

INCH-POUND

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DETAIL SPECIFICATION

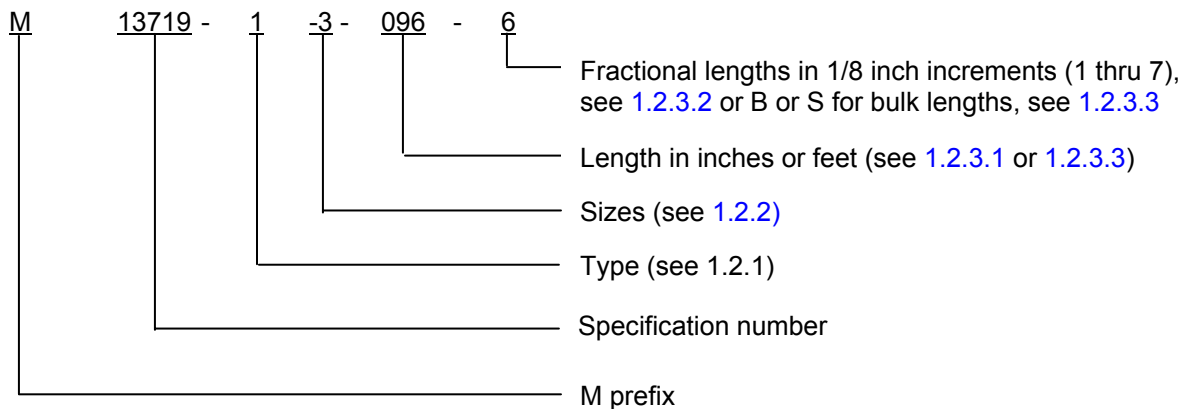
HOSE AND HOSE ASSEMBLY, RUBBER,
 HYDRAULIC BRAKE, TYPE I AND TYPE II

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 assembly, rubber, hydraulic brake, type I and type II.

1.2 Part or Identifying Number (PIN). The PIN consists of the letter M, the basic specification number, a dash, a number for hose type, a number for hose size, a dash, three numbers for length a dash, and a number for fractions of an inch or for bulk hose lengths the letter B or S.



1.2.1 Type. Type designator and characteristics, see table I.

TABLE I. Type and characteristics.

Designator	Type	Characteristics
1	Type I	Regular expansion
2	Type II	Low expansion

Comments, suggestions, or questions on this document should be addressed to: Defense Supply Center, Columbus, Attn: VAI, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Construction@dsc.dla.mil. Since contact information can change you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

MIL-DTL-13719F

1.2.2 Inside diameter (ID). ID designators, see [table II](#).

1.2.3 Hose lengths. Lengths of bulk hose are represented by inches and fractions in 1/8 inch increments.

1.2.3.1 Lengths of hose. Lengths of hose are represented by inches unless bulk hose is required see [1.2.3.3](#).

1.2.3.2 Fractions. Fractions are expressed in 1/8 inch increments (1 thru 7). Not applicable to bulk hose lengths.

1.2.3.3 Bulk hose lengths. Bulk hose lengths are represented by the letter B or S. Bulk lengths "B" are in increments of 20 feet or more (see [3.4.3.1](#)). The "S" designator is used to define specific lengths in feet (see [3.4.3.2](#)).

Note: For the inch designator insert the number zero in front of designator for lengths less than 100 inches (2.54 m).

Examples:

When 12 and 7/8 inch length is required the designator is: 012-7

When 96 inches is required the designator is: 096

When 30 feet total length is required the designator is: 030-B

When 30 feet continuous length is required with a 1% tolerance the designator is: 030-S

1.3 PIN for hose assemblies. See [3.6.3](#).

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

2.2.1 Specifications 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.

FEDERAL STANDARD

FED-STD-162 - Hose, Rubber, Visual Inspection Guide For

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-46176 - Brake Fluid, Silicone, Automotive, All Weather, Operational and Preservative

MIL-DTL-13719F

DEPARTMENT OF DEFENSE STANDARD

MIL-STD-889 - Dissimilar Metals

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

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

ASTM INTERNATIONAL

ASTM B117 - Salt Spray (Fog) Apparatus Operating
 ASTM D380 - Hose, Rubber
 ASTM D471 - Rubber Property - Effect of Liquids

(Copies of these documents are available online at <http://www.astm.org> or from the ASTM International, P.O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

SAE INTERNATIONAL

SAE J1401 - Road Vehicle - Hydraulic Brake Hose Assemblies for Use With Nonpetroleum - Base Hydraulic Fluids
 SAE-AMS2700 - Passivation of Corrosion Resistant Steels
 SAE-AS1933 - Age Controls for Hose Containing Age-Sensitive Elastomeric Material

(Copies of these documents are available online at <http://www.sae.org> or from the SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

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

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.3. Hose assemblies shall be tested as a combination of hose and fittings from specific sources. Any subsequent change to either the hose or fitting source in an approved assembly requires documented approval of the procuring activity.

3.2 Dissimilar metals. When dissimilar metals are used in intimate contact with each other, such as assembly to next higher assembly, protection against electrolysis and corrosion shall be provided. Dissimilar metals such as brass, copper or steel (except corrosion-resisting 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.

3.3 Materials. Unless otherwise specified, all materials shall conform to the applicable drawings (see 4.5.1 and 6.2) and shall be capable of meeting all the requirements specified herein.

MIL-DTL-13719F

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 specified requirements, and promotes economically advantageous life cycle costs.

3.3.2 Hose design and construction. Hose design and construction shall be as specified on figure 1 and consist of an inner tube, reinforcement, and outer cover, see 3.2.2.1, 3.2.2.2 and 3.2.2.3.

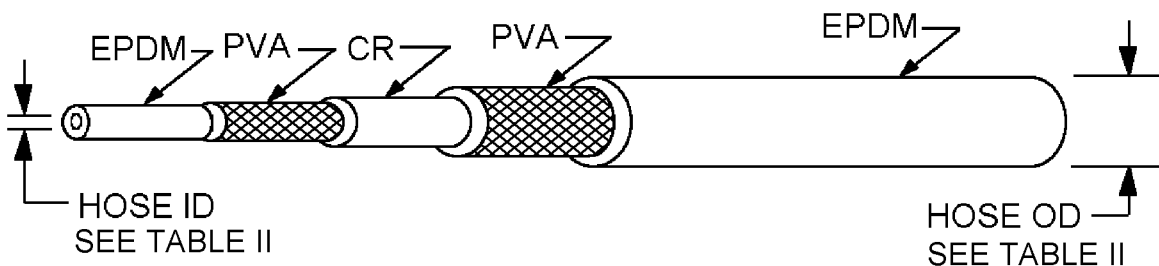


FIGURE 1. Dimensions and configuration.

3.3.2.1 Cover. The hose cover shall be a black. The primary polymer shall be a compound of ethylene propylene diene monomer (EPDM). The hose cover shall be free of holes exposing reinforcing material, see 4.5.1.

3.3.2.2 Reinforcement. Hydraulic brake hose shall be reinforced with a chloroprene rubber (CR) based compound (to act as a "friction" layer) between layers of polyvinyl acetate (PVA) yarn.

3.3.2.3 Inner tube. The inner tube shall be made of a compound whose primary polymer is EPDM. The inner tube shall have a smooth bore; it shall be free of pitting, cracks and other recognizable defects. The bore shall be free of dirt and other foreign material and shall not contain residual mandrel lubricant to the extent that the requirements of this specification cannot be met.

3.4 Hose assembly design and construction. Design and construction of the hose assemblies shall be as specified in the applicable drawing (see 4.5.2 and 6.2).

3.4.1 Fittings. Fittings of hose assemblies shall be securely attached to the hose. Each hydraulic brake hose assembly shall have permanently attached brake hose end fittings which are attached by deformation of the fitting about the hose by crimping or swaging. Form, size, threads per inch and class of fit shall be as specified in applicable drawing(s) (see 4.5.1 and 4.5.2).

3.4.2 Dimensions. ID (nominal) of the hose shall be specified in table II. Hose assemblies shall be furnished in the nominal ID and length as specified see 4.5.2 and 6.2.

TABLE II. ID size and designator. 1/

Dash size designator	ID (nominal)		
	inch decimal	Inch fraction	mm
-2	.125	1/8	3.18
-3	.188	3/16	4.78
-4	.250	1/4	6.35

1/ Metric equivalents are given for information only.

MIL-DTL-13719F

3.4.3 Length of bulk hose.

3.4.3.1 B designator of bulk hose lengths. Bulk hose shall be furnished in lengths greater than 20 feet (6.10 m). However, up to 10% of the order may be furnished in random lengths between 10 and 20 feet (3.05 to 6.10 m). No more than 10% of the order shall be furnished in random lengths between 3 and 10 feet (0.91 to 3.05 m).

3.4.3.2 S designator for specific bulk hose lengths. When the order is for a specific length in feet, a tolerance of $\pm 1\%$ of the required length shall be used.

3.5 Performance. The hose shall meet the following performance requirements. When necessary for testing, the hose shall be assembled with end fittings that have permanently attached brake hose end fittings which are attached by deformation of the fitting about the hose by crimping or swaging.

3.5.1 Constriction (hose assemblies only). After assembly, the bore of the hose assemblies shall be tested in 4.5.3. An unstricted bore shall allow the full length of the plug gage to drop into the hose assembly bore of its own weight in less than 5 seconds.

3.5.2 Proof pressure. Hose and hose assemblies, when tested in 4.5.4, shall show no evidence of leakage when subjected to an internal pressure of 1,500 pounds per square inch (psi) (10.3 megapascal (MPa) minimum for air or 3,000 psi (20.7 Mpa) minimum for liquid.

3.5.3 Expansion resistance. Hose, when tested in 4.5.5, shall not expand more than the values shown in table III.

TABLE III. Maximum hose expansion. 1/

Hose ID inch (mm)	1,000 psi (6.9 Mpa)		1,500 psi (10.3 Mpa)	
	Reg. expansion hose type I cm ³ /ft (cm ³ /m)	Low expansion hose type II cm ³ /ft (cm ³ /m)	Reg. expansion hose type I cm ³ /ft (cm ³ /m)	Low expansion hose type II cm ³ /ft (cm ³ /m)
.125 (3.18)	.66 (2.17)	.33 (1.08)	.79 (2.59)	.42 (1.38)
.188 (4.78)	.86 (2.82)	.55 (1.80)	1.02 (3.35)	.72 (2.36)
.250 (6.35)	1.04 (3.41)	.82 (2.70)	1.30 (4.27)	1.17 (3.85)

1/ Metric equivalents are given for information only.

3.5.4 Bursting strength. Hose assemblies, when tested in 4.5.6, shall withstand, without leaking or bursting, an internal hydrostatic pressure for a 2-minute hold period and any pressure up to and including the burst pressures, as specified in table IV.

TABLE IV. Hold and burst pressures. 1/

Hose nominal ID inch (mm)	Hydrostatic pressure	
	2-minute hold	Minimum burst
	psi (Mpa)	psi (Mpa)
.125 (3.18)	4,000 (27.6)	7,000 (48.2)
.188 (4.78)	3,000 (20.7)	5000 (34.5)
.250 (6.35)	3,000 (20.7)	4,500 (31.0)

1/ Metric equivalents are given for information only.

3.5.5 Fatigue life (whip). Hose assemblies, when tested in 4.5.7, shall have a minimum life of 35 hours.

MIL-DTL-13719F

3.5.6 Low temperature flexibility. Hose assemblies, when tested in 4.5.8, shall show no evidence of breaks, cracks, or leakage at low temperatures.

3.5.7 Tensile strength. Hose assemblies, when tested in 4.5.9, shall show no evidence of rupture of hose or fittings, or loosening of the fittings when subjected to a straight pull at a separation rate of 1 ± 0.1 inch per minute (25.4 ± 2.5 mm/min.) until a pull load of 325 lb (1446 Newtons) is attained.

3.5.8 Ozone resistance. Hose when visually examined at 9X magnification shall show no evidence of cracks or breaks when tested for ozone resistance in 4.5.10.

3.5.8.1 Hazardous substances and ozone depleting chemicals. The ozone resistance test (see 4.5.10) may contain hazardous chemicals. It shall be handled in accordance with Federal regulations and guidelines to perform those tests. For further information about toxic chemicals and hazardous materials list, consult the Environmental Protection Agency web database at www.epa.gov/ebtpages/pollutants.html.

3.5.9 Fluid resistance. The volume of a hose tube specimen, when tested in 4.5.11, shall not increase by more than 20 percent nor decrease by more than 3 percent.

3.5.10 Salt spray resistance (steel fittings only). When hose assemblies are exposed to salt spray testing in 4.5.12 the plating on the fittings shall show no corrosion products of zinc or basis 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. Hose assemblies shall subsequently meet the proof pressure requirements of 4.5.4.

3.6 Identification and marking.

3.6.1 Hose. The outer cover of hose shall have the outer cover marked with an oil-resistant, continuous blue stripe at least $1/16$ (.0625 inch (1.59 mm)) of an inch wide. The following information shall be permanently and legibly marked or broken into the stripe at repeated intervals of not more than 6 inches (15.2 cm) on the lay line of the hose, see 4.5.2.

- a. PIN as specified in 1.2, length designator may be omitted.
- b. Cure date in quarter and year such as 4Q07 for fourth quarter 2007.
- c. Capital letters either "HR" to indicate that the hose is regular expansion hydraulic hose or "HL" to indicate that the hose is low expansion hydraulic hose.
- d. Hose assembly manufacturer's commercial and government entity (CAGE).
- e. Manufacturer's name or trademark.

3.6.2 Hose with unmarkable surface. Hose may be marked as specified in 3.6.3, when the cover is too rough, or it is determined that the use of a stripe on the outside cover is impractical.

3.6.3 Hose assembly marking. The hose assembly shall be identified by a permanently snug-fitting aluminum or stainless steel band around the hose near the end fitting. The band shall be designed to remain tight on the hose to prevent relative movement and resultant chafing. The band shall be etched, embossed, or stamped in block capital letters, numerals or symbols at least one-eighth of an inch high. Where the hose assembly exceeds 4 feet (1.22 m) in length, a band shall be attached near each end fitting of the assembly. The metal band shall be marked in raised, etched, or stamped lettering with the following information appropriately identified:

- a. PIN as specified in 1.2, length designator may be omitted.
- b. Cure date in quarter and year such as 4Q07 for fourth quarter 2007.

MIL-DTL-13719F

- c. Capital letters either "HR" to indicate that the hose is regular expansion hydraulic hose or "HL" to indicate that the hose is low expansion hydraulic hose.
- d. Hose manufacturer's commercial and government entity (CAGE).
- e. Manufacturer's name or trademark.
- f. Hose assembly specification PIN or drawing number PIN and CAGE.
- g. Hose assembly manufacturer's CAGE code, if different than the hose manufacturer.
- h. Date of hose assembly manufactured expressed in month and year such as 3/07.

NOTE: The band may exclude for lengths shorter than 12 inches (30.5 cm) a, b, c, d, and e if the entire hose marking, see 3.6.1, is still visible after the hose is assembled with connectors. Any lengths shorter than 12 inches (30.5 cm) shall be fully marked as specified in 3.6.3.

3.6.3.1 Marking of hose fitting. At least one end fitting of a hydraulic brake hose assembly shall be etched, stamped or embossed with a designation at least one-sixteenth of an inch high that identifies the manufacturer of the hose assembly.

3.7 Workmanship. Hose assemblies shall be free of imperfections. Each hose assembly shall be examined for defects as specified in table V.

TABLE V. Workmanship.

Defect	Method of examination
Cuts, breaks, blisters, corrosion, and pitting	Visual
Free from sulfur bloom	Visual
Holes in cover exposing reinforcing material	Visual
Fittings not securely attached to hose	Visual
Diameter nonconformance	SIE ^{1/}
Tubing overage (see 3.7)	Visual
Faulty workmanship affecting performance	Visual
Assembly length incorrect (see 4.5.2)	SIE
Bulge behind the coupling	Visual
Cocked couplings	Visual
Cracked couplings	Visual
Rusted couplings	Visual
Swivel-type fittings shall move freely	Visual
Improper and illegible marking (see 3.6)	Visual
Fitting seating surfaces shall be free of damage	Visual

^{1/} SIE - Standard Inspection Equipment.

3.8 Age limit. The age limit of 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. Hose inner tubing used in the hose assemblies shall have been manufactured not more than two quarters prior to presentation for acceptance, see 4.5.1 and 4.5.2.

3.9 Condition. All hose assemblies offered to the Government for acceptance shall be in good condition, free of defects, and shall not have been used in any manner or subjected to any tests except as specified in 4.4.

3.10 Cleanliness. The interior surface of the hose shall be free from oil, grease, dirt, moisture, cleaning solvents and foreign materials.

MIL-DTL-13719F

4. VERIFICATION

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

- a. First article inspection (see 4.3).
- b. Conformance inspections (see 4.4).

4.2 Responsibility for compliance. All items shall meet all requirements of sections 3, 4, and 5. The inspections 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.

4.3 First article inspection. A sample of 16 hose assemblies, .125 inch (3.18 mm) ID and a free hose length of 14 inches (35.6 cm) (measured between fittings), shall be furnished for first article inspection. Hose assemblies shall be representative of units proposed to be furnished under contract. First article inspection shall be conducted under Government surveillance by the contractor, or by an authorized testing facility at a site approved by the Government. First article inspection shall consist of all the examinations and tests of this specification, as specified in table VI. First article tests shall be conducted on the sample hoses in accordance with the test sequence specified in table VII.

4.3.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the tests conditions specified in 4.5.1, 4.5.3, 4.5.4, 4.5.5, 4.5.6, 4.5.7, 4.5.8, 4.5.9, 4.5.10, 4.5.11, and 4.5.12.

4.3.1.2 Ambient conditions. Unless otherwise specified, all inspections shall be conducted under the following ambient conditions: 77°F ±15°F (25 ±8°C), ambient pressure of 28.5 (+2, -3) inches of mercury (0.95 bar (+6.77, -10.16 kilopascal)), and 50 ±30% relative humidity.

4.3.2 First article samples. If requested by the contracting officer the manufacturer shall supply sample hoses or hose assemblies. The quantity and the hose or hose assembly lengths for the samples shall be specified on the contract or purchase order. The samples shall be representative of the construction, workmanship, components, and materials to be used during production. When a manufacturer is in continuous production of hose or hose assemblies from one contract to another, submission of additional first article samples for a new contract may be waived at the discretion of the acquiring activity (see 6.2).

4.3.3 Disposition of samples. First article samples shall be furnished to the Government as directed by the contracting officer (see 6.2).

4.3.4 First article information. Upon completion of first article inspection, the Government activity responsible for conducting the inspection program (see 6.2), shall report the results of the inspection, with appropriate recommendation, to the contracting officer. Approval of the first article samples or the waiving of first article inspection does not preclude the requirements for performing conformance inspection.

MIL-DTL-13719F

TABLE VI. First article inspections.

Inspection	Requirement paragraph	Test method
Visual inspection	3.3, 3.4, 3.6, 3.7, 3.8, and 3.10	4.5.1
Constriction	3.5.1	4.5.3
Proof pressure	3.5.2	4.5.4
Expansion resistance	3.5.3	4.5.5
Bursting strength	3.5.4	4.5.6
Fatigue life	3.5.5	4.5.7
Low temperature flexibility	3.5.6	4.5.8
Tensile strength	3.5.7	4.5.9
Ozone resistance	3.5.8	4.5.10
Fluid resistance	3.5.9	4.5.11
Salt spray	3.5.10	4.5.12

TABLE VII. First article test sequence.

Sample number	Inspection	Requirement paragraph	Test method
All	Visual inspection	3.3, 3.4, 3.6, 3.7, 3.8, 3.9, and 3.10	4.5.1
1, 2, 3, 4	Constriction 1/	3.5.1	4.5.3
	Proof pressure	3.5.2	4.5.4
	Fatigue life	3.5.5	4.5.7
5, 6	Expansion resistance	3.5.3	4.5.5
	Bursting strength	3.5.4	4.5.6
	Fluid resistance	3.5.9	4.5.11
7, 8	Ozone resistance	3.5.8	4.5.10
9, 10	Low temperature flexibility	3.5.6	4.5.8
	Constriction 1/	3.5.1	4.5.3
	Proof pressure	3.5.2	4.5.4
11, 12	Tensile strength	3.5.7	4.5.9
13, 14, 15, 16	Constriction	3.5.2	4.5.4
	Salt spray	3.5.10	4.5.12

1/ If it is necessary to cut the hose assembly to perform this test, perform this test on one additional sample and not on samples 1, 2, 3, 4 or 9 and 10. This may occur if a specific configuration is required because of an OEM drawing. If doing hose inspections only use a hose assembly configuration that does not require it to be cut.

MIL-DTL-13719F

4.3.5 Lot records. The manufacturer or supplier shall, on request, furnish to the purchaser a certificate stating that each lot has been sampled, tested, and inspected in accordance with MIL-DTL-13719 or the applicable hose assembly drawing for type I or type II hose or hose assemblies and has met the requirements. Manufacturers shall monitor for compliance to the prescribed procedures, and observe that satisfactory manufacturing conditions and records on lots are maintained for these pipes. The records, including as a minimum, an attributes summary of all quality conformance inspections conducted on each lot, shall be available to review by customers at all times. Manufacturers shall keep lot records for 3 years minimum.

4.3.6 Failures. Failure of a sample unit to pass any test shall be cause for rejection of the entire lot and to grant first article approval. Every sample shall meet all the contract requirements.

4.3.7 Waivers or deviations to specification requirements. All waivers or deviations to specification requirements shall be coordinated through the preparing activity; Defense Supply Center, Columbus, Attn: VAI, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Construction@dsccl.dla.mil.

4.4 Conformance inspection. For manufacturers that have successfully passed first article inspections, the manufacturer shall perform 100% inspection of the hose assemblies as specified in table VIII. Noncompliance with any of the specified requirements in sections 3 and 4 shall be cause for rejection of the sample and the inspection lot. An inspection lot shall consist of all units of one type and PIN from an identifiable production period, from one manufacturer, submitted at the same time for acceptance.

TABLE VIII. Individual inspections.

Type	Requirement paragraph	Test method
Visual	3.3 , 3.4 , 3.6 , 3.7 , 3.8 , 3.9 , and 3.10	4.5.1
Constriction ^{1/}	3.5.1	4.5.3
Proof pressure	3.5.2	4.5.4

^{1/} Omit this inspection if the hose has to be cut.

4.5 Test methods.

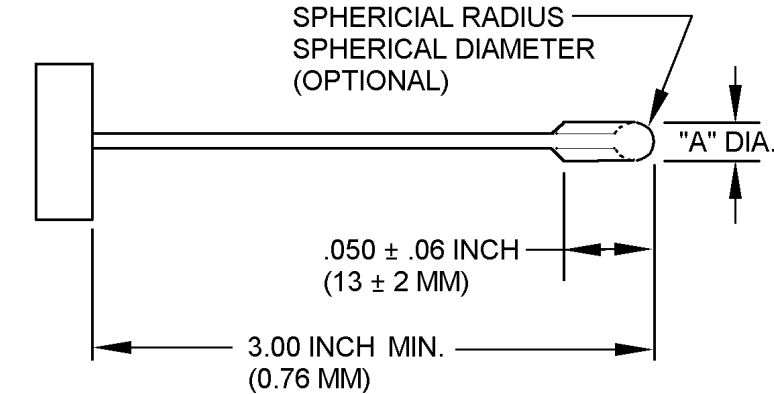
4.5.1 Visual inspection. Hose and hose assemblies shall be examined to ensure conformance with this specification and applicable drawings, see [4.5.2](#). Visual examination shall be in accordance with FED-STD-162. Continuous examination shall be performed to assure compliance with the following requirements:

- a. Specification sheets (see [3.1](#)).
- b. Materials (see [3.3](#)).
- c. Design, construction and physical dimensions (see [3.3.2](#) and [3.4](#)).
- d. Marking (see [3.6](#)).
- e. Workmanship (see [3.7](#)).
- f. Age (see [3.8](#)).
- g. Condition (see [3.9](#)).
- h. Cleanliness (see [3.10](#)).

4.5.2 Records. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports and rating data. Each hose assembly and its related manufacturing records shall be examined for compliance with the requirements specified herein with respect to dimensions, materials used, age limitations, identification of product, and workmanship, see [4.5.1](#).

MIL-DTL-13719F

4.5.3 Constriction test (see 3.5.1). Hose assemblies shall be tested for constriction and meet the requirements of 3.5.1. The hose assembly shall be held in a vertical position and the "A" diameter end of the plug gage (shown on figure 2) shall be inserted into the end of the fitting.



Constriction gage dimensions		
Hose ID inch (mm)	Gage "A" diameter inch (mm) ±.002 in. (±0.051 mm)	Gage weight oz (g)
.125 (3.2)	.080 (2.03)	2 ±0.1 (57 ±3)
.188 (4.8)	.120 (3.05)	
.250 (6.3)	.165 (4.19)	

NOTES:

1. Dimensions are in inches
2. Metric equivalents are given for information only.

FIGURE 2. Plug gage for testing constriction of hose assembly bore.

4.5.4 Proof pressure (see 3.5.2). Hose assemblies shall be proof pressure tested in accordance with SAE J1401 and shall meet the requirements of 3.5.2. Special care should be taken when inert gas or air is used. Under the pressure specified, gas or air is explosive if a failure should occur in the hose or hose assembly.

4.5.5 Expansion test (see 3.5.3). To determine conformance to 3.5.3, hose assemblies shall be tested as specified in SAE J1401. The expansion test apparatus shall be capable of applying the pressure at a rate of increase of 25,000 ±10,000 psi/minute (172.5 ±69 MPa/minute).

4.5.6 Bursting test (see 3.5.4). To determine conformance to 3.5.4, the hose assemblies shall be tested as accordance with ASTM D380, methods 14.1 and 16.1 of, except the pressure shall be raised to the hold pressure specified in table IV. The pressure shall then be increased until the minimum burst pressure, as specified in table IV, has been reached.

4.5.7 Fatigue life (whip) test (see 3.5.5). To determine conformance to 3.5.5, hose assemblies shall be tested in accordance with SAE J1401, except the free length and slack length shall be specified in table IX.

MIL-DTL-13719F

TABLE IX. Slack required for fatigue life (whip) test. ^{1/}

Hose ID inch (mm)	Slack required ± 0.015 inch (± 0.38 mm)	Free length between fittings inch (mm)
.125 (3.18)	1.750 (44.55)	14 (355.6)
.188 (4.78)	1.000 (25.40)	
.250 (6.35)	1.000 (25.40)	

^{1/} Metric equivalents are given for information only.

4.5.8 Low temperature flexibility test (see 3.5.6). To determine conformance to 3.5.6, hose assemblies shall be tested as in accordance with SAE J1401 with the following exceptions:

- Hose assemblies shall be conditioned for 72 hours at a temperature of $-65^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($-54^{\circ}\text{C} \pm 2^{\circ}\text{C}$).
- At the end of condition and while still at the specified temperature, the sample shall be bent, within 10 seconds, through 180° from the centerline over a mandrel with a diameter equal to 10 times the nominal outside diameter (OD) of the hose. While still at the specified temperature, the sample shall then be bent through 360° in the opposite direction over the same mandrel within the next 10 seconds.
- After completion of the bending at the specified temperature, the sample shall be subjected to the proof pressure test (see 4.5.4).

4.5.9 Tensile strength test (see 3.5.7). To determine conformance to 3.5.7, hose assemblies shall be tested in accordance with SAE J1401.

4.5.10 Ozone resistance test (see 3.5.8). To determine conformance to 3.5.8, hose shall be tested in accordance with SAE J1401. The following details shall apply:

- The exposure chamber shall maintain a mixture of air and ozone in the proportion of 50 ± 5 parts of ozone per 100 million parts of air by volume, and capable of maintaining an air temperature of $100^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($38^{\circ}\text{C} \pm 1^{\circ}\text{C}$).
- The test shall be conducted in an ambient temperature of $100^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($38^{\circ}\text{C} \pm 3^{\circ}\text{C}$).
- The sample shall be bent around a mandrel, the diameter of which shall be 7 times the OD of the hose being tested, and bound with twine or tape at the point where the ends of the hose cross one another. If collapse of the hose occurs, provisions shall be made to support the hose internally.
- The sample shall be conditioned 45 minutes in air at room temperature.
- The sample, while still on the mandrel, shall be placed into the chamber and exposed to the mixture of ozone and air for a period of 168 hours.
- At the end of the 168-hour period, the hose cover shall be examined under 9-power magnification, ignoring the areas immediately adjacent to or within the area of the sample where taped or tied.

4.5.11 Fluid resistance test (see 3.5.9). To determine conformance to 3.5.9, a sample of tube shall be tested as in accordance with ASTM D471, except the aging shall be for 70 hours at a temperature of $212^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($100^{\circ}\text{C} \pm 3^{\circ}\text{C}$). The immersion fluid shall conform to MIL-PRF-46176.

4.5.12 Salt spray test (see 3.5.10). To determine conformance to 3.5.10, hose assemblies shall be subjected to a 96-hour salt spray in accordance with ASTM B117, and subsequently proof pressure tested in accordance with 4.5.4.

MIL-DTL-13719F

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 packaging activities within the Military Service or Defense Agency, or within the Military Service System Commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. The hose and hose assemblies furnished under this specification are for use as flexible connections on automotive hydraulic brake components. Type I hose may be used in applications requiring regular expansion hose. Type II hose may be used in applications requiring either low expansion or regular expansion hose.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. PIN (see 1.2).
- c. Applicable drawings (see 3.2 and 3.3), length and ID of hose assemblies (see 3.4.2).
- d. If first article is required (see 3.1).
- e. If materials are other than as specified (see 3.3).
- f. If inspection conditions should be other than as specified (see 4.3.1).
- g. Sampling plan for conformance inspection (see 4.4).
- h. Packaging requirements (see 5.1). Brake hose assemblies should be stored in a straight position with no external forces placed upon the assembly. Care should be taken to the selection of packaging materials. Some packaging materials contain chemicals which may cause a reaction with the brake hose. Among those materials are certain plastics, adhesives, and paper treatments. Care should be taken to insure that the packaging materials are inert to the hose assembly.

6.3 First article. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first article samples. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.3.1 Defense Logistics Agency (DLA) waiver of first article test. A waiver of a first article testing will only be considered by DLA when the contractor has delivered the same item within the last three years, has no unfavorable quality history, has not changed processes, or changed any subcontractors. DLA will not accept first article testing results outside the stated requirements.

MIL-DTL-13719F

6.4 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table X lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

TABLE X. EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and Compounds	Lead and Compounds	Toluene
Carbon Tetrachloride	Mercury and Compounds	1,1,1 – Trichloroethane
Chloroform	Methyl Ethyl Ketone	Trichloroethylene
Chromium and Compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and Compounds	Nickel and Compounds	

6.5 Subject term (key word) listing.

Automotive
Connections
Expansion
Flexible
Ozone

6.6 Major changes. Major changes to this revision are removal of QPL requirements, and fungus testing. Size designators are in accordance with SAE convention. Added additional marking requirements for hose and hose assemblies.

6.7 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.

CONCLUDING MATERIAL

Custodians:
Army - AT
Navy - MC
DLA - CC

Preparing activity:
DLA - CC

(Project 2530-2007-001)

Review activity:
Navy - 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 <http://assist.daps.dla.mil>.