

INCH-POUND

MIL-PRF-13719E

9 December 1996

SUPERSEDING

MIL-H-13719D

7 February 1992

PERFORMANCE SPECIFICATION

HOSE ASSEMBLY, RUBBER, HYDRAULIC BRAKE

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

1. SCOPE

1.1 Scope. This specification covers two types of hose assemblies for use as flexible connections on hydraulic brake equipment for military vehicles.

1.2 Classification. Hose assemblies are of the following types and sizes, as specified (see 6.2):

Type I	- Regular expansion (see 6.1).
Type II	- Low expansion (see 6.1).
Sizes	- Inside diameters (ID): 0.125 inches (in.) [3.2 millimeters (mm)], 0.188 in. (4.8 mm), and 0.250 in. (6.3 mm).

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 requirement documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A

FSC 2530

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

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2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

- MIL-F-13927 - Fungus Resistance Test; Automotive Components.
- MIL-B-46176 - Brake Fluid, Silicone, Automotive, All Weather, Operational and Preservative, Metric.

STANDARDS

FEDERAL

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

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available 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 the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM B117 - Standard Practice For Operating Salt Spray (Fog) Testing Apparatus (DoD Adopted).
- ASTM D380 - Standard Test Methods For Rubber Hose (DoD Adopted).
- ASTM D471 - Standard Test Method For Rubber Property - Effect Of Liquids (DoD Adopted).

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

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

SAE J1401 - Road Vehicle - Hydraulic Brake Hose Assemblies For Use With Nonpetroleum-Base Hydraulic Fluids.

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

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.

3.2 Characteristics.

3.2.1 Performance.

3.2.1.1 Pressure resistance. Hose assemblies shall show no evidence of leakage when subjected to an internal pressure of 1500 pound per square inch (lb/in²) [10.3 megapascal (MPa)] minimum for air or 3000 lb/in² (20.7 MPa) minimum for liquid (see 4.5.3).

3.2.1.2 Constriction. After assembly, the bore of the hose assemblies shall not be constricted (see 4.5.4).

3.2.1.3 Expansion resistance. Hose shall expand not more than the values shown in table I (see 4.5.5).

TABLE I. Maximum hose expansion.

Hose ID in. (mm)	1000 lb/in ² (6.9 MPa)		1500 lb/in ² (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)
0.125 (3.2)	0.66 (2.17)	0.33 (1.08)	0.79 (2.59)	0.42 (1.38)
0.188 (4.8)	0.86 (2.82)	0.55 (1.81)	1.02 (3.35)	0.72 (2.36)
0.250 (6.3)	1.04 (3.41)	(a)	1.30 (4.27)	(a)

(a) At present there is no 0.250 in. ID low expansion hose available.

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3.2.1.4 Bursting strength. Hose assemblies shall withstand an internal hydrostatic pressure for the 2-minute hold period specified in table II without bursting and shall not leak or burst at any pressure up to and including the burst value specified in table II (see 4.5.6).

TABLE II. Hold and burst pressures.

Nominal ID of hose in. (mm)	Hydrostatic pressure	
	2-minute hold	Minimum burst
	lb/in ² (MPa)	lb/in ² (MPa)
0.125 (3.2)	4000 (27.6)	5000 (34.5)
0.188 (4.8)	3000 (20.7)	4500 (31.0)
0.250 (6.3)	3000 (20.7)	4500 (31.0)

3.2.1.5 Fatigue life. Hose assemblies shall have a minimum life of 35 hours (see 4.5.7).

3.2.1.6 Low temperature flexibility. Hose assemblies shall show no evidence of breaks, cracks, or leakage at low temperatures (see 4.5.8).

3.2.1.7 Tensile strength. Hose assemblies shall evidence no rupture of the hose or loosening of the end fittings when subjected to a straight pull at a speed of 1 ± 0.1 inch per minute (in./min) (25.4 ± 3 mm/min) until a pull of 325 lb [1446 Newtons (N)] is attained (see 4.5.9).

3.2.1.8 Ozone resistance. Hose shall show no evidence of cracks or breaks when subjected to ozone (see 4.5.10).

3.2.1.9 Fluid resistance. The volume of the tube specimen shall not increase by more than 20 percent nor decrease by more than 3 percent (%) (see 4.5.11).

3.2.1.10 Fungus resistance. Hose assemblies shall not support growth of fungi and shall subsequently meet all requirements of 3.2.1.1 (see 4.5.12).

3.2.1.11 Corrosion-resistance. Fittings shall show not more than one red rust spot 0.06 in. (1.6 mm) in diameter when exposed to a corrosive environment. No white corrosion shall occur on areas that can be contacted by a 0.5 in. (13 mm) diameter ball (see 4.5.13).

3.2.2 Design, construction and workmanship standards.

3.2.2.1 Design and construction. The configuration of all hose assemblies shall conform to the applicable drawings (see 4.5.1 and 6.2).

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3.2.2.1.1 Fittings. Fittings of hose assemblies shall be securely attached to the hose. Form, threads per inch, and class of fit shall be as specified in applicable drawing or standard (see 4.5.1 and 4.5.2).

3.2.2.1.2 Dimensions. Inside diameter (ID) (nominal) of the hose shall be 0.125 in. (3.2 mm), 0.188 in. (4.8 mm), or 0.250 in. (6.3 mm). Hose assemblies shall be furnished in the nominal ID and length as specified (see 4.5.2 and 6.2).

3.2.2.2 Workmanship. Workmanship shall be such as to produce hose assemblies that are free of imperfections such as, cuts, breaks, blisters, and pitting. Swivel type fittings shall move freely. Seating surfaces of all fittings shall be free of damage (see 4.5.2).

3.2.2.3 Condition. All hose assemblies offered to the Government for acceptance shall be in good condition and free of defects and shall not have been used or subjected to any tests except as specified in 4.5.3. Hose inner tubing used in the hose assemblies shall have been manufactured not more than 2 quarters prior to presentation for acceptance (see 4.5.1 and 4.5.2).

3.2.3 Materials, processes and parts.

3.2.3.1 Materials. Unless otherwise specified, materials shall be capable of meeting all the operational and environmental requirements specified herein (see 4.5.1).

3.2.3.2 Cover. Cover shall be black (see 4.5.1 and 4.5.2).

3.2.3.3 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs (see 4.5.1).

3.2.4 Identification and marking.

3.2.4.1 Hose assemblies. Hose assemblies, having a free length of 12 in. (305 mm) or longer, shall have the outer cover marked with an oil-resistant, continuous blue stripe. The following information shall be permanently and legibly marked or broken into the stripe at repeated intervals of not more than 12 in. (305 mm) on the lay line of the hose (see 4.5.2):

- a. Specification number.
- b. Size (nominal diameter).
- c. Date of manufacture (quarter and year).
- d. Capital letters "OZ".
- e. Manufacturer's code symbol.

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Hose assemblies may, at the discretion of the Government inspector, be marked as specified in 3.2.4.2, when the cover is too rough, or for any other reason, it is determined that the use of a stripe is impractical on the outside cover.

3.2.4.2 Short lengths. Hose assemblies having a free length of less than 12 in. (305 mm) shall have the following information stamped on the fittings (see 4.5.2):

- a. Manufacturer's code.
- b. Capital letters "OZ".

The unit package containing the hose shall, in addition to other required marking, show the following:

- a. Specification number.
- b. Date of manufacture (quarter and year).
- c. Size (nominal diameter).

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)
 1. Examination (see 4.4.2).
 2. Tests (see 4.4.3).

4.2 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed under the following conditions:

- a. Air temperature: 77 ± 15 degrees Fahrenheit ($^{\circ}\text{F}$) [25 ± 8 degrees Celsius ($^{\circ}\text{C}$)].
- b. Barometric pressure: 28.5 (+2, -3) in. of mercury (Hg) [96.5 (+6.8, -10.2) kilopascal (kPa)].
- c. Relative humidity: $50 \pm 30\%$.

TABLE III. Classification of inspections.

Title	Requirement	Inspection	First article	Conformance	
				Examination	Tests
Materials, design and construction	3.2.2.1, 3.2.2.1.1, 3.2.2.3, 3.2.3.2 thru 3.2.3.3, and 3.2.4.1	4.5.1	X		
Defects	3.2.2.1.1, 3.2.2.1.2, 3.2.2.2, 3.2.2.3, 3.2.3.2, and 3.2.4	4.5.2	X	X	
Pressure resistance	3.2.1.1	4.5.3	X		
Constriction	3.2.1.2	4.5.4	X		X
Expansion resistance	3.2.1.3	4.5.5	X		
Bursting strength	3.2.1.4	4.5.6	X		X
Fatigue life	3.2.1.5	4.5.7	X		
Low temperature flexibility	3.2.1.6	4.5.8	X		
Tensile strength	3.2.1.7	4.5.9	X		
Ozone resistance	3.2.1.8	4.5.10	X		
Fluid resistance	3.2.1.9	4.5.11	X		
Fungus resistance	3.2.1.10	4.5.12	X		
Corrosion resistance	3.2.1.11	4.5.13	X		

4.3 First article inspection. A sample of 16 hose assemblies, 0.125 in. ID, and a free hose length of 14 in. (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 III.

4.3.1 First article test sequence. First article tests shall be conducted on the sample in accordance with the test sequence specified in table IV.

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TABLE IV. First article test sequence.

Sample No.	Paragraph No.
1, 2, 3, 4	4.5.3, 4.5.4, 4.5.7
5, 6	4.5.5, 4.5.6, 4.5.11
7, 8	4.5.10
9, 10	4.5.8, 4.5.4
11, 12	4.5.9
13, 14, 15, 16	4.5.12, 4.5.4, 4.5.13

4.4 Conformance inspection. Conformance inspection shall include the examinations of 4.4.2 and the tests of 4.4.3. Noncompliance with any of the specified requirements in section 3 and 4 shall be cause for rejection of the sample and the inspection lot.

4.4.1 Sampling plan. The sampling plan shall be as specified in the contract or order (see 6.2). Any sampling plan used in conjunction with this specification shall accept 0 defects and shall reject with one or more defects.

4.4.1.1 Lot formation. An inspection lot shall consist of all units of one type and part identification number (PIN), from an identifiable production period, from one manufacturer, submitted at the same time for acceptance.

4.4.2 Examinations (100 %). The sample selected in accordance with 4.4.1 shall be examined and defects classified as specified in table V.

TABLE V. Classification of defects.

Category	Defect	Method of examination
<u>Major:</u>		
101	Cover not black (see 3.2.3.2).	Visual
102	Dimensional nonconformance of fittings affecting the interchangeability (see 3.2.2.1.1).	SIE <u>1</u> /
103	Fittings not securely attached to hose (see 3.2.2.1.1).	Visual
104	Diameter nonconformance (see 3.2.2.1.2).	SIE
105	Assembly length incorrect (see 3.2.2.1.2).	SIE
106	Tubing overage (see 3.2.2.3).	Visual
107	Faulty workmanship affecting performance (see 3.2.2.2).	Visual
<u>Minor:</u>		
201	Improper and illegible marking (see 3.2.4).	Visual

1/ SIE = Standard Inspection Equipment.

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4.4.3 Acceptance test (100 %) and sequence. The sample selected in accordance with 4.4.1 shall be subjected to the tests specified in table III and in the test sequence specified in table VI.

TABLE VI. Acceptance test sequence.

Type	Test sequence
Constriction	4.5.4
Burst	4.5.6

4.4.4 Conformance inspection failure. Any item that fails to conform to any specified requirement shall be rejected; any failure (one or more) of the selected sample in either the Major/Minor categories or test for the appropriate inspection lot size shall constitute a failure of the entire lot.

4.5 Methods of inspection.

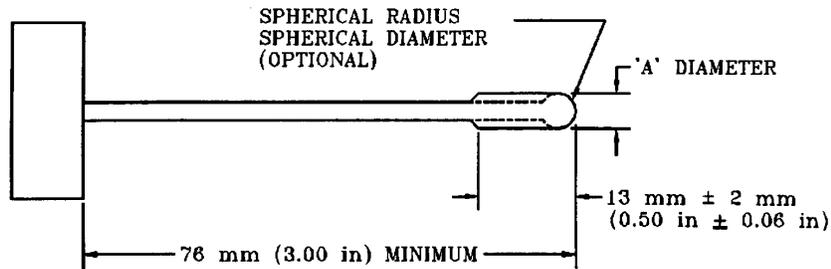
4.5.1 Materials, design and construction. Conformance to 3.2.2.1, 3.2.2.1.1, 3.2.2.3, and 3.2.3.2 thru 3.2.3.3 shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4.5.2 Defects. Conformance to 3.2.2.1.1, 3.2.2.1.2, 3.2.2.2, 3.2.2.3, 3.2.3.2, and 3.2.4 shall be determined by examination for defects listed in table V. Examination shall be visual, tactile, or by measurement with standard inspection equipment. Visual examination shall be in accordance with FED-STD-162.

4.5.3 Pressure resistance test. To determine conformance to 3.2.1.1, hose assemblies shall be tested as specified in SAE J1401.

4.5.4 Constriction test. Hose assemblies shall be tested for constriction of the bore by means of the plug gage shown in figure 1. The hose assembly shall be held in a vertical position and the "A" diameter end of the gage inserted into the end of the fitting. An unconstricted bore shall allow the plug gage to drop into the hose assembly bore of its own weight in less than 5 seconds (see 3.2.1.2).

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CONSTRICTION GAGE DIMENSIONS		
Hose ID in. (mm)	Gage "A" dimension minimum diameter in. (mm)	Gage weight oz (g)
0.125 (3.2)	0.080 \pm 0.002 (2.03 \pm 0.051)	2 \pm 0.1 (57 \pm 3)
0.188 (4.8)	0.120 \pm 0.002 (3.05 \pm 0.051)	
0.250 (6.3)	0.165 \pm 0.002 (4.19 \pm 0.051)	

FIGURE 1. Gage plug for testing constriction of bore of hose assembly.

4.5.5 Expansion test. To determine conformance to 3.2.1.3, 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 \pm 10 000 lb/in²/min (172.5 \pm 69 MPa/min).

4.5.6 Bursting test. To determine conformance to 3.2.1.4, the hose assemblies shall be tested as specified in method 14.1 of ASTM D380, except the pressure shall be raised to the hold pressure specified in table II. The pressure shall then be increased until the minimum burst pressure, as specified in table II, has been reached.

4.5.7 Fatigue life (whip) test. To determine conformance to 3.2.1.5, hose assemblies shall be tested as specified in SAE J1401, except that the free length and slack length shall be obtained from table VII.

TABLE VII. Slack required for fatigue life (whip) test.

Free length between fittings, in. (mm)	Slack required, in. (mm)		
	0.125 (3.2) ID	0.188 (4.8) ID	0.250 (6.3) ID
14 (355.6)	1.750 \pm 0.015 (44.55 \pm 0.381)	1.000 \pm 0.015 (25.4 \pm 0.381)	1.000 \pm 0.015 (25.4 \pm 0.381)

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4.5.8 Low temperature flexibility test. To determine conformance to 3.2.1.6, hose assemblies shall be tested as specified SAE J1401 with the following exceptions:

- a. Hose assemblies shall be conditioned for 72 hours at a temperature of $-85 \pm 4^{\circ}\text{F}$ ($-65 \pm 2^{\circ}\text{C}$).
- b. 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 test specified in 4.5.3.

4.5.9 Tensile strength test. To determine conformance to 3.2.1.7, hose assemblies shall be tested as specified in SAE J1401.

4.5.10 Ozone resistance test. To determine conformance to 3.2.1.8, hose shall be tested as specified in SAE J1401 with the following exceptions:

- a. 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 $100 \pm 2^{\circ}\text{F}$ ($38 \pm 1^{\circ}\text{C}$).
- b. The test shall be conducted in an ambient temperature of $100 \pm 5^{\circ}\text{F}$ ($38 \pm 3^{\circ}\text{C}$). 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. To determine conformance to 3.2.1.9, sample of tube shall be tested as specified in ASTM D471, except that the aging shall be for 70 hours at a temperature of $212 \pm 5^{\circ}\text{F}$ ($100 \pm 3^{\circ}\text{C}$). The immersion fluid shall conform to MIL-B-46176.

4.5.12 Fungus resistance test. To determine conformance to 3.2.1.10, hose assemblies shall be tested in accordance with class 3, Method A of MIL-F-13927, and then shall be tested as specified in 4.5.3.

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4.5.13 Corrosion resistance test. To determine conformance to 3.2.1.11, hose assemblies shall be subjected to a 96-hour salt spray in accordance with ASTM B117.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

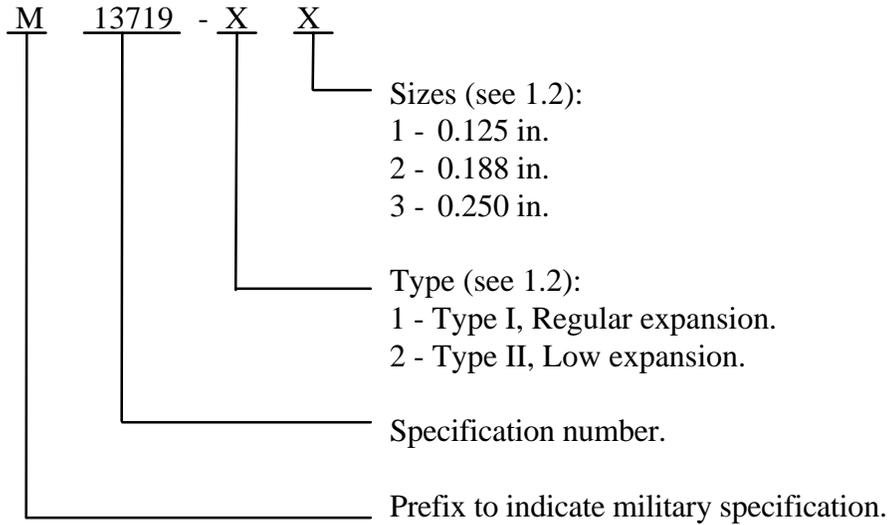
6.1 Intended use. The hose assemblies furnished under this specification are for use as flexible connections on automotive hydraulic brake components. Type I hose may be used in applications requiring regular expansion hose. Type II hose may be used in applications requiring either low expansion or regular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

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Type hose required (see 1.2).
- c. Issue of DoDISS to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- d. If first article is required (see 3.1).
- e. Title, number, and date of applicable drawing (see 3.2.2.1).
- f. Applicable ID of hose assemblies (see 3.2.2.1.2).
- g. If inspection conditions should be other than as specified (see 4.2).
- h. If sampling plan for conformance inspection is other than as specified (see 4.4.1).
- i. Packaging requirements (see 5.1).

6.3 Part or identifying number (PIN). The PINs to be used for hose assemblies acquired to this specification are created as follows:

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6.4 Subject term (key word) listings.

Automotive
Connections
Expansion
Flexible

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

Custodians:
Army - AT
Navy - MC

Preparing Activity:
Army - AT

(Project 2530-0381)

Review Activities:
Army - MI, SM
DLA - CS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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

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

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-13719E	2. DOCUMENT DATE (YYMMDD) 961209
3. DOCUMENT TITLE HOSE ASSEMBLY, RUBBER, HYDRAULIC BRAKE		
4. NATURE OF CHANGE <i>(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)</i>		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME <i>(Last, First, Middle Initial)</i>	b. ORGANIZATION	
c. ADDRESS <i>(Include Zip Code)</i>	d. TELEPHONE <i>(Include Area Code)</i> (1) Commercial (2) AUTOVON <i>(If applicable)</i>	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY		
a. NAME	b. TELEPHONE <i>(Include Area Code)</i> (1) Commercial (810) 574-8745	(2) AUTOVON 786-8745
c. ADDRESS <i>(Include Zip Code)</i> Commander U.S. Army Tank-automotive and Armaments Command ATTN: AMSTA-TR-E/BLUE Warren, MI 48397-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	