

INCH-POUND

MIL-DTL-27516G
19 October 2011
SUPERSEDING
MIL-DTL-27516F
16 July 2003

DETAIL SPECIFICATION

HOSE AND HOSE ASSEMBLY, NONMETALLIC, SUCTION AND DISCHARGE

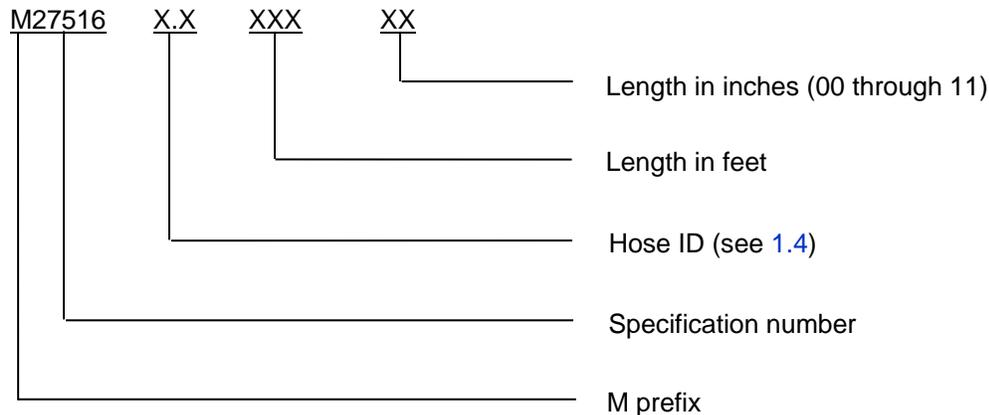
This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification contains the requirements for a non-collapsible, wire reinforced, synthetic rubber hose and hose assembly used with gasoline and jet-fuel.

1.2 Part or Identifying Number (PIN). PIN for hose only see 1.2.1 for hose assemblies see 1.3.

1.2.1 Hose PIN. The PIN consists of the letter M, the basic specification number, specification sheet number, hose ID, length in feet, and length in inches.

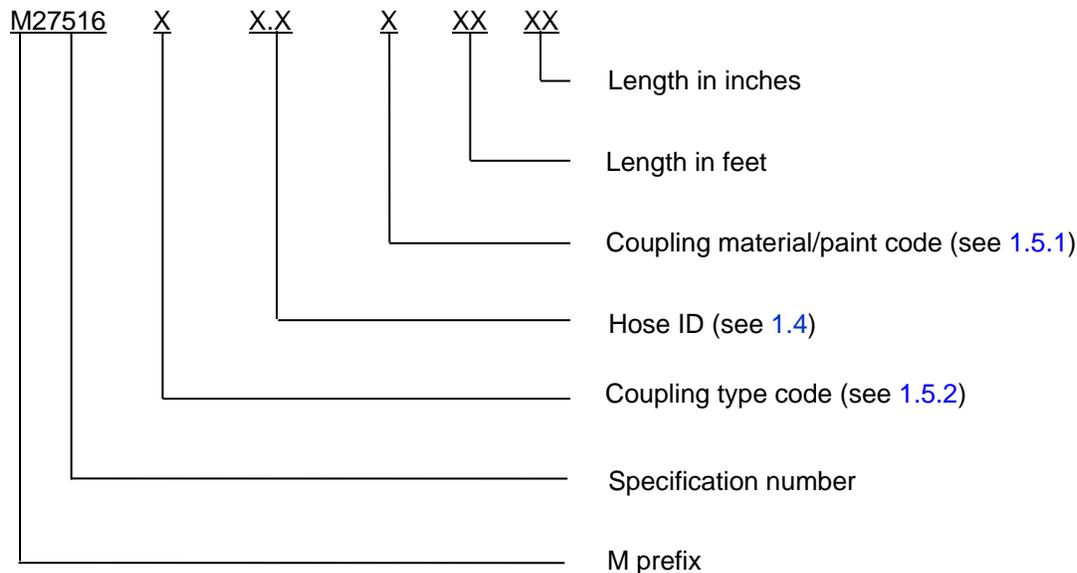


Example of a PIN: M275161.505000 indicates a hose 1.5 inches ID, 50 feet long.

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

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1.3 Hose assembly PIN. The PIN consists of the letter M, the basic specification number, specification sheet number, coupling type in code numbers, hose ID, coupling material/ paint color, length in feet and inches.



Example of a PIN: M27516G1.5A05006 indicates a hose assembly 1.5 inches ID, with A-A-59377-A unisex couplings on each end painted semi-gloss green, 50 feet 6 inches long.

1.4 Hose ID. The hose ID for hoses and hose assemblies are specified in 3.3.1.4.

1.5 Coupling codes.

1.5.1 Type code. The code letters for coupling type used in PIN designation are as specified in tables I, II, III and IV.

1.5.2 Reattachable screw-on, SAE-AS38404. Use class I (fuel service), either type I (male) or type II (female) either end, see table I.

TABLE I. SAE-AS38404 coupling type code.

Coupling Type Code	Hose coupling specification SAE-AS38404 threaded type, class I			
	1st End		2nd End	
	Type I (male)	Type II (female)	Type I (male)	Type II (female)
A	X		X	
B		X		X
C	X			X

1.5.3 Couplings, A-A-59326. Use class I, type II (male) one end and type VI (female) ether end, see table II.

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TABLE II. A-A-59326 coupling type code.

Coupling type code	Hose coupling specification CID A-A-59326 cam-locking type, style 2			
	1st End		2nd End	
	Type II (male)	Type VI, style 2 (female)	Type II (male)	Type VI, style 2 (female)
D	X		X	
E		X		X
F	X			X

1.5.4 Couplings, A-A-59326. Use class I, type II (male) one end and type VI (female) ether end, see [table II.](#)

TABLE III. A-A-59377 unisex coupling type code. 1/ 2/

Coupling type code	Coupling			
	End 1		End 2	
	A-A-59377-A	A-A-59377-B	A-A-59377-A	A-A-59377-B
G	X		X	
H		X		X
J	X			X
K 3/	X		X	
L 3/		X		X
M 3/	X			X

1/ Class:

Class A - Valved (dry break)

Class B - Valveless (wet break)

2/ For 2 or 3 inch hoses only.

3/ A-A-59377 unisex coupling with 40 to 60 mesh strainer.

1.5.5 Material/paint code. The letters specified in [table IV](#) refer to the coupling material or paint code in the PIN designation, see [3.3.3.5.](#)

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TABLE IV. Material and color designator.

Material color designator	Coupling	Material	Color
R	SAE-AS38404, class 1	Brass	N/A
S	SAE-AS38404, class 2	Stainless steel or aluminum	N/A
T	A-A-59326, class 1	Aluminum	N/A
U	A-A-59326, class 2	Brass	N/A
Blank	A-A-59377	N/A	Non-vivid and lusterless shade of tan. Valve lever, bumper and dust cap are a lusterless shade of black.
A	A-A-59377	N/A	FED-STD-595/24052 (semi-gloss green).
B	A-A-59377	N/A	FED-STD-595/33446 (desert tan).
C	A-A-59377	N/A	FED-STD-595/16081 (dark gray).
D	A-A-59377	N/A	FED-STD-595/15044 (dark blue).

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.

COMMERCIAL ITEM DESCRIPTIONS

A-A-52506	-	Clamps, Hose
A-A-59326	-	Coupling Halves, Quick-Disconnect, Cam-Locking Type, General Specification For
A-A-59326/2	-	Coupling Half, Male by Hose Shank, Type II
A-A-59326/6	-	Coupling Half, Female by Hose Shank, Type VI
A-A-59326/10	-	Coupling Half, Cap, Dust, Type IX
A-A-59326/11	-	Coupling Half, Plug, Dust, Type X
A-A-59377	-	Coupling Assembly, Quick-Disconnect, Sexless Type

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-83420	-	Wire Rope, Flexible, for Aircraft Control
MIL-PRF-16173	-	Corrosion Preventive Compound, Solvent Cutback, Cold-Application
MIL-PRF-24635	-	Coating Systems, Weather-Resistant, Exterior Use
MIL-PRF-85285	-	Coating: Polyurethane, Aircraft and Support Equipment
MIL-PRF-85582	-	Primer Coatings: Epoxy, Waterborne

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FEDERAL STANDARD

- FED-STD-595/15044 - Blue, Gloss
- FED-STD-595/16081 - Gray, Gloss
- FED-STD-595/24052 - Green, Semigloss
- FED-STD-595/33446 - Yellow, Flat or Lusterless
- FED-STD-601 - Rubber: Sampling and Testing

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch/> 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 D156 - Petroleum Products, Saybolt Color of (Saybolt Chromometer Method)
- ASTM D380 - Hose, Rubber
- ASTM D412 - Rubber, Vulcanized and Thermoplastic Elastomers - Tension
- ASTM D413 - Rubber Property - Adhesion to Flexible Substrate
- ASTM D471 - Rubber Property - Effect of Liquids
- ASTM D1149 - Rubber Deterioration - Surface Ozone Cracking in a Chamber
- ASTM D2276 - Standard Test Method for Particulate Contaminant in Aviation Fuel by Line Sampling

(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.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

- ISO 17025 - General requirements for the competence of testing and calibration laboratories

(Copies of these documents are available online at <http://www.iso.org> or from ISO, 1, ru de Varembe, case postale 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11 or from ANSI.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

- NCSL Z540.3 - Requirements for the Calibration of Measuring and Test Equipment

(Copies of these documents are available online at <http://www.ncsli.org> or from NCSL International 2995 Wilderness Place, Suite 107 Boulder, Colorado 80301-5404.)

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SAE INTERNATIONAL

SAE-AS1933 - Hose Containing Age-Sensitive Elastomeric Material, Age Controls For
SAE-AS38404 - Couplings, Hose, Reattachable Screw-On

(Copies of these documents are available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein 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), samples shall be subjected to first article inspection in accordance with 4.4.

3.2 Material. Materials shall be as specified in this specification. Materials which are not specified by this specification, or which are not specifically described herein, shall be of the quality appropriate for the purpose intended (see 6.1).

3.2.1 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 Components.

3.3.1 Hose. The construction of the hose, see [figure 1](#), shall consist of the following:

- a. A compounded inner tube (see 3.3.1.1).
- b. Stiffened wire reinforcement (see 3.3.1.2).
- c. A compounded cover (see 3.3.1.3).

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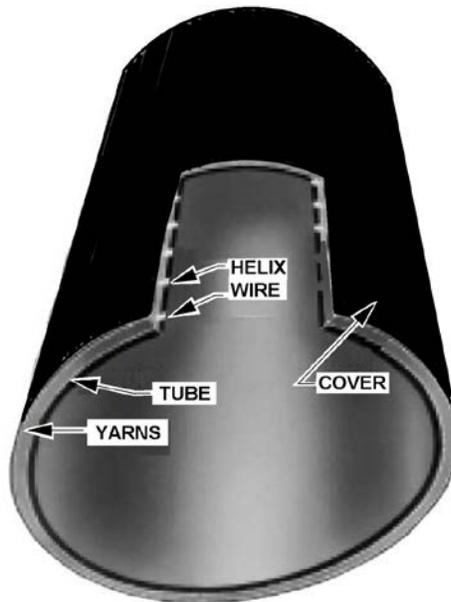


FIGURE 1. Hose construction.

3.3.1.1 Tube. The inner tube shall be fabricated of synthetic rubber compounded with a copolymer of butadiene and acrylonitrile to provide resistance against aromatic gasoline and jet fuels. The bore of the tube shall be smooth, free from pitting, cuttings, borings, or cements. The tube shall have a uniform thickness of not less than .078 inch (1.98 mm).

3.3.1.2 Reinforcement. A helix or helices of round steel wire shall be reinforced by being interwoven with yarns, cotton or synthetic, or by being sandwiched in between two layers of braided or woven yarns. The steel wire shall have physical and dimensional characteristics necessary to meet the requirement specified in 3.5.9. The reinforcement shall be well, evenly, and firmly braided, loomed, or plied, and free from defects, dirt, knots, lumps, and irregularities of twist.

3.3.1.3 Cover. The cover shall be constructed of compounded polymerized chloroprene and shall be smooth, free from pitting. It shall have a uniform thickness of not less than .047 inch (1.19 mm).

3.3.1.4 Finished hose dimensions. The finished hose dimensions shall be in accordance with [table V](#).

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TABLE V. Classification of hose and hose assembly. ^{1/} _{2/}

Hose size code number	ID ±.031 (9.45 mm) inches (mm)	OD +.125 / -.062 (+38.10/-18.90) inches (mm)
1.0	1.00 (25.4)	1.50 (38.1)
1.2	1.25 (31.8)	1.75 (44.5)
1.5	1.50 (38.1)	2.00 (50.8)
2.0	2.00 (50.8)	2.50 (63.5)
2.5	2.50 (63.5)	3.13 (79.5)
3.0	3.00 (76.2)	3.63 (92.2)
4.0	4.00 (101.6)	4.66 (118.4)
6.0	6.00 (152.4)	6.81 (173.0)

^{1/} Dimensions are in inches.

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

3.3.2 Hose assembly configuration. The hose assembly shall meet the requirements as specified herein. The hose assembly shall consist of the following:

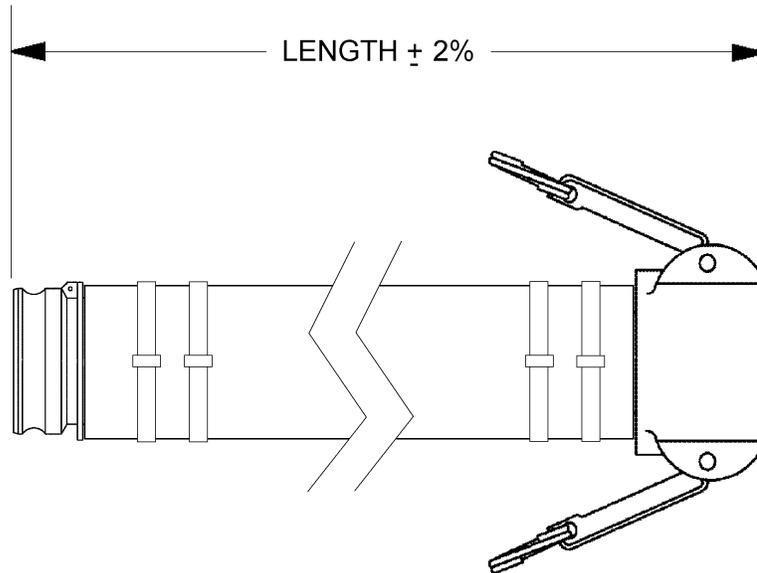
- a. The basic hose (see 3.3.1).
- b. Two reattachable couplings, if required, one at each end of the hose (see 3.3.2.1).
- c. Two or three clamps per coupling (see 3.3.3.3)
- d. Reusable protective caps or plugs for each coupling (see 3.3.3)

3.3.2.1 Hose ends. The ends of the hose shall not be shaved, tapered or have the inner or outer diameter changed in any way, to facilitate attachment of the couplings. When couplings are not required the cut hose ends shall be sealed to prevent the entrance of foreign contaminants.

3.3.2.2 Diameter. The inside and outside diameters of the hose shall be within the limits shown in table V as applicable to the hose size specified by the acquiring activity (see 1.2).

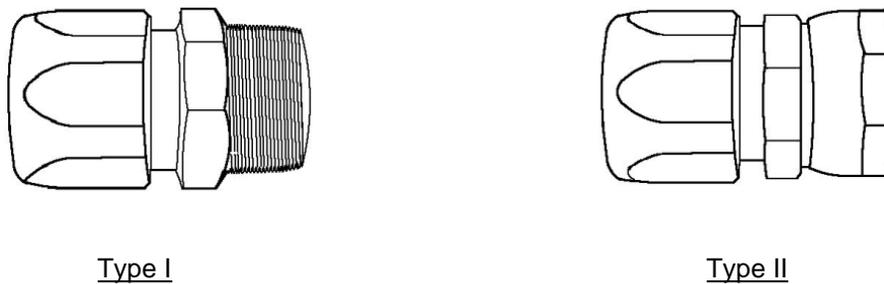
3.3.2.3 Length of hose assembly. The hose assembly length shall be measured as shown on figure 2.

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FIGURE 2. Hose assembly length.

3.3.2.4 Hose assembly couplings. The hose assembly end fittings shall conform to the general configuration shown on figures 1, 2, and 3. The end fittings shall be retained on the assembly without slipping or leaking when coupled to the hose and tested as specified herein.

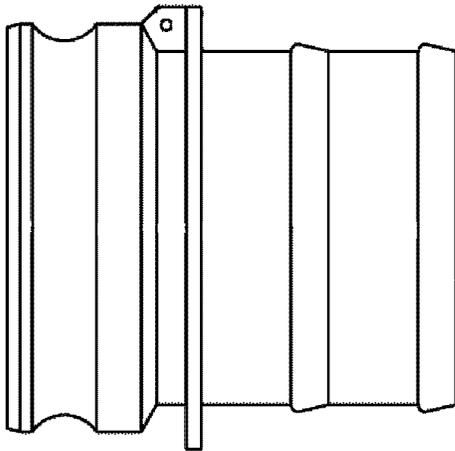
3.3.2.5 Reattachable screw-on male or female couplings. Reattachable screw-on male or female couplings shall be in accordance with SAE-AS38404 type I or type II and if not specified, the default for class shall be class 1 of SAE-AS38404, see figure 3.

FIGURE 3. Reattachable screw-on male or female couplings SAE-AS38404.

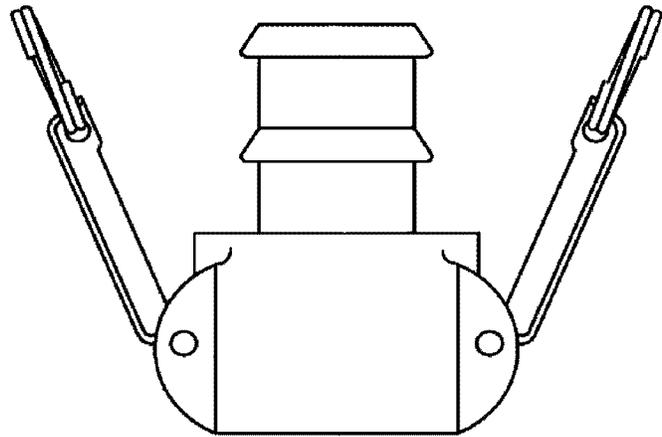
3.3.2.6 Hose shanks. Hose shanks shall be in accordance with A-A-59326/2 (type II) or A-A-59326/6 (type VI) coupling halves of A-A-59326 and if not specified, the default for class shall be class 1 of A-A-59326, see figure 4.

3.3.2.7 Gaskets. Female coupling halves shall contain gaskets in accordance with A-A-59326.

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A-A-59326/2 (type II).



A-A-59326/6 (type VI)

FIGURE 4. Male and female hose shanks.

3.3.2.8 Unisex couplings . Unisex couplings shall be in accordance with A-A-59377, see [figure 5](#).

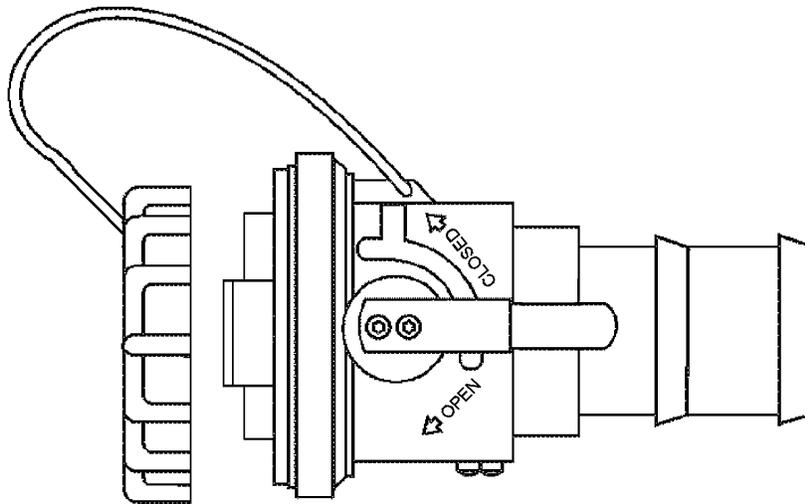


FIGURE 5. Unisex coupling.

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3.3.2.9 Aluminum parts. All aluminum moving parts and parts subject to wear shall be given a hard anodic coating.

3.3.3 Caps plugs, and clamps.

3.3.3.1 Caps. Male couplings in accordance with SAE-AS38404 shall be provided with protective, closed end, reusable threaded metal caps. The metal cap shall not be chemically affected by corrosion-preventive compound in accordance with grade I of MIL-PRF-16173. The male couplings in accordance with A-A-59326 shall be provided with dust caps in accordance with A-A-59326/10, type IX and shall be of the same class as the male couplings, except with a 1/16 inch diameter wire rope in accordance with type II composition B of MIL-DTL-83420 in lieu of the sash chain.

3.3.3.2 Plugs. Female couplings in accordance with SAE-AS38404 shall be provided with protective, closed end, reusable threaded metal plugs. The metal plug shall not be chemically affected by corrosion-preventive compound in accordance with grade I of MIL-PRF-16173. The female couplings in accordance with A-A-59326 shall be provided with dust plug in accordance with A-A-59326/11, type X and shall be of the same class as the female couplings, except with a 1/16 inch diameter wire rope in accordance with type II composition B of MIL-DTL-83420 in lieu of the sash chain.

3.3.3.3 Hose clamps. Two hose clamps shall be provided for each coupling half less than 6 inches (152.4 mm) ID. For hose sizes 6 inch (152.4 mm) and larger ID the coupling half shall have three clamps. Hose clamps shall be in accordance with A-A 52506, type H, style optional. Bands and buckles shall be 300 series corrosion-resistant steel.

3.3.3.3.1 Band width.

- a. Hose ID less than 4 inch (101.6 mm) shall be .500 inch (12.70 mm) minimum.
- b. Hose ID 4 inch and larger the band width shall be .750 inch (19.05mm).

3.3.3.4 Unisex couplings dust caps. Unisex couplings in accordance with A-A-59377 shall be furnished with protective closed end, reusable caps.

3.3.3.5 Unisex coupling top coat. Unless otherwise specified, see 1.5.4, the A-A-59377 coupling assembly color is a non-vivid and lusterless shade of tan, except the valve lever, bumper and dust cap are a lusterless shade of black. If required all exposed metal surfaces shall be coated with either primer/topcoat in accordance with MIL-PRF-85582, type I, class N, MIL-PRF-85285, type II or III, class H or MIL-PRF-24635, type III or IV, class 2 or 3, and grade A.. The colors shall be in accordance with, FED-STD-595/15044, FED-STD-595/16081, FED-STD-595/24052, or FED-STD-595/33446, see table IV.

3.4 Physical characteristics.

3.4.1 Diameter. Hose and hose assemblies shall be furnished in the sizes specified in 1.2.

3.4.2 Length. Hose and hose assembly length shall be as specified by the procuring activity (see 6.2) with a tolerance of ± 2 percent. Length of the hose assembly shall be measured from the interface ends of the couplings while the hose assembly is subjected to 10 ± 1 psig (69 ± 7 KPa).

3.4.3 Weight. Weight of the hose shall be not greater than the values listed in table VI.

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TABLE VI. Allowable weights of hose. 1/ 2/

Hose ID inch (mm)	Maximum weight lb/ft (kg/304.8 mm)
1.00 (25.4)	0.90 (0.41)
1.25 (31.8)	1.00 (0.45)
1.50 (38.1)	1.15 (0.52)
2.00 (50.8)	1.50 (0.68)
2.50 (63.5)	2.15 (0.98)
3.00 (76.2)	2.50 (1.13)
4.00 (101.6)	3.60 (1.63)
6.00 (152.4)	7.00 (3.18)

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3.5 Performance.

3.5.1 Adhesion between component parts. When tested in accordance with 4.6.2, adhesion between component parts shall be not less than the values specified in table VII.

TABLE VII. Adhesion requirements. 1/ 2/

ID of hose	Unaged adhesion lb/in (kg/25.4 mm)	Aged adhesion lb/in (kg/25.4 mm)
Up to and including 3 inches (76.2 mm)	12 (5.44)	9 (4.08)
4 and 6 inches (101.6 and 152.4 mm)	10 (4.53)	5 (2.27)

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3.5.2 Volume increase. When tested in accordance with 4.6.3, the volume increase of the tube and cover shall be not greater than 50 and 100 percent, respectively.

3.5.3 Tensile strength. When tested in accordance with 4.6.4, the tensile strength of the tube and cover shall be not less than 600 and 400 psi (4.1 and 2.8 MPa), respectively.

3.5.4 Ultimate elongation. When tested in accordance with 4.6.4, the ultimate elongation of the tube and cover before immersion shall be not less than 200 percent. After immersion, the ultimate elongation of the tube and cover shall be not less than 100 percent.

3.5.5 Pull resistance. When tested in accordance 4.6.5, the hose assembly shall not break and the couplings shall not disconnect from the hose.

3.5.6 Proof pressure. When tested in accordance with 4.6.6 and subjected to the proof pressure specified in table VIII, leakage shall not occur in the hose or at the couplings. There shall be no signs of permanent deformation or impending failure.

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TABLE VIII. Proof pressure and burst pressure requirements. 1/ 2/

Hose ID inch (mm)	Proof pressure psi (MPa)	Burst pressure psi (MPa)
1.00 (25.4)	175 (1.2)	500 (3.4)
1.25 (31.8)	175 (1.2)	500 (3.4)
1.50 (38.1)	175 (1.2)	500 (3.4)
2.00 (50.8)	175 (1.2)	400 (2.8)
2.50 (63.5)	175 (1.2)	400 (2.8)
3.00 (76.2)	175 (1.2)	400 (2.8)
4.00 (1.1.6)	100 (0.7)	300 (2.1)
6.00 (152.4)	100 (0.7)	300 (2.1)

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3.5.7 Length change. The length of the hose shall not change more than 7 percent when tested in accordance with 4.6.7.

3.5.8 Burst pressure. When tested in accordance with 4.6.8 and subjected to the burst pressure specified in table VIII, the hose shall not leak, disconnect from the couplings, burst, or develop a permanent blister.

3.5.9 Crush resistance. Testing shall be performed in accordance with 4.6.9. During the test, the outside diameter shall be not less than 85 percent of the original outside diameter of the hose. After the load has been released, the outside diameter shall be not less than 95 percent of the original outside diameter of the hose.

3.5.10 Low temperature bend. Specimens of the tube and cover shall not crack when tested in accordance with 4.6.10.

3.5.11 Environmental vacuum. The hose assembly shall maintain a vacuum after being tested in accordance with 4.6.11.

3.5.12 Ozone resistance. When tested in accordance with 4.6.12 and then examined with 2X magnification, the cover shall not show any evidence of cracking.

3.5.12.1 Hazardous substances and ozone depleting chemicals. The ozone resistance test (see 4.6.12) 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.

3.5.13 Sediment and fuel color change. When tested in accordance with 4.6.13, change in the fuel color shall be not greater than 40 and the sediment shall not exceed 2 milligrams per liter.

3.6 Product identification. The hose shall be legibly marked along its longitudinal axis with a fuel-resistant yellow stripe. The stripe shall be broken at intervals of approximately 2 inches.

3.6.1 Hose labeling. A continuous mylar tape layline shall be cured into the hose during manufacturing process. The marking, in the minimum of 12 inch (305 mm) increments, shall include all the information in 3.6.1 a, b, c, and d. The letters shall be legible and contrasting color to the mylar tape.

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The tape shall run longitudinal along the hose and the print information shall be repeated continuously along the length of the hose.

- a. PIN as described in [1.2](#), length, configuration, and color designator and may be omitted.
- b. Cure date in quarter and year such as 4Q11 for fourth quarter 2011.
- c. CAGE code.
- d. Manufacturer's name or trademark.

Example : M275161.5 4Q11 CAGE manufacturer's name or trademark.

3.6.2 Tagging of hose assemblies. After the hose is assembled into a hose assembly the hose assembler shall attach a removable tag to each hose assembly and shall contain the military PIN, date of assembly, specification number, name, and CAGE code of assembly manufacturer.

Example: M27516G1.5A05006 4Q11 CAGE manufacturer's name or trademark.

3.7 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 specified in 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 [4.6.1](#)

3.8 Workmanship. Workmanship shall be of the quality necessary to produce hose and hose assemblies free from defects which would adversely affect service performance, see [table IX](#).

TABLE IX. Workmanship defects.

Inspection	Paragraph
Hose ends of the hose shaved or tapered	3.3.2.1
Inner tube missing; braided, loomed, or plied reinforcement	3.3.1.1
Inner tube bore shall be smooth, free from pitting, objectionable cuttings, borings, or cements; and shall have a uniform	3.3.1.1
Inner tube wall thickness not less than .078 inch (1.98 mm)	3.3.1.1
Reinforcement shall be well, evenly, and firmly braided, loomed, or plied, and free from defects, dirt, knots, lumps, and irregularities of twist	3.3.1.2
Cover shall be smooth, free from pitting.	3.3.1.3
Reinforcement through cover	N/A
Cover uniform thickness not less than .047 inch (1.19 mm)	3.3.1.3

4. VERIFICATION

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

- a. First article inspection (see [4.4](#)).
- b. Conformance inspection (see [4.5](#))

4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the applicable test method referenced in the test procedures.

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4.3 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 shall be in accordance with ISO 17025 and NCSL Z540.3 as applicable.

4.3.1 Responsibility for compliance. All items shall meet all requirements of sections 3, 4, and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material. The supplier's inspection and test records shall clearly demonstrate the products conformance to technical specifications.

4.3.2 Lot records. Manufacturers shall keep lot records for 3 years minimum. Manufacturers shall monitor for compliance to the prescribed procedures, and observe that satisfactory manufacturing conditions and records on lots are maintained for these hose assemblies. 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.

4.4 First article inspection. When specified in the contract or purchase order (see 6.2), samples that are representative of the production item shall be subjected to first article inspection after the Government has awarded the contract. First article inspection shall be performed in accordance with [table X](#) to determine whether the production items meet the requirements of this specification. The hose assembly samples shall be subjected to first article inspection as specified in 4.4.2. All hose assembly samples shall be representative of the construction, workmanship, components and materials used during manufacturing. Each sample shall be a section of hose of the specified diameter with sufficient length for all inspections and tests specified in 4.6. Depended on which style of hose assembly that is being considered for first article inspection couplings in accordance with SAE-AS38404 on one end and A-A-59326 on the other end or A-A-59377 on each end shall be provided.

4.4.1 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 individual or periodic inspections. The supplier's inspection and test records shall clearly demonstrate the products conformance to technical specifications.

4.4.2 First article testing. First article testing shall be performed in accordance with [table X](#) under the conditions specified for each particular test.

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TABLE X. First article test methods.

Requirement	Requirement paragraph	Test method paragraph	Sample
Examination of product	3.2, 3.4, 3.3.1, 3.3.2, 3.3.3, 3.6, 3.7 and 3.8	4.6.1	All hose assemblies
Adhesion between component parts	3.5.1	4.6.2	1-12-inch (305 mm) length hose
Volume increase	3.5.2	4.6.3	Tube and cover specimens
Tensile strength	3.5.3	4.6.4	Tube and cover specimens
Ultimate elongation	3.5.4	4.6.4	Tube and cover specimens
Pull resistance (see 4.4.4) 1/	3.5.5	4.6.5	1-hose assembly 15-inch (381 mm)
Proof pressure 1/	3.5.6	4.6.6	All hose assemblies
Length change	3.5.7	4.6.7	1-Hose assembly
Burst pressure (see 4.4.4)	3.5.8	4.6.8	1-hose assembly 3 ft
Crush resistance	3.5.9	4.6.9	12-inch (304.8mm) hose
Low temperature bend	3.5.10	4.6.10	Tube and cover specimens
Environmental vacuum	3.5.11	4.6.11	1-hose assembly
Ozone resistance	3.5.12	4.6.12	Cover specimens
Sediment and fuel color change	3.5.13	4.6.13	1-hose, of sufficient length to contain at least 4 liters of fluid

1/ This data shall be furnished by the hose assembly manufacturer. All other data may be supplied from the hose manufacturer or the hose assembly manufacturer.

4.4.3 Inspection lot. All hoses or hose assemblies of the same type and size offered to the Government at one time shall be considered as a lot for the purpose of inspection.

4.4.3.1 First article samples. 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 the 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).

4.4.3.2 Nonconformance of first article tests. All samples shall meet all of the contract requirements. Failure of a sample unit to pass any test shall be cause for rejection of the entire lot and to not grant first article approval.

4.4.3.2.1 Specimen tests. If a defect is found among samples for adhesion (4.6.2.), volume increase (4.6.3), tensile strength (4.6.4), ultimate elongation (4.6.4), low temperature bend (4.6.10), ozone resistance (4.6.12), or fuel color change (4.6.13) the lot shall be considered as failed.

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4.4.3.2.2 Hose assemblies. Hose assemblies if one or more defects are identified, then the entire production lot shall be screened for that defect and all defects shall be either removed or reworked. A second inspection sample shall then be selected from the different lot and the sampling tests shall be performed again. If one or more defects are identified from the second inspection lot then the lot shall be considered as failed.

4.4.4 Sampling for destructive testing. One hose length shall be randomly selected from each lot and submitted for inspection. After examining the length of hose in accordance with 4.6.1, the hose shall be cut approximately 3 feet (914.4 mm) from one end and 15 inches (381 mm) from the other end. These will provide lengths for the pull test (see 4.6.5) and the burst pressure test (see 4.6.8). Additional lengths of hose shall be cut from the original length for the remaining tests required. When hose is ordered in short lengths and is insufficient for tests, the manufacturer shall furnish extra lengths for test purposes. Samples subjected to destructive testing shall not be supplied as part of the contract or order.

4.4.5 Disposition of first article samples. Unless otherwise specified, after award of the contract or order, the manufacturer shall forward (1 hose or hose assembly), fabricated from random samples of the hose or hose assembly. The sample shall be representative of the construction, workmanship, components, and materials to be used during production. When a manufacturer is in continuous production of the hose and 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).

4.4.6 Waivers or deviations to specification requirements. All waivers or deviations to specification requirements shall be coordinated through the preparing activity; DLA Land and Maritime, Columbus, Attn: VAI, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Fluidflow@dla.mil.

4.5 Conformance inspection. Conformance inspection shall be performed to determine whether the products conform to the requirements set forth in this specification.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of individual inspections in [table XI](#).

TABLE XI. Individual inspections.

Requirement	Requirement paragraph	Test method paragraph	Samples
Examination of products	3.2 , 3.4 , 3.3.1 , 3.3.2 , 3.3.3 , 3.6 , 3.7 , and 3.8	4.6.1	All hose assemblies
Adhesion between component parts <u>1/</u>	3.5.1	4.6.2	1-12-inch (305 mm) length hose
Proof pressure	3.5.6	4.6.6.1	All hose and assemblies

1/ Each new lot/batch of bulk hose. This data may be furnished by the hose manufacturer.

4.5.2 Sampling for individual inspections. Fittings for sampling shall be selected from a production lot (see [4.5.2.2](#)) and shall be subjected to the individual inspections in [table XI](#).

4.5.2.1 Nonconformance individual inspections. If a defect is found in the adhesion between component parts test the lot shall be considered as failed. If a defect is a part of a hose assembly the hose assembly may be reworked. 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. Test data of part performance shall be made available to the contracting agency upon request.

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4.5.2.2 Production lot. A production lot shall consist of all products of the same PIN which have been manufactured under the same conditions and on the same continuous run.

4.5.2.3 Inspection sample. The inspection sample shall be product selected at random from the production lot without regard to quality.

4.6 Tests.

4.6.1 Examination of products. The hose or hose assembly shall be examined for the following:

- a. Dimensions, length and weight not as specified (see 3.4).
- b. Materials not as specified (see 3.2).
- c. Hose construction not as specified (see 3.3.1).
- d. Couplings not as specified (see 3.3.2).
- e. Identification marking missing, illegible, or not as specified (see 3.6).
- f. Age (see 3.7).
- g. Workmanship not as specified (see 3.8).

4.6.2 Adhesion between inner tube and outer cover (see 3.5.1). Hoses when subjected to adhesion testing shall meet the requirements of 3.5.1. The following details shall apply:

- a. A 12-inch (305 mm) length of hose shall be capped with leak proof plugs and filled with fluid in accordance with ASTM D471, reference fuel B.
- b. The filled specimen shall be aged at $75 \pm 5^{\circ}\text{F}$ ($24 \pm 3^{\circ}\text{C}$) for 48 hrs.
- c. Within 15 minutes after removal of the fluid, ring specimens shall be obtained from the center of the hose length and tested in accordance with ASTM D413.

4.6.3 Volume increase (see 3.5.2). Specimens of the tube and cover when subjected to volume increase testing shall meet the requirements of 3.5.2. Specimens of the tube and cover shall be tested in accordance with method 6211 of FED-STD-601, except that the immersion fluid used shall conform to ASTM D471, reference fuel B.

4.6.4 Tensile strength and ultimate elongation (see 3.5.3 and 3.5.4). Tube and cover specimens tensile strength and ultimate elongation tested shall meet the requirements of 3.5.3 and 3.5.4. The following details shall apply:

- a. Testing shall be conducted in accordance with ASTM D412.
- b. The tube and cover test specimens shall be obtained using die C.
- c. Immersion shall be for 48 hours at $75 \pm 5^{\circ}\text{F}$ ($24 \pm 3^{\circ}\text{C}$) in fluid in accordance with ASTM D471, reference fuel B.
- d. Testing shall be conducted within 5 minutes after removal from the fluid.

4.6.5 Pull resistance (see 3.5.5). One hose assembly shall be pull resistance tested and meet the requirements of 3.5.5. The following details shall apply:

- a. One coupling of a 15-inch (381 mm) hose assembly held securely while a pull is applied to the other coupling by any convenient means.
- b. The separation rate between the couplings shall not be less than 1 in/min (25.4 mm/min) until a load of 1000 lb (453.6 kg) has been reached.
- c. Couplings used for testing shall be dependent on the hose assembly being subjected to first article testing the hose assembly, shall be tested with either two unisex couplings in accordance with A-A-59377 or SAE-AS38404 on one end and A-A-59326 on the other end.

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4.6.6 Proof pressure testing first article inspection (see 3.5.6). A hose assemblies shall be proof pressure tested and shall meet the requirements of 3.5.6. The following details shall apply:

- a. For first article inspection the depending on the hose assembly being subjected to first article testing the hose assembly, shall be tested with either two unisex couplings in accordance with A-A-59377 or with attached couplings in accordance with SAE-AS38404 on one end and to A-A-59326 on the other end.
- b. The hose assembly shall be subjected to the proof pressure in accordance with ASTM D380 to the pressure specified in table VIII and then tested in accordance to ASTM D380.

4.6.6.1 Proof pressure testing production (see 3.5.6). The hose assembly shall be proof pressure tested in accordance with ASTM D380 to the pressure specified in table VIII. The hose assembly shall meet the requirements of 3.5.6.

4.6.7 Length change (see 3.5.7). Length change shall be determined while the hose is subjected to the proof pressure test (see 4.6.6 or 4.6.6.1) and shall meet the requirements of 3.5.7.

4.6.8 Burst pressure (see 3.5.8). A hose assembly shall be burst pressure tested and meet the requirements of 3.5.8. The following details shall apply:

- a. A hose assembly, approximately 3 ft in (914 mm) length, shall be tested in accordance with ASTM D380.
- b. Couplings in accordance with SAE-AS38404 shall be used for testing all hose sizes except the 6 inch (152.4 mm) ID hose.
- c. When testing the 6-inch (152.4 mm) ID hose, any coupling that will remain on the hose at the pressure tested may be used.

4.6.9 Crush resistance (see 3.5.9). A length of hose shall be subjected to crush resistant testing and shall meet the requirements of 3.5.9. The following details shall apply:

- a. An unpressurised 12-inch (304.8mm) length of hose shall be centered between 3 inch (76.3 mm) wide parallel metal plates so that only a 3-inch (76.2 mm) length of the hose shall be crushed.
- b. The plates shall be brought together at a rate no greater than 2 in/min (50.8 mm/min) until a load of 250 pounds (159 kg) has been applied.
- c. The distance between the plates shall be measured and expressed as a percentage of the original outside diameter of the hose.
- d. When the load is released, the smallest outside diameter of the hose at the center of the compressed area shall be measured.
- e. The results shall be recorded as a percentage of the original outside diameter of the hose.

4.6.10 Low temperature bend (see 3.5.10). Specimens of the tube and cover shall be low temperature bend tested and shall meet the requirements of 3.5.10. The following details shall apply:

- a. Buffed specimens of the tube and cover, 4.500 inches (114.3 mm) long, shall be clamped in a concave shape between 2-inch (0.91 mm) wide plates held at 2.500 inches (63.5 mm) apart.
- b. No more than .250 inch (0.11 mm) of each end shall be used for clamping.
- c. The specimen shall be held in this position and exposed to $-42 \pm 2^{\circ}\text{F}$ ($-41 \pm 1.1^{\circ}\text{C}$) for 72 hours.
- d. After 72 hours and while maintaining the same temperature, the plates shall be moved together in 5 ± 2 seconds until the ends of the specimens are not more than 1 inch apart.

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4.6.11 Environmental vacuum (see 3.5.11). A hose assembly shall be subjected to environmental vacuum tests and shall meet the requirements of 3.5.11. The following details shall apply.

- a. One hose assembly of each size hose being procured shall be completely filled with fluid in accordance with ASTM D471, reference fuel B, and then held at atmospheric pressure and temperature for 7 days.
- b. At the end of this period, the hose assembly shall then be subjected to the following vacuum cycling:
 - (1). Apply 15 inches mercury (Hg) vacuum to the hose assembly and hold for not less than 5 minutes.
 - (2). Release the vacuum to approximately zero gage.
 - (3). Repeat "a" and "b" every 7 minutes until 500 cycles have been completed. The number of cycles recorded shall be cumulative. The test may be run continuously or intermittently.

4.6.12 Ozone resistance (see 3.5.12). Cover specimens shall be ozone resistant tested and shall meet the requirements of 3.5.12. The following details shall apply:

- a. Specimens from the cover shall be tested in accordance with ASTM D1149 method B procedure B2.
- b. After conditioning for 24 hours in an ozone free atmosphere, the specimens shall then be exposed for 72 hours at $104 \pm 2^{\circ}\text{F}$ ($40^{\circ}\text{C} \pm 1.1^{\circ}\text{C}$) in an atmosphere containing 50 parts per hundred million of ozone.

4.6.13 Sediment and fuel color change (see 3.5.13). A hose shall be subjected to fuel color change and shall meet the requirements of 3.5.13. The following details shall apply:

- a. A hose, of sufficient length to contain at least 4 liters of fluid, shall be filled with fuel in accordance with ASTM D471, reference fuel B, capped or plugged and then permitted to stand for 72 hours with agitation at 24 and 48 hours.
- b. The fuel used shall contain no more than 1 milligram per liter of sediment contamination.
- c. After the 72-hour period, fuel drawn from the center section of the hose length shall be tested in accordance with ASTM D156.
- d. The fuel color before and after the 72-hour period shall be determined in accordance with ASTM D156 and shall not exceed a change of 40.
- e. A 1-liter sample of fuel shall be obtained and analyzed for solid contamination in accordance with ASTM D2276.
- f. If the total rise in sediment exceeds 2 milligrams per liter, it shall be cause for rejection.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the Military Service's 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.

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6. NOTES

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

6.1 Intended use. The hose and hose assembly required by this specification are used in dispensing hydrocarbon fuels and demineralized water (see SAE-AS38404, class 2). It is military unique due to its usage on both fuel servicing trucks and air transportable hydrant refueling systems. Its basic application is aircraft ground support.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. PIN (see 1.2 or 1.3).
- c. Quantity required.
- d. Whether first article inspection is waived (see 4.4).
- e. Name and address of Government facility where the first article inspection samples are to be submitted, if required (see 3.1 and 6.3). Name and address of the first article inspection test facility to which first article samples if required (see 4.3.1) are to be forwarded and the name and address of the Government activity responsible for conducting the first article inspection program (see 4.3.1 and 6.3).
- f. If required marking hose with contract or order number (see 3.6.1).
- g. Shelf life requirements (see 6.4).
- h. Packaging requirements (see 5.1).

6.3 First article inspection requirements. When First article inspection is required samples should be selected from the initial procurement items. The contracting officer should provide specific instructions, in all procurement instruments, regarding the arrangements for examinations, test and approval of the first article samples. First article inspection may be waived if the contractor has previously passed first article inspection for the same size (inside diameter) under previous contracts with the government.

6.4 Shelf life. This specification covers items where the assignment of a Federal shelf-life code is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order, and should include, as a minimum, shelf-life code, shelf-life code, shelf-life package markings in accordance with MIL-STD-129 or FED-STD-123, preparation of a materiel quality storage standard for type II (extendible) shelf-life items, and a minimum of 85 percent shelf-life remaining at time of receipt by the Government. These and other requirements, if necessary, are in DoD4140.27-M, *Shelf-life Management Manual*. The shelf-life codes are in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoD 4140.27-M, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points that manage the item and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: <http://www.shelflife.hq.dla.mil/>.

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6.5 Subject term (key word) listing.

Acrylonitrile
 Butadiene
 Cam locking type couplings
 Coupling
 Dematerialized water
 Drybreak
 Hydrocarbon fuels, dispensing
 Quick-disconnect
 Refueling systems
 Reattachable screw on type couplings
 Sexless
 Trucks, fuel servicing
 Wetbreak

6.6 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals is available on their website at <http://www.epa.gov/epawaste/hazard/wastemin/index.htm>. Included in the EPA list of 31 priority chemicals are cadmium, lead, and mercury. Use of the materials on the list should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

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 extensive change.

CONCLUDING MATERIAL

Custodians:

Army - AT
 Navy - AS
 Air Force - 99
 DLA - CC

Preparing activity:

DLA - CC

(Project 4720-2011-004)

Review activities:

Army - AV
 Navy - MC, SA
 Air Force - 70, 71

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.daps.dla.mil>.