resumed. All of the samples shall be subjected to the sampling tests.

4.7 Performance.

4.7.1 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, documented approval must be obtained from the qualifying activity 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.

4.7.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in ASTM D380, or in accordance with the applicable test method referenced in the test procedures. Unless otherwise specified, room temperature shall be defined as +60°F to +90°F (15.56°C to 32.22°C).

4.7.3 Visual and mechanical inspection. Hose and hose assemblies shall be examined to ensure conformance with this specification and associated specification sheets. Hose and hose assemblies shall be examined to verify that the design, construction and physical dimensions are in accordance with the applicable requirements. Continuous examination shall be performed to assure compliance with the following requirements:

- a. Specification sheets (3.1).
- b. Design, construction, materials, and physical dimensions (3.5).
- c. Marking (3.7)
- d. Age limit (3.8)
- e. Workmanship (3.9)

4.7.4 Elongation and contraction (see 3.6.1). The elongation and contraction shall be tested as specified in ASTM D380 and meet the requirements of 3.6.1. The following details shall apply:

- a. Test specimens shall consist of three hose assemblies, each not less than 18 inches (457 mm) between fittings.
- b. Final pressure shall be the working pressure specified in table IV for the type and size hose tested.
- c. Average change in length of the three specimens, expressed in percentage of the original length, shall be calculated and used to determine conformance to 3.6.1.

4.7.5 Proof pressure (see 3.6.2). The proof pressure test shall be as specified in ASTM D380 and meet the requirements of 3.6.2. The following details shall apply:

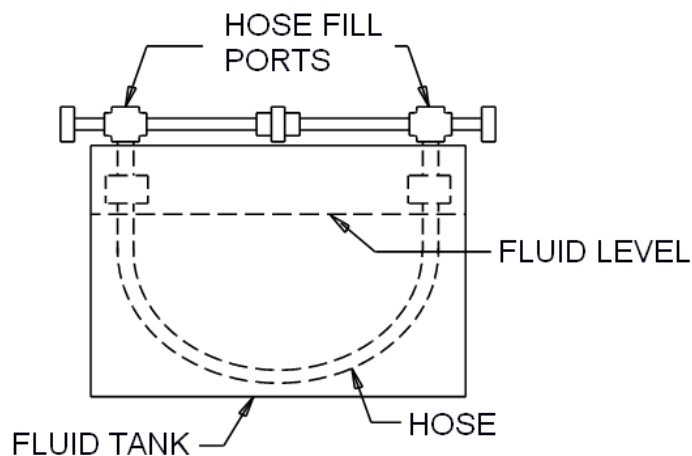
- a. Each hose length and each hose assembly shall be subjected to this test.
- b. Proof pressures shall be as specified in table IV for the type and size tested.
- c. The test fluid may be water, engine oil conforming to MIL-PRF-2104, or hydraulic oil conforming to MIL-PRF-87257, MIL-PRF-5606, or MIL-PRF-83282.

4.7.6 Burst pressure (see 3.6.3). Hose and hose assemblies shall meet the burst test specified in ASTM D380 "straight bursting test" and shall meet the requirements of 3.6.3. The following details shall apply:

- a. The three test specimens used in elongation and contraction testing (see 4.7.4) shall be subjected to the burst pressure test specified in ASTM D380, except as specified herein.
- b. Failure of the hose specimen shall consist of leakage, rupture, or detachment from a fitting.
- c. 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.

4.7.7 Low temperature flexibility (see 3.6.4). When exposed to low temperature the hose assemblies shall meet the requirements of 3.6.4, the following details shall apply:

- a. Three 18-inch (457.20 mm) long hose and/or hose assemblies shall be selected from the type(s) of hose being qualified.
 - (1) One of the three specimens shall be air aged for 168 hours at $158^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($70^{\circ} \pm 2.78^{\circ}\text{C}$).
 - (2) One shall be aged in accordance with figure 1 using hydraulic oil conforming to MIL-PRF-87257, MIL-PRF-5606, or MIL-PRF-83282 at a temperature of $212^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($100^{\circ} \pm 1.11^{\circ}\text{C}$), for a period of 70 hours.
 - (3) The third specimen shall remain untreated.
- b. After conditioning, the 3 specimens shall be further conditioned for 70 ± 1 hours at a temperature of $-67^{\circ}\text{F} \pm 6^{\circ}\text{F}$ ($-55^{\circ}\text{C} \pm 3.33^{\circ}\text{C}$) for type I hose and at a temperature of $-55^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($-48.33^{\circ} \pm 1.11^{\circ}\text{C}$) for type III hose.
- c. At the end of this period, and while still at the specified temperature, all three specimens shall be bent through 180° from the centerline over a mandrel with a diameter as specified in table IX.
- d. The specimens shall then be bent through 360° in the opposite direction over the same size mandrel. Bending rate shall be $21^{\circ} \pm 2^{\circ}$ per second.
- e. The entire bending operation shall be completed within 45 seconds.
- f. After bending, the specimens shall be examined to determine conformance to 3.6.4.



NOTES:

1. Type I hose specimen is immersed in test fluid up to but not including hose end couplings. Hose specimen is then filled internally.
2. Type III hose shall receive internal conditioning only.

FIGURE 1. Specimen conditioning fluid tank.TABLE IX. Low temperature flexibility mandrel diameter. 1/ 2/

Hose size			Mandrel diameter inches (mm)
Fraction	Inches	Metric	
1/8	.125	3.18	3.5 (88.90)
3/16	.188	4.78	4.0 (101.60)
1/4	.250	6.35	4.5 (114.30)
5/16	.313	7.95	5.5 (139.70)
3/8	.375	9.53	6.0 (152.40)
13/32	.406	10.31	7.0 (177.80)
1/2	.500	12.70	7.5 (190.50)
5/8	.625	15.88	9.5 (241.30)
3/4	.750	19.05	11.0 (279.40)
7/8	.875	22.23	12.0 (304.80)
1-1/8	1.125	28.58	15.0 (381.00)
1-3/8	1.375	34.93	16.0 (406.40)
1-13/16	1.813	46.05	20.0 (508.00)

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

4.7.8 Ozone resistance (see [3.6.5](#)). Type I hose covers when subjected to ozone test in accordance with ASTM D1149 shall meet the requirements of 3.6.5. The following details shall apply:

- The hose outer cover shall be elongated 12.5% and shall be exposed for a period of 168 hours at a temperature of $+ 100^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($+37.78^{\circ}\text{C} \pm 1.11^{\circ}\text{C}$) to an ozone concentration maintained at 50 ± 5 parts of ozone per hundred million parts of air.
- During the duration of the test specimens shall be examined daily for cracking, visual examinations shall be made without and with 7X magnification, except areas covered by tape or twine. The first observable cracking shall be recorded.
- After required exposure to ozone, the specimen shall be visually examined without and with 7X power magnification to determine conformance to [3.6.5](#).

4.7.9 Vacuum collapse resistance (see [3.6.6](#)). Hose specimens when subjected to vacuum shall meet the requirements of [3.6.6](#). The following details shall apply:

- A piece of 36 inch (0.91 m) long hose shall be wrapped around a mandrel having a diameter as specified in [table X](#).
- While bent around the mandrel, hose less than 1/2 inch (.500 inch) (12.70 mm) nominal size shall be subjected to an internal vacuum equivalent to 20 inches of mercury (0.68 bar); hose 1/2 inch (.500 inch) (12.70 mm) and larger shall be subjected to an internal vacuum equivalent to 10 inches of mercury (0.34 bar).
- While vacuum is being applied, two readings spaced 90° apart shall be taken on the outside diameter of the hose. The readings shall subsequently be averaged and the decrease calculated as a percentage of the original outside diameter.

TABLE X. Vacuum collapse resistance mandrel diameter. ^{1/} ^{2/}

Hose size			Mandrel diameter inches (mm)
Fraction	Inches	Metric	
1/8	.125	3.18	3.5 (88.90)
3/16	.188	4.78	4.0 (101.60)
1/4	.250	6.35	4.5 (114.30)
5/16	.313	7.95	5.5 (139.70)
3/8	.375	9.53	6.0 (152.40)
13/32	.406	10.31	7.0 (177.80)
1/2	.500	12.70	7.5 (190.50)
5/8	.625	15.88	9.5 (241.30)
3/4	.750	19.05	11.0 (279.40)
7/8	.875	22.23	12.0 (304.80)
1-1/8	1.125	28.58	15.0 (381.00)
1-3/8	1.375	34.93	16.0 (406.40)
1-13/16	1.813	46.05	20.0 (508.00)

^{1/} Dimensions are in inches.

^{2/} Metric equivalents are given for information only.

4.7.10 Oil resistance (see [3.6.7](#)). When hose samples are subjected oil resistance testing in accordance with ASTM D380, immersion test for change in volume, shall meet the requirements of [3.6.7](#). The following details shall apply:

- a. Each specimen shall be approximately 2 square inches (1290.32 mm^2) in area.
- b. 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.
- c. Each specimen shall be immersed in petroleum base oil IRM 903, or for 70 hours at a temperature of $212^\circ\text{F} \pm 5^\circ\text{F}$ ($100^\circ \pm 2.78^\circ\text{C}$).
- d. The change in volume reported for the outer cover shall be the average of the values obtained from the three outer cover specimens tested.
- e. The change in volume of the inner tube shall be the average of the values obtained from the three inner tube specimens tested.
- f. The change in volume of the outer cover and inner tube shall each be calculated to determine conformance to [3.6.7](#).

4.7.11 Fuel resistance (see [3.6.8](#)). Hose specimens with subjected to the fuel resistance test in accordance with ASTM D380, immersion test for change, shall meet the requirements of [3.6.8](#). The following details shall apply:

- a. 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.
- b. Each specimen shall be approximately 2 square inches (1290.32 mm^2) in area.
- c. Each specimen shall be immersed in reference fuel D 48 hours at a temperature of $80^\circ\text{F} \pm 10^\circ\text{F}$ ($26.67 \pm 5.56^\circ\text{C}$).
- d. The change in volume reported for the outer cover shall be the average of the values obtained from the three outer cover specimens tested.
- e. The change in volume of the inner tube shall be the average of the values obtained from the three inner tube specimens tested.
- f. The change in volume of the outer cover and inner tube shall each be calculated to determine conformance to [3.6.8](#).

4.7.12 Vibration resistance (see [3.6.9](#)). When hose assemblies are subjected to vibration testing, they shall meet the requirements of [3.6.9](#). The following details shall apply:

- a. Six hose assemblies with a free hose length of not less than 12 inches (30.48 cm) shall be selected for testing.
- b. Each specimen shall be arranged to provide an initial slack of .375 inch (9.53 mm) and an offset of 1.500 inches (38.10 mm) at an angle of 90° to the direction of stroke.
- c. The specimens shall then be vibrated through an amplitude of .344 inch (8.74 mm) total excursion of .688 inch (17.48 mm) at a rate of 1800 ± 10 cycles per minute for 200 hours.
- d. During the vibration period, lubricating oil M2104R-II or M2104V-II in accordance with MIL-PRF-2104 shall be circulated through each specimen at a pressure of 45 psig (3.10 bar) and at a temperature of $250^\circ\text{F} \pm 5^\circ\text{F}$ ($121.11 \pm 2.78^\circ\text{C}$).
- e. At the end of the vibration period the specimens shall be examined for evidence of leakage or other failure.

4.7.13 Fungus resistance (see [3.6.10](#)). Hose specimens shall be tested in accordance with MIL-STD-810, method 508, procedure I. to determine conformance to [3.6.10](#). The following details shall apply:

- a. Test specimens shall consist of six hose assemblies, each with hose length between fittings of not less than 24 inches (61 mm).
- b. Two specimens shall be subjected to the proof pressure test (see [4.7.5](#)) after each of the incubation periods (30, 60 and 90 days) to determine conformance to [3.6.10](#).

4.7.14 Hot oil circulation (see [3.6.11](#)). When type III hose assemblies are exposed to oil the hose assemblies shall meet the requirements of [3.6.11](#). The following details shall apply:

- a. Two untested type III hose assemblies shall be selected.
- b. Oil conforming to viscosity grade 40 of MIL-PRF-21260 at a temperature of $300^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($148.89^{\circ}\text{C} \pm 2.78^{\circ}\text{C}$), and at a pressure of 175 ± 25 psig (12.07 ± 1.72 bar) shall be continuously circulated through the hose assemblies for 240 ± 1 hours in an ambient temperature of $75^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($23.89^{\circ}\text{C} \pm 5.55^{\circ}\text{C}$).
- c. After the circulation test, specimens shall be bent around the applicable mandrel specified in [table XI](#) with hose at a temperature of $75^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($23.89^{\circ}\text{C} \pm 5.55^{\circ}\text{C}$).
- d. While bent around the specified mandrel, the specimens shall be proof-tested in accordance with [4.7.5](#).
- e. Specimens shall then be examined for internal or external leaks, ruptures, or cracks.

TABLE XI. Hot oil mandrel diameter. ^{1/} ^{2/}

Hose size			Mandrel diameter inches (mm)
Fraction	Inches	Metric	
1/8	.125	3.18	NA
3/16	.188	4.78	2.00 (50.80)
1/4	.250	6.35	2.25 (57.15)
5/16	.313	7.95	2.75 (69.85)
3/8	.375	9.53	NA
13/32	.406	10.31	4.62 (117.35)
1/2	.500	12.70	5.50 (139.70)
5/8	.625	15.88	6.50 (165.10)
3/4	.750	19.05	NA
7/8	.875	22.23	7.38 (187.45)
1-1/8	1.125	28.58	9.00 (228.60)
1-3/8	1.375	34.93	11.00 (279.40)
1-13/16	1.813	46.05	17.00 (431.80)

^{1/} Dimensions are in inches.

^{2/} Metric equivalents are given for information only.

4.7.15 Salt spray testing (see [3.6.12](#)). Fittings when subjected to salt spray testing in accordance with ASTM B117 shall meet the requirements of [3.6.12](#). Duration of the test shall be 96 hours.

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 or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service 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 that may be helpful, but is not mandatory.)

6.1 Intended use. Hose and hose assemblies covered by this specification are intended for use as fuel and oil lines carrying fuel, oil or diesel fuel in military vehicles and for other military applications. Type I and type III hose and hose assemblies covered by this specification are military unique because they must be able to operate satisfactorily in temperatures ranging from temperatures - 65°F to +250°F (- 53.89°C to +121.11°C) for type I and from -55°F to +300°F (-48.33°C to +148.89°C) for type III. Commercial products are not manufactured to operate at these extreme temperatures and would experience catastrophic failure.

6.1.1 Oxygen hose. The hose and hose assemblies described in this specification are not intended for use as oxygen hoses.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Title, number, and date of the applicable specification sheet and the complete PIN (see 3.1).
- c. Level of preservation, packaging, and marking required (see section 5.1).
- d. Shelf life requirements (see 6.2.1).

6.2.1 Shelf life. This specification covers items where the assignment of a Federal shelf-life code is a consideration. Specific shelf life requirements should be specified in the contract or purchase order, and should include as a minimum, shelf-life code, shelf life package markings in accordance with MIL-STD-129 or FED-STD-123, preparation of a materiel quality storage standard for type II (extendible) shelf-life items, and a minimum of 85 percent shelf-life remaining at time of receipt by the Government. These and other requirements, if necessary, are in DoD 4120.27-M, *Shelf-life Management Manual*. The shelf-life codes are in the Federal Logistics Information System Total item Record. Additive information for shelf-life management may be obtained from DoD 4120.27-M, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points that manage the item and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf Life Management website: <https://www.shelflife.hq.dla.mil/>.

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. 13444, 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, Land and Maritime-VQP, P.O. Box 3990, Columbus, OH 43218-3990. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil>.

6.3.1 Provisions governing qualification (SD-6). Copies of "Provisions Governing Qualification" are available online at <https://assist.dla.mil>.)

6.4 Subject term (key word) listing.

Cadmium
Chromate
Chromic acid
Fittings
Hydraulic fluid
Lubricating oil
Nickel
Thread size
Tube
Zinc

6.5 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification.

6.6 Guidance on use of alternative parts with less hazardous or nonhazardous materials. This specification provides for a number of alternative plating materials via the PIN. Users should select the PIN with the least hazardous material that meets the form, fit and function requirements of their application.

6.6.1 Cadmium plating replacements. Cadmium is prohibited from use in NAVSEA owned shipboard systems in accordance with the requirements of T9070-AL-DPC-020/077-2.

6.6.2 Zinc coatings. It is recommended that zinc coatings be specified in place of cadmium plating whenever contact with salt atmosphere is not a problem. Zinc coatings are not for use in aircraft. Zinc coatings requires approval from the Program Office for all applications.

6.6.3 Zinc in contact with water-glycol fluids. Zinc-plated materials should be avoided in systems with water-glycol fluids. Reference ASTM MNL37 - Fuels and Lubricants Handbook, "water glycol fluids are highly alkaline due to the presence of amine based corrosion inhibitors. As a result, these fluids can attack zinc, cadmium, magnesium, and non-anodized aluminum, forming sticky or gummy residues." Consequently, these metals should be avoided when selecting system components.

6.7 References to superseded specifications. All the requirements of MIL-DTL-13444J are interchangeable with those of MIL-H-13444E, therefore, previously existing documents (OEM drawings, etc.) referencing MIL-H-13444 need not be changed.

6.8 Supersession data. Type I hose are used in lieu of the canceled type II hose.

6.8.1 Hydraulic fluid. Hydraulic fluid MIL-PRF-87257 is the preferred fluid and is a direct replacement for MIL-PRF-5606.

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 extensiveness of the changes.

CONCLUDING MATERIAL

Custodians:

Army - AT
Navy - YD
DLA - CC

Preparing activity:

DLA-CC

(Project 4720-2019-004)

Review activities:

Army - AR, MI
Navy - MC, SA

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>.