

INCH-POUND

MIL-DTL-26521K
15 February 1999
 SUPERSEDING
 MIL-H-26521J
 21 June 1995

DETAIL SPECIFICATION

HOSE ASSEMBLY, NONMETALLIC, FUEL, COLLAPSIBLE, LOW TEMPERATURE
 WITH NON-REUSABLE COUPLINGS

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

1. SCOPE

1.1 Scope. This specification covers collapsible synthetic rubber hose assemblies for ground fueling of aircraft with hydrocarbon fuels or non-potable water where working pressures do not exceed 225 psi.

1.2 Classification. Hose assemblies are to contain static dissipating, collapsible walls with fuel resistant liners, synthetic material reinforcements, fuel, abrasion and ozone resistant covers, and non-reusable couplings. The inside diameters with couplers of table I apply.

TABLE I. Hose dimensions.

Hose Assembly Size	ID \pm .06 (inch)
1	2.00
2	2.50
3	3.00
4	4.00

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center, Columbus, DSCC-VAI, 3990 East Broad Street, Columbus, OH 43216-5000, 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

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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.

2.2 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-PRF-5624	-	Turbine, Fuel, Aviation, Grade JP-4, JP-5 and JP-5/JP-8ST
MIL-T-83133	-	Turbine, Fuel, Aviation, Kerosene Types, NATO F-34 (JP-8) & F-35

STANDARDS

FEDERAL

FED-STD-H28/10	-	Screw Thread Standards for Federal Services Section 10 Hose, Coupling and Fire Hose Coupling Screw Threads
FED-STD-162	-	Hose, Rubber, Visual Inspection Guide For

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Automated Printing Service, 700 Robbins Avenue, Building 4/D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of 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 PETROLEUM INSTITUTE (API)

API BULLETIN 1529 - Aviation Fueling Hose

(Application for copies should be addressed to the American Petroleum Institute, 1220 L Street Northwest, Washington DC 20005.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM B 121 - Standard Specification for Leaded Brass Plate, Strip, and Rolled Bar (DoD adopted)
- ASTM B 124 - Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes
- ASTM D 156 - Standard Method of Test for Saybolt Color of Petroleum Products (DoD adopted)
- ASTM D 380 - Standard Method of Testing Rubber Hose (DoD adopted)
- ASTM D 412 - Standard Method of Tension Testing of Vulcanized Rubber (DoD adopted)
- ASTM D 413 - Standard Method of Test for Adhesion of Vulcanized Rubber (Friction Test) (DoD adopted)
- ASTM D 471 - Standard Test Method for Rubber Property-Effects of Liquids (DoD adopted)
- ASTM D 518 - Standard Test Method for Rubber Deterioration-Surface Cracking (DoD adopted)
- ASTM D 1149 - Rubber Deterioration-Surface Ozone Cracking in a Chamber (DoD adopted)
- ASTM D 1500 - Test for ASTM Color of Petroleum Products (ASTM Color Scale) (DoD adopted)
- ASTM D 2276 - Standard Test Method for Particulate Contaminant in Aviation Fuel (DoD adopted)
- ASTM D 3182 - Rubber Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets (DoD adopted)
- ASTM D 3183 - Preparation of Pieces for Test from other than Standard Vulcanized Sheets (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.)

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BRITISH STANDARDS INSTITUTION (BSI)

BS EN ISO 8031 - 1997 Rubber and Plastic Hoses and Hose Assemblies -
Determination of Electrical Resistance

(Application for copies should be addressed to the British Standards Institution,
389 Chiswick High Road, London, W4 4AL, United Kingdom.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 4649 - Rubber Determination of Abrasion-Resistance Using a
Rotating Cylindrical Drum Device

(Application for copies should be addressed to the International Organization for
Standardization, c/o American National Standards Institute, 11 West 42nd Street, New York,
New York 10036.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

ANSI/NCSL Z540-1 - Calibration Laboratories and Measuring and Test
Equipment, General Requirements

(Application for copies should be addressed to the National Conference of Standards
Laboratories, 1800 30th St., Suite 305B, Boulder, CO 80301.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications or 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 First article. When specified, a sample shall be subjected to first article inspection (see 4.3, 4.6 through 4.7 and 6.4). Change of material, production process or procedures shall not be implemented subsequent to first article approval without prior written acquiring activity approval.

3.2 Components. The complete hose assembly shall consist of the basic hose, two non-reusable couplings (see figure 1), one attached to each end of the hose and a one-time use protective shipping cap for each coupling to prevent the entrance of dirt and other foreign matter.

3.3 Materials. Materials shall be as specified herein. If not specifically designated, the material shall be of the best quality for the intended purpose and meet the requirements of this specification.

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

3.3.2 Hazardous substances. The use of hazardous substances, toxic chemicals, or Ozone Depleting Chemicals (ODCs) shall be avoided, whenever feasible.

3.4 Hose. The hose shall consist of a synthetic rubber inner liner, synthetic braided, loomed, or plied reinforcement laminated between rubber layers and a synthetic rubber cover (see figure 2).

3.4.1 Liner material. The liners (inner tube) material shall be continuous, either calendered or extruded, fuel resistant synthetic rubber compounded to meet all the requirements of this specification. The liner shall be a smooth, continuous, free of pitting, blisters, depressions, grooves, holes, cuts, charge marks, slits, porosity, and foreign material. Spiral tube laps and die marks are acceptable.

3.4.1.1 Liner thickness. The liner thickness shall be not less than .06 inch when measured in accordance with ASTM D 380.

3.4.1.2 Liner tensile and elongation. The liner material shall have a tensile strength of not less than 1000 psi and an elongation of not less than 200% when tested in accordance with 4.7.1.1.

3.4.1.3 Liner volume change. The liner material shall not have more than 30% increase in volume when tested in accordance with 4.7.1.2.

3.4.1.4 Liner extractable material. The liner shall not have more than 6% of extractable matter when tested in accordance with 4.7.1.3.

3.4.1.5 Liner fuel contamination. The hose shall not contaminate fuel with more than 20 mg per 100 ml of extractable material when tested in accordance with 4.7.1.4.

3.4.1.6 Liner fuel discoloration. The color of the fuel following the fuel contamination test shall not be less than +15 saybolt when tested in accordance with 4.7.1.5.

3.4.1.7 Liner low temperature. The liner material shall not crack when subjected to $-40 \pm 2^\circ$ F when tested in accordance with 4.7.1.6.

3.4.2 Cover material. The cover shall be constructed of a black, ozone resistant and fuel resistant synthetic rubber material compounded to meet all the requirements of this specification. The cover material shall be smooth, and free of pitting, blisters, depressions, grooves, holes, cuts, charge marks, slits, porosity, and foreign material. Wrap impressions are acceptable.

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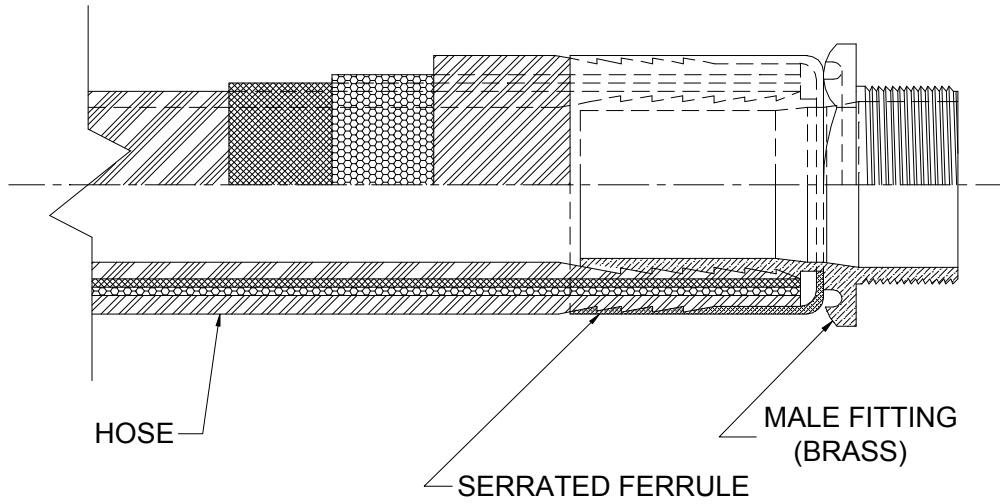


FIGURE 1. Permanent type coupler.

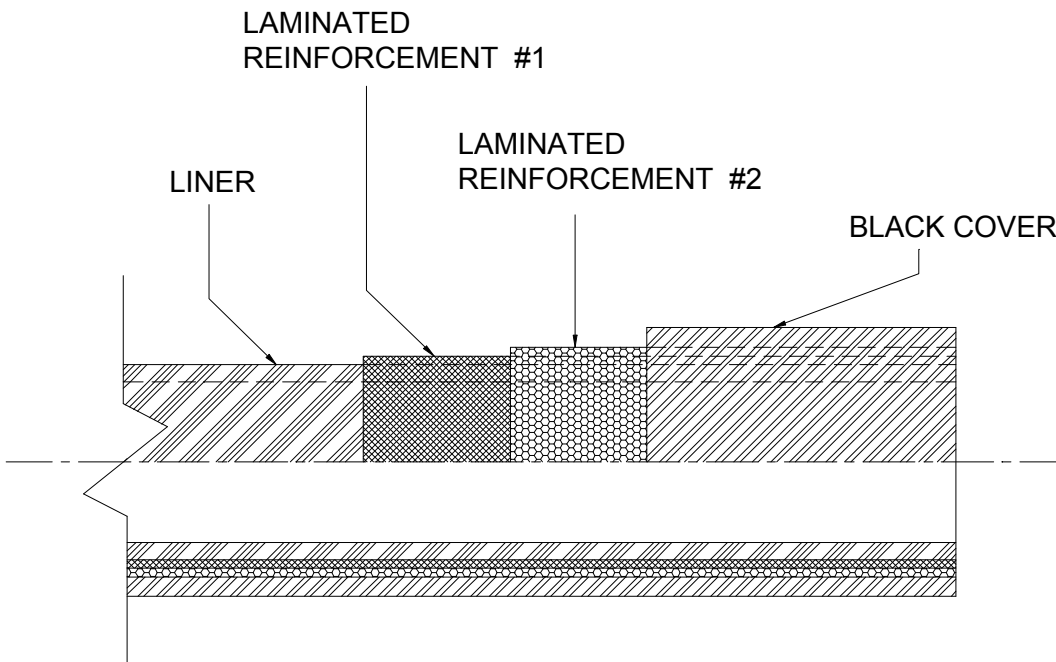


FIGURE 2. Hose section.

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3.4.2.1 Cover thickness. The cover thickness shall be not less than .06 inch. The dimensions shall be measured in accordance with 4.7.2.

3.4.2.2 Cover tensile and elongation. The cover material shall have a tensile strength of not less than 1000 psi and an elongation of not less than 200% when tested in accordance with 4.7.2.1.

3.4.2.3 Cover ozone resistance. The cover material shall not show signs of cracking when tested in accordance with 4.7.2.2 and examined as specified in ASTM D 518.

3.4.2.4 Cover volume change. The cover material shall not have more than 80% volume change when tested in accordance with 4.7.2.3.

3.4.2.5 Cover low temperature resistance. The cover material shall not crack when subjected to $-40 \pm 2^{\circ}$ F and tested in accordance with 4.7.2.4.

3.4.2.6 Cover material abrasion resistance. The quantity of material abraded shall not exceed 160 mm^3 when tested in accordance with 4.7.2.5.

3.4.3 Reinforcement material. The reinforcement material shall be a synthetic yarn, cord, or fabric that is braided, spiraled or plied and free of defects and geometrical irregularities. Two or more layers of reinforcement laminated between synthetic rubber layers not less than .03 inch thick shall be used in the hose construction. The reinforcement material weave construction shall be such that it will allow the rubber layer on one surface to flow through the reinforcement and vulcanize with the rubber layer on the other surface in such a manner as to encapsulate the reinforcement yarns with rubber. The reinforcement material shall not exist within the liner or cover thickness areas.

3.5 Hose.

3.5.1 Hose inside diameter. The hose inside diameter shall be as specified in table II.

TABLE II. Hose dimensional and physical requirements.

Hose I.D. $\pm .06$ (inch)	Pressure (psi)		
	Maximum Working	Minimum Proof	Minimum Burst
2.00	225	400	900
2.50	225	400	900
3.00	225	400	900
4.00	225	340	900

3.5.2 Length. The length of the hose shall be as specified, with a tolerance of $\pm 1\%$. The length measurement shall not include the couplings.

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3.5.3 Hose electrical resistance. Electrical resistance of the hose assembly shall not exceed 10^6 ohm/m (see 4.6.8).

3.5.4 Adhesion. Minimum force required to separate adjacent layers of the hose shall be not less than 17 lb/in width when pulled at 2 in/min. After bore aging the hose with JP-4 (MIL-PRF-5624), JP-8 (MIL-T-83133) or commercial jet A and A1 fuel for 168 ± 2 hours at $72 \pm 2^\circ$ F, the minimum force required to separate adjacent layers shall be not less than 10 lb/in width at 2 in/min pull rate. The test shall be conducted in accordance with 4.6.7.

3.5.5 Low temperature flexibility. Hoses with an inside diameter of 2.5 inches or less shall not crack or require a force of more than 70 pounds to straighten hose to an angle of 180° , within one minute when tested in accordance with 4.6.6. Hoses with an inside diameter of 3 inches or more shall not crack or require a force of more than 80 pounds to straighten hose to an angle of 180° , within one minute when tested in accordance with 4.6.6.

3.5.6 Working pressure. The hose assembly working pressure shall be as specified in table II when tested in accordance with 4.6.3.

3.5.7 Proof pressure. The hose assembly shall not leak, change in length more than 7% or show any imperfections when subjected to proof pressure specified in table II. The test shall be in accordance with 4.6.4.

3.5.8 Burst resistance. The hose assembly shall not blow out the coupling, burst, or develop a blister at or below the burst pressure as specified in table II. The test shall be in accordance with 4.6.5.

3.5.9 Age. The hose assemblies cured date shall be no more than twelve (12) quarters old on the date of delivery to the acquiring activity.

3.5.10 Collapsibility. Hose having ID of 2 inches shall coil to a diameter of 27 ± 2 inches and hoses having ID of 2.5 and 3 inches shall coil to a diameter of 30 ± 2 inches when tested in accordance with 4.6.9. Four inch ID hoses shall coil to 32 ± 2 inches. Test length shall be 50 ft ± 6 inches.

3.5.11 Durability. There shall be no evidence of leakage, pull off of fittings or other malfunctioning of the hose assemblies when tested in accordance with 4.6.10. The 4 inch ID hose assemblies will not be subjected to this test.

3.5.12 Hose identification requirements. The hose assembly shall be identified along its entire length with the following:

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Part or Identifying Number (PIN)
Manufacturer's CAGE code
Hose Cure Date
Contract Number

3.5.12.1 Identification data. The identification data shall be applied, using a wear resistant material or embossed longitudinally and continuously along hose. The identification characters shall not be less than .2 inch high.

3.5.12.2 Hose assembly serial number. Each hose assembly shall be identified with a, wear resistant and discernible to the naked eye, serial number, and placed 12 ±2 ft from each hose end or on the nut.

3.6 Couplings.

3.6.1 Couplings. A hose sample that meets this specification requirements shall be fitted with an API 1529 male coupling at each end. Couplings on the ends of the hoses shall be internally expandable, non-reusable design, two-piece construction (see 6.2.). The male fitting body shall be high strength brass that meets or exceeds ASTM B 121 or ASTM B 124 specification requirements. The serrated ferrule shall be brass that meets or exceeds ASTM B 121 or ASTM B 124 specification requirements or 300 series corrosion resistance steel. The coupling shall be furnished with standard male NPT (American Standard Taper Thread) threads. The threads shall conform to FED-STD-H28/10 Screw-thread standards for Federal Services, Section 10 or latest revision. When expanded, these fittings shall have an inside diameter conforming to the nominal inside diameter of the hose. Slippage of hose/coupling connection shall not exceed .03 inch due to hose pressurization to proof pressure when tested in accordance with 4.6.11. This measurement shall be made after hose assembly depressurization from proof pressure. Couplings shall be capable of performing free of failure for the expected life of the hose. The couplings used shall meet all of the requirements of this specification.

3.6.2 Couplings caps. The couplings shall be provided with protective one-time use, tapered or threaded caps for external threaded couplings. The caps shall be of a fuel and oil resistant polymer.

3.6.3 Coupling identification. The coupling ferrule shall be permanently identified with the following:

Coupling Manufacturer CAGE Code
Coupling Manufacturer PIN

3.7 Workmanship. The hose and hose assemblies shall conform to the quality specified herein with no cuts, nicks, bruises, blisters, sharp edges, or lumps, and shall be clean and smooth.

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4. VERIFICATION

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

- a. First article inspection (see 4.3.).
- b. Screening (see 4.4.1).
- c. Conformance inspection (see 4.4.2).
 1. Group A lot acceptance inspection (see 4.4.2.1).

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 or identified by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment (i.e. Industry Standard, Military Standard, etc.) shall be in accordance with ANSI/NCSL Z540-1 or equivalent.

4.3 First article inspection and testing. The first article inspection shall be performed at a laboratory acceptable to the acquiring activity on sample units produced with equipment and procedures used in production.

4.3.1 First article samples. The first article samples shall be representative of the products proposed to be furnished to the Government. The samples shall consist of the following hose lengths for each hose size. Samples shall be identified in accordance with 3.5.12 through 3.6.3.

- a. All samples shall be prepared as specified in ASTM D 3182 and ASTM D 3183.
 - a. 12 inch length uncoupled - For adhesion tests (see 4.6.7).
 - b. 36 inch length with couplings - For working pressure test (see 4.6.3), proof pressure test (see 4.6.4), burst pressure test (see 4.6.5), electrical resistance test (see 4.6.8) and couplings tests (see 4.6.11 and 4.7.3).
 - c. 50 foot length with couplings - For collapsibility test (see 4.6.9) and durability test (see 4.6.10).

4.3.2 Inspection routine. First article inspection shall consist of the tests described under 4.6 through 4.7 and table III, except where otherwise noted (see 6.4).

4.3.3 Failures. One or more failures shall be cause for rejection.

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4.4 Inspection of product for delivery. Inspection of product for delivery shall consist of screening and group A.

TABLE III. Tests quick reference summary

Test	Reqt. Para.	Test Para.	Specification	Requirement
Tensile strength	3.4.1.2 3.4.2.2	4.7.1.1 4.7.2.1	ASTM D 380 ASTM D 412	1000 psi (min)
Ultimate elongation	3.4.1.2 3.4.2.2	4.7.1.1 4.7.2.1	ASTM D 380 ASTM D 412	200% (min)
Volume change	3.4.1.3 3.4.2.4	4.7.1.2 4.7.2.3	ASTM D 380 ASTM D 471	30% (max) liner 80% (max) cover
Liner extractable material	3.4.1.4	4.7.1.3	ASTM D 2276	6% (max)
Discoloration	3.4.1.6	4.7.1.5	ASTM D 156 ASTM D 1500	+15 saybolt (min)
Adhesion	3.5.4	4.6.7	ASTM D 380 ASTM D 413	liner/cover (min) 17 lbs unaged 10 lbs aged
Low temperature flexibility	3.5.5	4.6.6	ASTM D 380	down to $-40 \pm 2^{\circ}$ F
Abrasion	3.4.2.6	4.7.2.5	ISO 4649	160 mm ³ (max)
Liner fuel contamination	3.4.1.5	4.7.1.4	ASTM D 471 ASTM D 2276	20 mg/100 ml (max)

4.4.1 Screening. Each production hose assembly shall be subjected to the examination of product (see 4.6.1), proof pressure (see 4.6.4) and length change test (see 4.6.2). Any hose assembly which fails any test in the screening sequence shall be removed from the lot at the time of observation or immediately at the conclusion of the test in which the failure was observed.

4.4.2 Conformance inspection.

4.4.2.1 Group A inspection. Group A inspection shall consist of the following tests in the order specified. Hose assemblies subjected to destructive tests shall not be included as part of the contract quantity for delivery.

- a. Adhesion (see 4.6.7).
- b. Volume change (see 4.7.1.2 and 4.7.2.3).
- c. Low temperature flexibility (see 4.6.6).

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- d. Tensile and elongation (see 4.7.1.1 and 4.7.1.5).
- e. Extractable matter (see 4.7.1.3).
- f. Burst resistance (see 4.6.5).
- g. Color change (see 4.7.1.5).

4.4.2.1.1 Group A sampling plan. Group A tests 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 group A 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.

4.4.2.1.2 Production lot. A production lot shall consist of hose assemblies of the same part number which have been manufactured under the same conditions and on the same continuous run.

4.4.2.1.3 Inspection lot. The inspection lot shall be product selected at random from the production lot without regard to quality and shall be the size specified in table IV.

TABLE IV. Group A inspection.

Production lot size of assemblies	Accept on zero sample size 4.4.2.1 a, d, f	Accept on zero sample size 4.4.2.1 b, c, e, g
0 - 50	1	0
51 - 150	2	0
151 - 300	3	1
301 - 500	4	2

NOTE: Increase sample size by one for every 500 additional production quantity.

4.5 Methods of inspection. The following identified tests and test methods assure 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.

4.6 Hose assembly test methods.

4.6.1 Examination of hose assemblies. Hose assemblies shall be examined to determine compliance with the requirements of this specification with regard to workmanship,

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identification, materials, size, construction, length, age, couplings and coupling caps. Defects found during visual inspection of assemblies shall be identified, categorized, and referenced in accordance with FED-STD-162.

4.6.2 Hose dimensional requirements. The hose length and diameter dimensions shall be measured in accordance with ASTM D 380.

4.6.3 Working pressure. The hose assembly shall be tested in accordance with ASTM D 380 (see 6.5).

4.6.4 Proof pressure. The hose assembly proof pressure shall be tested in accordance with ASTM D 380 (see 6.5).

4.6.5 Burst pressure. Hose assembly burst pressure resistance shall be tested in accordance with ASTM D 380.

4.6.6 Low temperature flexibility. A five foot sample of coupled hose shall be used for the low temperature flexibility test. The hose sample shall be folded, kinking the hose in a "V" shape. The "V" shaped sample shall be compressed so that both couplings touch, and the hose shall be secured in such a way that both sides are in contact along the entire length. The hose sample shall then be subjected to a temperature of $-40^{\circ}\text{F} \pm 2^{\circ}$ for not less than seventy-two hours. The hose shall be verified for flexibility (see 3.5.5). The sample shall then be subjected to the hydrostatic proof test in accordance with ASTM D 380 to a minimum proof pressure as identified in table II. Following the hydrostatic test, the sample shall be split lengthwise and inspected for cracks, breaks, blisters, and separations. Failure of this test shall be cause for rejection of the production lot."

4.6.7 Adhesion test method. Sample preparation and testing shall be in accordance with ASTM D 380 and ASTM D 413 using the "Ring" or "Strip 90 degrees" method, at a rate of 2 in/min, using a tension tester (stress strain machine), at $72 \pm 2^{\circ}\text{F}$. The test specimen shall be pulled completely around the circumference of the hose, with the average value around the circumference being 17 lb/in width, and 10 lb/in width after bore aging the hose with JP-4 (MIL-PRF-5624), JP-8 (MIL-T-83133) or commercial jet A and A1 fuel for 168 ± 2 hours at $72 \pm 2^{\circ}\text{F}$.

4.6.8 Hose assembly static dissipation test. The electrical resistance of the hose assembly, measured from coupling using a 500 volt source, shall not exceed 10^6 ohm/m (see 4.6.6). Tests shall be in accordance with BS EN ISO 8031.

4.6.9 Collapsibility test. Hoses having ID of 2 inches shall be tested by winding cylindrically (not spirally) an uncoupled 50 ft ± 6 in length around a reel having a diameter of $9 \pm .125$ in. The second coil and each succeeding coil shall be centered directly over the previous coil. After winding, the diameter of the coils of hose shall be measured at the point of

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greatest diameter. The same procedure shall be used for 2.5, 3 and 4 inch ID hose, except a $13 \pm .125$ in reel shall be used.

4.6.10 Durability. A hose assembly shall be installed on a hose reel. The reel hub shall have a diameter of not more than 16 inches and shall be capable of accommodating the length of hose wound in multiple layers in a single hose width wide coil. The hose shall be unwrapped from the hose reel, filled with JP-4 (MIL-PRF-5624), JP-8 (MIL-T-83133) or commercial jet A and A1 fuel, and pressurized to a hydrostatic pressure of 50 ± 5 psi. The hose shall then be evacuated through the hose reel (at least 95% of the fuel shall be removed) and rewound on the reel. Evacuation vacuum shall be 15 ± 2 inches of mercury. (An automotive vacuum gage shall be installed at the outboard or nozzle end of the hose.) This cycle of unreeling pressurizing, evacuation and reeling shall be accomplished 1000 times. The hose shall then be unreeled, rotated 180° , filled with JP-4 (MIL-PRF-5624), JP-8 (MIL-T-83133), or commercial jet A and A1 fuel, and an additional 1000 cycles accomplished. The rewinding of the hose on the hose reel shall be accomplished neatly without twisting, with the hose wound tightly. At the completion of this test, the hose shall be subjected to a hydrostatic pressure of 50% of the proof pressure in table I for not less than 3 minutes. The hose shall then be destructive tested by cutting through one side of the hose longitudinally and examined. If the hose has tube separation or the inner tube has cracks, cuts or pits, it shall be cause for rejection.

4.6.11 Couplings. A 3 foot hose sample that meets these specification requirements shall be fitted with a coupling at each end. After the sample is conditioned, the joint between the coupling and the hose shall withstand a maximum cyclic surge pressure of 0 to 225 psi for not less than 15000 cycles without leakage or visible coupling movement of not more than .03 inch when tested in accordance with 4.7.3.

4.6.12 Liner material. The liner material shall be a fuel resistant synthetic rubber capable of meeting all the requirements of this specification. The liner shall be smooth and continuous either calendered or extruded, free of pitting, blisters, holes, porosity and foreign material. Cuts shall not exceed .03 inch in depth.

4.7 Hose components materials test methods.

4.7.1 Liner thickness. The liner thickness dimensions shall be measured in accordance with ASTM D 380.

4.7.1.1 Liner tensile and elongation. The liner material tensile strength and elongation shall be tested in accordance with ASTM D 380 and ASTM D 412.

4.7.1.2 Liner volume change. The liner material shall be immersed for 70 hours in ASTM D 471 reference fuel B at $72 \pm 2^\circ\text{F}$ and tested in accordance with ASTM D 380 and ASTM D 471.

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4.7.1.3 Liner extractable material. The fuel-soluble matter test shall be performed based on ASTM D 2276, in conjunction with the procedures given below.

- a. A sample of hose liner shall be cut into pieces of approximately .12 in².
- b. Five ± .01 grams of the sample shall be extracted into 100 ml of reference fuel B in accordance with ASTM D 471.
- c. The test fluid and sample shall be stored in a glass flask for 96 hours at 104 ±2° F. Suitable precaution should be taken to prevent loss by evaporation.
- d. The flask contents shall be filtered into a pre-weighed hemispherical glass dish of suitable size, while washing both the residue in the flask and the filter with a further quantity of fuel.
- e. The contents of the dish shall be evaporated on a boiling water bath and the residue shall be heated in a ventilated air oven for 2 hours at 302 ±5° F.
- f. The weight of the extractable residual matter shall be calculated as a percentage of the original test sample weight. The percentage of extractable residual matter shall not exceed the limit specified in 3.4.1.4.

4.7.1.4 Liner fuel contamination. The liner material shall be extracted with ASTM D 471 reference fuel B. A 12 inch long and 3 inch diameter hose sample shall be used for the test. The sample shall be plugged at one end with a glass or non-contaminating metal plug. The hose sample shall be filled with reference fuel B specified in ASTM D 471 and shall be allowed to stand for three days at 72 ±2°F. The hose sample shall be drained and refilled with fresh ASTM D 471 fuel B. The procedure shall be repeated daily for four additional days. On the eighth day the hose sample shall be drained and refilled with fresh ASTM D 471 reference fuel B and shall be allowed to stand for three additional days at 72 ±2°F. On the final cycle, the fuel from the sample hose shall be tested in accordance with ASTM D 2276. If sample hose with a diameter other than 3 inch diameter is used then the allowable amount of contaminate shall be adjusted as follows:

$$\frac{(\text{mg}/100\text{ml results})(\text{Hose sample ID adjusted})}{3 \text{ inch diameter of specified sample}} = \text{mg}/100 \text{ ml}$$

4.7.1.5 Liner fuel discoloration. The liner shall be tested in accordance with ASTM D 156 and ASTM D 1500.

4.7.1.6 Liner low temperature. The liner material shall be subjected to -40 ±2° F for 5 hours and tested in accordance with ASTM D 380.

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4.7.2 Cover thickness. The cover thickness shall not be less than .06 inch. The dimensions shall be measured in accordance with ASTM D 380.

4.7.2.1 Cover tensile and elongation. The cover material shall have a tensile strength of not less than 1000 psi and an elongation on not less than 200% when tested in accordance with ASTM D 380 and ASTM D 412.

4.7.2.2 Cover ozone resistance. The cover material shall not show signs of cracking when subjected to a 24-hour conditioning period and an exposure of $72 \pm .5$ hours at 104° F to an atmosphere containing 100 ± 10 parts per hundred million (PPHM) of ozone in accordance with ASTM D 1149. The specimen shall be examined as specified in 3.4.2.3.

4.7.2.3 Cover volume change. The cover material shall not have more than 80% volume change after a 70 hour immersion in ASTM D 471 reference fuel B at $72 \pm 2^\circ$ F and tested in accordance with ASTM D 380 and ASTM D 471.

4.7.2.4 Cover low temperature resistance. The cover material shall not crack when subjected to $-40 \pm 2^\circ$ F for 5 hours and tested in accordance with ASTM D 380.

4.7.2.5 Cover material abrasion resistance. The abrasion resistance shall be ascertained using the procedures of ISO 4649, Method A and the results shall be within the limit specified in 3.4.2.6.

4.7.3 Coupler pressure cycling test. The test sample shall be conditioned filling with ASTM D 471 fuel B and allowing it to soak for not less than 24 hours. After the 24 hours soak period the ASTM D 471 fuel B shall be drained prior to starting the cycling test. The pressure cycling test shall be started within 4 hours after draining the ASTM D 471 fuel B. The pressure shall be 225 psi alternately applied for 60 seconds and then released to 0 psi for 30 seconds at a rate of 30 cycles per hour. The test shall be conducted for 15,000 cycles on a 36 inch hose assembly at $72 \pm 2^\circ$ F. Water may be used as the pressure test medium. At the end of the test the coupling shall be carefully removed and the hose examined to determine that no cuts exceeding .03 inch in depth or failure of the hose lining have occurred.

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.

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6. NOTES

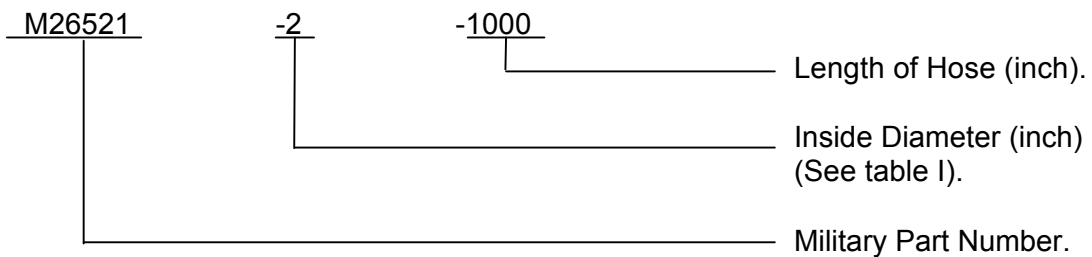
(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. The military unique hose assemblies covered by this specification are intended for use in exceptional fuel servicing of aircraft with aromatic hydrocarbon aviation fuel and require strict adherence to military requirements. Exceptional fuel servicing is defined for this specification as hot refueling and fueling of passenger aircraft with passengers on board. The hose assemblies will be used on pantographs, hydrant systems and fuel servicing mobile equipment where the 225 psi rated maximum working pressure includes peak surge pressure. These hose assemblies meet the strict flexibility test requirement at -40 °F and 225 psi, which complies with detailed military requirements.

6.2 Acquisition requirements. Acquisition documents for the hose assembly must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specified issue of individual documents referenced (see 2.2.1).
- c. Inside diameter required.
- d. Length of hose assembly required.
- e. Packaging requirements (see 5.1).

6.3 Part or Identifying Number (PIN). The hose assembly PIN is as follows:



6.4 First article test waiver. First article tests may be waived for bidders that have satisfactorily tested hose assembly to this specification requirements for the particular hose assembly within 12 months of submittal of bid. Also, manufacturers who have successfully completed first article testing and whose production hoses have performed satisfactorily in the field should be waived for sizes smaller than originally tested. Production conformance testing

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should not be waived (For additional information concerning first article test requirements, refer to 4.3.)

6.4.1 First article test report. First article tests reports should be prepared in accordance with MIL-STD-831.

6.5 Certification. Hose assembly certification indicating the working pressure and passage of the proof pressure test should be retained.

6.6 Subject term (key word) listing.

- Inner tube (liner)
- Reinforcement
- Cover
- Serrated ferrule

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.

6.8 Reference to superseded specifications. All requirements of MIL-DTL-26521K are interchangeable with those of MIL-H-26521J, therefore, previously existing documents (OEM drawings, etc.) referencing MIL-H-26521 need not be changed.

Custodians:
Air Force - 99
Army - AR
Navy - YD

Preparing activity:
DLA - CC

(Project 4720-0219)

Review activity:
Air Force - 82
Army - AV

