

INCH-POUND
MIL-PRF-62028B
30 October 1995
SUPERSEDING
MIL-H-62028A
8 December 1987

PERFORMANCE SPECIFICATION

HOSE, AIR DUCT: HIGH-TEMPERATURE
FLEXIBLE, REINFORCED

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

1. SCOPE

1.1 Scope. This specification covers reinforced flexible hose used for transferring heat to crew compartments and preheating engine compartments, oil pans, batteries, fuel and coolant lines, and other components to assist in starting engines under extreme cold weather conditions.

1.2 Classification. The hose is classified as follows (see 6.2).

1.2.1 Types.

<u>Type</u>	<u>Working pressure</u>
I	-5 to +5 pounds per square inch (psi)
II	-5 to +16 psi.

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 4720

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

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1.2.2 Classes

<u>Class</u>	<u>Operating temperature range</u>
1	Minus 65 degrees Fahrenheit (°F) to plus 300°F.
2	Minus 65°F to plus 450°F.
3	Minus 65°F to plus 600°F.

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 in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents

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

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-F-13927 - Fungus Resistance Test; Automotive Components.

(Unless otherwise indicated, copy of the above specification is 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).

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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM D380 - Rubber Hose (DoD Adopted).
- ASTM D2000 - Rubber Products in Automotive Applications (DoD Adopted).

(Application for copies may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

- ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (DoD Adopted).

(Application for copies may be obtained from the American Society for Quality Control, P.O. Box 305, 611 East Wisconsin Avenue, Milwaukee, WI 53202-4606.)

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 first article samples shall be subjected to first article inspection in accordance with 4.3.

3.2 Materials. Materials used shall be in accordance with the manufacturer's materials specifications for hoses. The materials shall be capable of meeting all the operational and environmental requirements specified herein. Recovered materials shall be used to the maximum extent practicable (see 4.7.1).

3.3 Design and construction. All hoses shall be flexible reinforced and conform to the manufacturer's design and construction for the applicable item.

3.3.1 Configuration. The configuration of the hose shall be as specified on the applicable engineering drawing (AED) (see 6.2).

3.3.2 Interchangeability. All hoses shall be interchangeable with parts of other manufacturers having the same military part number.

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3.4 Performance.

3.4.1 Leakage. The hose shall not leak more than 0.02 cubic foot of air per minute, per inch of inside diameter (ID), per foot length, at the maximum working pressure specified in table I for the applicable type when tested as specified in 4.7.3.

3.4.2 Proof and burst pressures. The hose shall withstand the proof and burst pressures specified in table I for the applicable type without rupturing (see 4.7.4)

TABLE I. Pressure requirements.

Type	ID (inches)	Working pressure (psi)	Proof pressure (psi)	Burst pressure (psi)
I	3 1/	-5 to 5	10	20
II	3	-5 to 16	32	64

1/ Use 3 inches hose for test purposes for both types.

3.4.3 Vacuum resistance. The outside diameter (OD) of the hose shall not be reduced more than 5 percent and the inner tube shall not collapse or separate from the balance of the hose structure when tested as specified in 4.7.5.

3.4.4 Flexibility. The hose shall not permanently kink, flatten, fracture, or deform more than 2 percent when tested as specified in 4.7.6.

3.4.5 Collapsing resistance. The OD of the hose shall not permanently set, distort, or deform more than 5 percent when tested as specified in 4.7.7.

3.4.6 High-temperature resistance. The hose shall show no brittleness, cracks, or breaks when tested as specified in 4.7.8 and shall subsequently meet the requirements of 3.4.1 and 3.4.2.

3.4.7 Low-temperature resistance. The hose shall show no delamination, cracks, or deterioration when tested as specified in 4.7.9 and shall subsequently meet the requirements of 3.4.1 and 3.4.2.

3.4.8 Vibration resistance. The hose shall show no delamination, cracks, or breaks when tested as specified in 4.7.10 and shall subsequently meet the requirements of 3.4.1 and 3.4.2.

3.4.9 Fungus resistance. The hose shall not support growth of fungi when tested as specified in 4.7.11 and shall subsequently meet the requirements of 3.4.1 and 3.4.2.

3.4.10 Ozone resistance. The hose shall show no cracks or breaks when tested as specified in 4.7.12

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3.5 Identification marking. Identification marking shall include, as a minimum, the following information permanently marked on the exterior of the hose (see 4.7.2):

- a. Hose, air duct
- b. Manufacturer's serial number
- c. Manufacturer's brand or firm name, or CAGE number
- d. Military part number
- e. Date of manufacture (month and year)
- f. Contract or order number
- g. US.

3.6 Date of manufacture. The hose shall not be more than 6 months old starting the date of manufacture when submitted for acceptance (see 4.7.2).

3.7 Workmanship. Workmanship shall be such as to produce a finished product that is clean and free from blisters, pits, cracks, or any other defect that will affect its life, serviceability, or appearances. Workmanship shall be such as to ensure that the finished product is in conformance to this specification (see 4.7.2).

4. VERIFICATION

4.1 Classification of inspections. 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. Acceptance tests (see 4.4.3).
- c. Control tests (see 4.5).

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

- a. Air temperature: $77 \pm 10^{\circ}\text{F}$.
- b. Barometric pressure: 28.5 (+2, - 3) inches mercury.
- c. Relative humidity: 50 ± 30 percent.

4.3 First article inspection. A first article inspection sample of nine hose samples (see 3.1) shall be submitted for first article inspection. The first article inspection shall consist of the examinations of 4.4.2 (see table III) and the tests of table II

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4.3.1 Failure. Failure of any sample to pass any of the examinations or tests specified herein may be cause, at the option of the Government, for refusal to conduct additional testing until the faults revealed by the test have been corrected.

TABLE II. Test schedule

Sample	Paragraph	Test	First article inspection	Acceptance	Control
1	4.7.6	Flexibility	X	X	X
	4.7.7	Collapsing resistance	X	X	
2	4.7.9	Low temperature resistance	X		
	4.7.3	Leakage	X	X	
	4.7.4	Proof and burst pressures	X	X	
3	4.7.8	High temperature resistance	X		
	4.7.3	Leakage	X		
	4.7.4	Proof and burst pressures	X		
4	4.7.5	Vacuum resistance	X		X
5	4.7.10	Vibration resistance	X		
	4.7.3	Leakage	X		
	4.7.4	Proof and burst pressures	X		
6,7,8	4.7.11	Fungus resistance	X		
	4.7.3	Leakage	X		
	4.7.4	Proof and burst pressures	X		
9	4.7.12	Ozone resistance	X		

4.4 Conformance inspections.4.4.1 Sampling.

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

4.4.1.2 Sampling for examination. Samples for conformance examination shall be selected in accordance with ASQC Z1.4.

4.4.2 Examination. Each sample selected in accordance with 4.4.1.2 shall be examined and shall be free from any defects as listed in table III.

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TABLE III. Classification of defects.

Category	Defect	Method of examination
Critical	None	
<u>Major:</u>		
101	Dimensions affecting interchangeability, out of tolerance (see 3.3.1).	SIE 1/
102	Identification marking, missing or improper (see 3.5).	Visual
103	Date of manufacture, not meeting age requirement (see 3.6).	Visual
104	Workmanship, faulty affecting performance (see 3.7).	Visual
<u>Minor:</u>		
201	Dimensions not affecting interchangeability, out of tolerance (see 3.3.1).	SIE
202	Workmanship, faulty affecting appearance (see 3.7)	Visual

1/ SIE = Standard Inspection Equipment.

4.4.3 Acceptance tests. Samples selected in accordance with 4.4.1.2 shall be subjected to the acceptance tests specified in table II.

4.5 Control tests. Control tests shall be conducted on 5 from each 5000 units consecutively produced, except that not more than 10 shall be selected in any 30-day period. The samples shall be identified as to production period, examined for the defects specified in table III, and subjected to the control tests specified in table II.

4.6 Failure. Failure of any sample to pass any of the specified conformance or control tests shall be cause for the Government to refuse acceptance of the production quantity represented, until action taken by the contractor to correct defects and prevent recurrence has been approved by the Government.

4.7 Methods of inspection.

4.7.1 Materials. Conformance to 3.2 shall be determined by inspection of contractor records providing proof or certification that materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records,

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processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data

4.7.2 Defects. Conformance to 3.3, 3.5, 3.6, and 3.7 shall be determined by examination for the defects listed in table III. Examination shall be visual, tactile, or by measurement with SIE.

4.7.3 Leakage. To determine conformance to 3.4.1, the hose shall be pressurized with air to the maximum working pressure specified in table I for the applicable type for a period of 1 minute. The leakage rate through the hose wall shall be measured and recorded.

4.7.4 Proof and burst pressures. To determine conformance to 3.4.2, the hose shall be tested in accordance with ASTM D380, at the proof and burst pressures specified in table I for the applicable type.

4.7.5 Vacuum resistance. To determine conformance to 3.4.3, a 36-inch length of hose shall be assembled with end couplings. One end shall be closed in such a manner as to prevent leakage of air, and the other end shall be connected to a vacuum pump. The OD of the hose shall be measured and recorded. The hose shall then be subjected to a vacuum of 10 inches of mercury while curved to a radius equal to 5 times the OD of the hose. After a period of 5 minutes and with the vacuum maintained, the OD of the hose shall be measured and the hose examined.

4.7.6 Flexibility. To determine conformance to 3.4.4, the hose shall be marked at four points spaced 90 degrees apart around the external perimeter. The hose shall then be bent successively on each of the four marked points for 180 degrees around a rigid cylinder with a diameter equal to the ID of the hose. The hose shall then be examined.

4.7.7 Collapsing resistance. To determine conformance to 3.4.5, the OD of the hose shall be measured and recorded. Any 6-inch longitudinal section in a 36-inch test specimen shall be subjected to a load of 50 pounds applied in 15 seconds for a period of 5 minutes. The load shall then be removed and the OD of the hose shall be measured.

4.7.8 High-temperature resistance. To determine conformance to 3.4.6, the hose shall be subjected to an internal flow of air at the maximum temperature specified in 1.2.2 for the applicable class. The air flow shall be maintained for a period of 72 hours with the ambient temperature at room temperature. The hose shall then be examined and subsequently tested as specified in 4.7.3 and 4.7.4.

4.7.9 Low-temperature resistance. To determine conformance to 3.4.7, the hose shall be tested in accordance with ASTM D380 at -65°F. The hose shall then be examined and subsequently tested as specified in 4.7.3 and 4.7.4.

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4.7.10 Vibration resistance. To determine conformance to 3.4.8, the hose shall be vibrated with a constant applied double amplitude of 0.060 inch, with the frequency cycling between 10 and 55 cycles per second in 1-minute cycles. The vibration shall be parallel to the hose axis for 50 hours, and then perpendicular to the hose axis for another 50 hours. The hose shall then be examined and subsequently tested as specified in 4.7.3 and 4.7.4.

4.7.11 Fungus resistance. To determine conformance to 3.4.9, the hose shall be tested in accordance with MIL-F-13927, class 3, method A; sample no. 6 for 30 days, sample no. 7 for 60 days, and sample no. 8 for 90 days, and upon completion of 90 days, sample no. 8 shall be tested as specified in 4.7.3. and 4.7.4.

4.7.12 Ozone resistance. To determine conformance to 3.4.10, the hose shall be tested in accordance with ASTM D2000. The hose shall than be examined.

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 which may be helpful, but is not mandatory.)

6.1 Intended use. The hose covered by this specification is intended for use in heat-transfer applications in military vehicles.

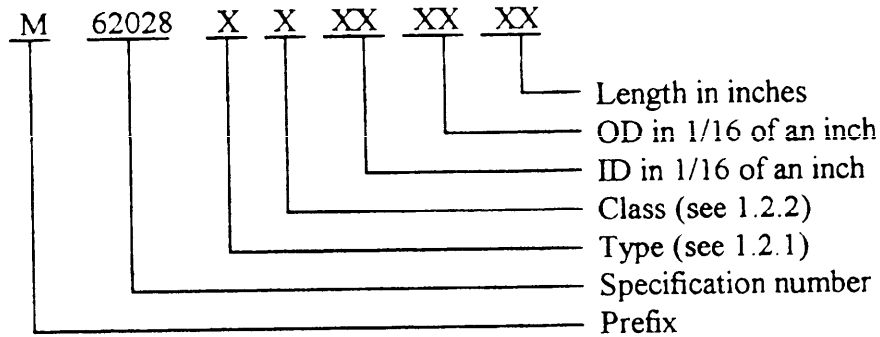
6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type and class of 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 inspection is required (see 3.1 and 4.3).
- e. AED number, title, and date (see 3.3.1) or part or identifying (PIN) (see 6.3).

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- f. If inspection conditions should be other than as specified (see 4.2).
g. Packaging requirements (see 5.1).

6.3 PIN. For items without a previously assigned PIN, the PIN is constructed as follows:



Example: M6202823010572

Signifies: Type II, class 3, 1/16-inch ID, 5/16-inch OD, 72 inches in length.

6.4 Disposition of test assemblies. Hoses undergoing destructive tests should not be used and should be indelibly marked "DO NOT USE," and purposely scrapped.

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.

6.6 Subject term (key word) listing.

Crew compartments
Cold weather
Engine compartments
Heat transfer
Preheating

Custodian:
Army - AT

Preparing activity:
Army - AT

Review activity:
DLA - CS

(Project 4720-0049)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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-62028B	2. DOCUMENT DATE (YYMMDD) 30 October 1995
3. DOCUMENT TITLE Hose, Airduct: High-Temperature, Flexible, Reinforced		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (810) 574-8745 (2) AUTOVON 786-8745 (If applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY		
a. NAME	b. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON	
c. ADDRESS (Include Zip Code) Commander U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-F-RI,IE 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	