

INCH-POUND

MIL-H-17902F(SH)

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SUPERSEDING

MIL-H-17902E(SHIPS)

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(See 6.9)

## MILITARY SPECIFICATION

HOSE, END FITTINGS AND HOSE ASSEMBLIES,  
SYNTHETIC RUBBER, AIRCRAFT FUELS

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers both collapsible and noncollapsible hoses.

1.2 Classification.

1.2.1 Military part number. The Military part number for the hose and end fittings covered by this specification shall consist of the letter "M", the basic number of this specification and the coded numbers or letters as shown in the following examples:

Hose and hose assembly

M17902-A-CCA-50

Basic number of specification \_\_\_\_\_

Size (diameter) \_\_\_\_\_

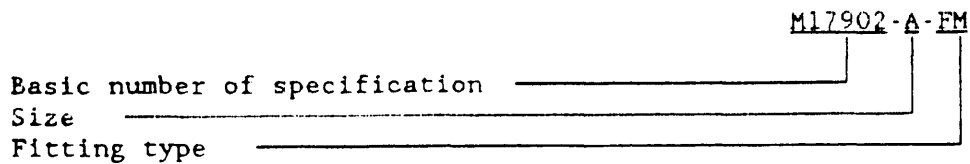
Hose: \_\_\_\_\_

Type \_\_\_\_\_

Length \_\_\_\_\_

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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Hose fitting

1.2.1.1 Hose fitting, hose assembly size. Size shall be identified by a letter symbol as shown in table I.

TABLE I. Size designation.

Symbol	Size (id) (inch)
A	1-1/2
B	2-1/2

1.2.1.2 Hose and hose assembly type. Type shall be identified by a two-letter symbol as shown in table II (see 6.2).

TABLE II. Hose type designation.

Symbol	Hose type/configuration
CC	Collapsible
NC	Noncollapsible
A	Hose assembly
H	Hose only

1.2.1.3 Hose fitting type. Type shall be identified by a two-letter symbol as shown in table III (see 6.2).

TABLE III. Fitting type designation.

Symbol	Fitting type
FM	Fitting, male
FF	Fitting, female

1.2.1.4 Hose and hose assembly length. Length shall be identified by a two-number symbol as shown in table IV.

TABLE IV. Hose, hose assembly length.

Symbol	Length, feet, nominal
25	25
50	50

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Unless otherwise specified (see 6.2), the length of bulk hose or hose assemblies shall be 50 feet, nominal.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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

## FEDERAL

PPP-F-320 - Fiberboard; Corrugated and Solid Sheet Stock (Container Grades), and Cut Shapes.

## MILITARY

MIL-H-775 - Hose, Hose Assemblies; Rubber, Plastic, Fabric, or Metal (Including Tubing); and Associated Hardware: Packaging of.  
 MIL-R-6855 - Rubber, Synthetic Sheets, Strips, Molded or Extruded Shapes General Specification for.  
 MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated.  
 MIL-P-46179 - Plastic Moldings and Extrusion Material, Polyamide-imide (PAI).

## STANDARDS

## FEDERAL

FED-STD-H28 - Screw-Thread Standards for Federal Services.  
 FED-STD-151 - Metals; Test Methods.  
 FED-STD-162 - Hose, Rubber, Visual Inspection Guide for.  
 FED-STD-601 - Rubber: Sampling and Testing.

(Unless otherwise indicated, copies of federal and Military specifications and standards are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.2 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 issue of the documents cited in the solicitation (see 6.2).

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 313 - Standard Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Spring Wire. (DoD adopted)  
 B 16 - Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines. (DoD adopted)

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- B 121 - Standard Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar. (DoD adopted)
- B 129 - Standard Specification for Cartridge Brass and Cartridge Case Cups. (DoD adopted)
- B 176 - Standard Specification for Brass Die Castings. (DoD adopted)
- B 283 - Standard Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed). (DoD adopted)
- B 453 - Standard Specification for Copper-Zinc-Lead Alloy (Leaded Brass) Rod. (DoD adopted)
- D 156 - Standard Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method). (DoD adopted)
- D 380 - Standard Methods of Testing Rubber Hose. (DoD adopted)
- D 381 - Standard Test Method for Existent Gum in Fuels by Jet Evaporation. (DoD adopted)
- D 412 - Standard Test Methods for Rubber Properties in Tension. (DoD adopted)
- D 413 - Standard Test Methods for Rubber Property-Adhesion to Flexible Substrate. (DoD adopted)
- D 573 - Standard Test Method for Rubber - Deterioration in an Air Oven. (DoD adopted)
- D 750 - Standard Test Method for Rubber Deterioration in Carbon-Arc Weathering Apparatus. (DoD adopted)
- D 2276 - Standard Test Methods for Particulate Contaminant in Aviation Turbine Fuels. (DoD adopted)
- D 3951 - Standard Practice for Commercial Packaging. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

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

### 3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.4) in accordance with 4.3.

3.2 Material. Material shall be new and unused. The hose shall have been manufactured not more than 1 year prior to date of delivery.

3.2.1 Tube. The tube shall be made of a rubber compounded for resistance to deterioration by aromatic and jet fuels and shall contain no phosphate plasticizers.

3.2.2 Cover. The cover shall be made of a rubber compounded for resistance to deterioration caused by atmospheric oxygen and ozone, sunlight, abrasion and fuels.

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3.2.3 Reinforcement. The reinforcement may be of nylon, polyester or high tenacity rayon that shall meet the requirements of this specification.

3.2.3.1 Wire helix (type NC hose). The wire in the helix shall be heavily galvanized or copper plated steel with a diameter of not less than 0.035 inch. The cross sectional area of wire per linear inch of longitudinal section on one side of the hose shall be not less than 0.09 square inch (in<sup>2</sup>) for the 1-1/2 inch inside diameter (id) hose, and not less than 0.11 in<sup>2</sup> for the 2-1/2 inch id hose. The tensile strength of the wire shall be not less than 200,000 pounds per square inch (psi) (see 4.6.9.1). The wire shall show no defects in the steel (see 4.6.9.2). Flaking or peeling of the galvanized or copper coating on the wire shall not be considered a defect.

3.2.4 Friction or filler. The friction or filler used to impregnate the reinforcement shall be made of a rubber compounded for resistance to deterioration by aromatic and jet fuels.

3.2.5 Couplings and fittings. The materials for the couplings and contact assembly shall be as specified in table V.

TABLE V. Materials for couplings and contact assembly.

Part no.	1/Name of part	Material	Applicable document
1.	Contact button	Brass	ASTM B 16
2.	Spring	CRES	ASTM A 313, type 302
3.	Front nut	Brass	ASTM B 16
4.	Spider	Polyamide-imide	MIL-P-46179
5.	Contact rod	Brass	ASTM B 16
6.	Washer	Brass	ASTM B 121
7.	Contact rod guide	Brass	ASTM B 453
8.	Lead washer	Virgin lead	ASTM B 129
9.	Double securing nut	Brass	ASTM B 16
10.	Cable connector bolt	Brass	ASTM B 16
11.	Coupling body	Brass, forging	ASTM B 283, UNS C37700
12.	Coupling sleeve	Brass, pressure die casting	ASTM B 176, UNS C87900
13.	Coupling grip	Brass wire cold worked (58 percent minimum copper)	
14.	Gasket	Buna-N	MIL-R-6855, class 1, grade 80 ± 5
15.	Cable, control	2/	
16.	Swivel nut	Brass, forging	ASTM B 283

See footnotes at top of next page.

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- 1/ Part numbers correspond to figures 1 through 6.
- 2/ The control cable shall be made of seven strands of seven corrosion-resisting steel wires per strand, each wire approximately 0.0075 inch in diameter. The cable shall be covered with nylon insulation to an approximate finished gauge of 1/8 inch in diameter.

3.3 Construction.

3.3.1 Hose. Both type CC and type NC hose shall consist of the following:

- (a) Inner tube of rubber.
- (b) Two or more layers of braided or spiral wrap reinforcement.
- (c) Outer cover of rubber.
- (d) Optional - Breaker plies of rubber-impregnated fabric may be used at the option of the manufacturer.

3.3.1.1 Type NC hose shall also include a helix of round wire. The helix shall be thoroughly embedded in rubber, shall be between the layers of reinforcement, and shall not contact either the inner or outer layer of reinforcement.

3.3.2 Physical properties.

3.3.2.1 Physical properties of the hose. The hose shall meet the physical properties specified in table VI.

TABLE VI. Physical properties of hose.

Physical property	Hose type			Test
	CC	NC		
	size	size		
	B	A	B	
Inside diameter (in) $\pm$ 0.063	2-1/2	1-1/2	2-1/2	4.6.1
Outside diameter (in) $\pm$ 0.063	3-1/8	2-1/8	3-1/8	4.6.1
Tube thickness (in) min	0.063	0.063	0.063	4.6.1
Cover thickness (in) min	0.063	0.094	0.094	4.6.1
Hose length, nominal (ft)	50	50	50	4.6.1
Hose weight, (lbs) max	100	85	125	4.6.2
Proof test pressure (psi, min)	300	300	250	4.6.4
Burst test pressure (psi, min)	600	600	500	4.6.5
Vacuum (in Hg), type NC only		22	22	4.6.3

3.3.2.2 Physical properties of rubber components. The rubber components of the hose shall meet the physical properties specified in table VII (see 4.6).

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TABLE VII. Physical properties of rubber components.

Properties	Requirements			Test
	Tube	Cover	Friction compound on reinforcement plies	
<u>Initial properties:</u>				
Tensile strength, minimum, psi	2600	1800		4.6.8.1.1
Ultimate elongation, minimum, percent	300	350		4.6.8.1.1
<u>Adhesion, minimum, pounds per inch width:</u>				
Between tube and breaker ply	20			4.6.8.2.1
Between cover and reinforcement ply		15		4.6.8.2.1
Between reinforcement plies and filler on wire helix			15	4.6.8.2.1
<u>Properties after immersion in medium no. 6:</u>				
Tensile strength, minimum, psi	1400	800		4.6.8.1.2
Ultimate elongation, minimum, percent	200	150		4.6.8.1.2
<u>Adhesion, minimum, pounds per inch width:</u>				
Between tube and breaker ply	12			4.6.8.2.2
Between cover and reinforcement ply		9		4.6.8.2.2
Volume increase, maximum, percent (no shrinkage allowed)	30	30	30	4.6.8.3
<u>Properties after oven aging:</u>				
Tensile strength, minimum, psi	2000	1450		4.6.8.1.3
Ultimate elongation, minimum, percent	250	220		4.6.8.1.3
Resistance to ozone of hose cover		No cracks		4.6.8.4
Nonvolatile extractable material in hose tube, maximum, percent	2.0			4.6.8.5
Saybolt color number of test fluid in hose tube, minimum	+15			4.6.8.6
Phosphate plasticizer in hose tube, maximum, percent	0.0			4.6.8.7

3.3.3 Hose assembly. When hose assemblies are being fabricated, each length of hose shall have one type FM and one type FF fitting attached. Two spider assemblies and a length of control cable shall be fitted to the hose assembly as shown on figure 1.

3.3.3.1 Hose fittings. Fitting types FF and FM shall be of the reusable compression grip type consisting of an internal tailpiece, an external, long tapered sleeve and a brass wire helix grip. The fittings shall not exceed the

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dimension of figure 1 and shall not have any sharp protruding edges which could damage the hose. The type FM fitting shall be as shown on figures 1 and 2 and the type FF fitting shall be as shown on figures 1 and 3. Threads shall be in accordance with FED-STD-H28. Female swivels shall not be held in place with compression wire retainers.

3.3.3.2 Spider assemblies. Spider assemblies and components shall be in accordance with figures 1, 4 and 5. Spiders shall be molded of polyamide-imide in accordance with MIL-P-46179 and the color shall be light brown.

3.4 Marking.

3.4.1 Hose. Each 50-foot length of hose shall be permanently marked by one of the two following methods at the option of the hose manufacturer.

- (a) Two brands inlaid and vulcanized to the cover, one brand approximately 4 feet from each end.
- (b) Continuous embossed lay line.

The inlaid brands or continuous layline shall include the following:

- (a) Specification number.....M 17902
- (b) Hose type.....CC or NC
- (c) Hose size.....1-1/2 or 2-1/2
- (d) Manufacturer's name or trade mark.....(as applicable)
- (e) Quarter and year of manufacture.....(for example 4-87)

3.4.2 Fittings. Each fitting assembly shall be stamped with the following information:

- (a) Specification number.....M 17902
- (b) Fitting type .....FF or FM
- (c) Fitting size .....1-1/2 or 2-1/2
- (d) Manufacturer's name or trademark.....(as applicable)
- (e) Manufacturer's fitting part number.....(as applicable)

Stamping shall be with low stress dies with the letter size not smaller than 1/8 inch in height. Stamping shall be placed on the external sleeve.

3.5 Electrical continuity. There shall be no electrical continuity between the couplings and the control cable. The resistance between the contact buttons at each end of the hose shall be not more than 40 ohms per 50-foot hose assembly (see 4.6.10).

3.6 Low temperature flexibility. The tube and cover shall show no signs of cracking (see 4.6.6).

3.7 Sedimentation. The interior surface of the hose shall be free from particulate materials to the extent that the weight of sediment contained in the flushing fluid from the tube shall be not more than 10 milligrams per liter (see 4.6.7).



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3.8 Plugs and caps. After testing, each hose assembly shall be thoroughly dried. Plastic plugs and caps shall be installed on the threaded end fittings to protect the threads. Bulk hose shall be thoroughly dried after testing and shall have the ends protected with cloth or plastic backed self-adhesive tape.

3.9 Workmanship. Hoses and fittings shall be uniform in quality and material. Castings shall be free from patching, misalignment resulting from shifted coring, warping and porosity. Sprues shall be removed and the castings shall be free from sand, dirt and scale. Forgings shall be free from patching, warping or other defects and from dirt and scale. Machined parts shall be manufactured to tolerances and dimensions specified herein. Metal parts shall be free of sharp edges. Hose and hose assemblies shall be free of dirt, oil, and metal particles. Hose shall exhibit no cracks or blisters.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 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 the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

- (a) First article inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.2.1 Inspection lot. Hose lengths with couplings of the same size with the same construction materials, produced under essentially the same conditions, and offered for inspection at one time shall be considered a lot for purposes of inspection.

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4.3 First article inspection. Unless otherwise specified (see 6.2), first article inspection shall be performed on one hose assembly (see 3.1). The inspection shall include the examination of 4.5 and the tests of 4.6. The first article may be a standard production item from the contractor's current inventory provided that the unit meets the requirements of the specification and is representative of the design, construction, and manufacturing techniques applicable to the remaining units to be furnished under the contract (see 6.3).

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the individual examination and tests as specified in 4.4.1.

4.4.1 Individual examination and tests. Each length of hose or hose assembly shall be subjected to the examination and tests listed in table VIII.

TABLE VIII. Test for physical properties.

Property	Requirement	Applicable ASTM	Test
Inside diameter	3.3.2.1 and table VI	ASTM D 380	4.6.1
Outside diameter	3.3.2.1 and table VI	ASTM D 380	4.6.1
Length	3.3.2.1 and table VI	ASTM D 380	4.6.1
Proof pressure	3.3.2.1 and table VI	ASTM D 380	4.6.4
Electrical continuity	3.5	----	4.6.10

4.4.2 Sampling for tests.

4.4.2.1 Sampling for vacuum test. Samples of hose assemblies shall be taken from each lot in accordance with table IX for the initial vacuum test specified in 4.6.3.

TABLE IX. Sampling for vacuum test.

Number of hose assemblies in lot	Number of hose assemblies in sample
8 and under	all
9 to 90	8
91 to 280	32
281 to 500	50
501 to 1200	80

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4.4.2.2 Sampling for all other tests. With each 100 hose assemblies, or less, offered for quality conformance inspection, samples shall be furnished in accordance with table X.

TABLE X. Sampling for all other tests.

Test	Requirement	Test	Test <sup>2/</sup> sample	Method in FED-STD-601 or ASTM
Tube thickness	3.3.2.1 and table VI	4.6.1	a	ASTM D 380
Cover thickness	3.3.2.1 and table VI	4.6.1	a	ASTM D 380
Hose weight	3.3.2.1 and table VI	4.6.2	a	----
Burst pressure	3.3.2.1 and table VI	4.6.5	a	ASTM D 380
Vacuum	3.3.2.1 and table VI	4.6.3	a	ASTM D 380
Low temperature flexibility	3.6	4.6.6	a	Method 6001
Cleanliness	3.7	4.6.7	a	ASTM D 2276 or Method 6001
Tensile properties	3.3.2.2 and table VII	4.6.8.1	a	Method 6111, ASTM D 412, ASTM D 573
Adhesion	3.3.2.2 and table VII	4.6.8.2	a	ASTM D 413
Volume change	3.3.2.2 and table VII	4.6.8.3	a,b	Method 6211
Ozone resistance	3.3.2.2 and table VII	4.6.8.4	a	ASTM D 573, ASTM D 750
Nonvolatile extract	3.3.2.2 and table VII	4.6.8.5	a	ASTM D 380
Saybolt color number	3.3.2.2 and table VII	4.6.8.6	a	ASTM D 156
Phosphate plasti- cizer	3.3.2.2 and table VII	4.6.8.7	a	Method 15825
Wire helix <sup>1/</sup>	3.2.3.1	4.6.9	c	FED-STD-151

<sup>1/</sup> For hose type NC only.

<sup>2/</sup> Sample selection shall be in accordance with the following:

- (a) One hose assembly shall be provided in addition to the quantity required for delivery. This hose assembly shall be taken at random for the tests specified in table X.
- (b) Vulcanized samples, 6 by 6 inches by  $0.080 \pm 0.005$  inch in thickness of the friction and filler compounds used to impregnate the reinforcement and surround the wire helix, or both, shall be provided for the test specified in table X (see 6.3 and 6.6).
- (c) A straight 6-foot length of the helix wire used in the hose offered for quality conformance inspection for the tests specified in table X.

4.5 Visual and dimensional examination. Each of the sample hose assemblies selected in accordance with 4.4.1 shall be examined to verify conformance to the requirements of this specification regarding all parts of the hose assembly

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which do not involve tests. Visual defects shall be determined and evaluated in accordance with FED-STD-162. Length, outside diameter and inside diameter shall be determined as specified in 4.6.1. Weight shall be determined as specified in 4.6.2.

#### 4.6 Test methods.

4.6.1 Dimensions of hose. The procedure specified in ASTM D 380 shall be used to determine the inside diameter, outside diameter, tube thickness, cover thickness and length of the hose. Inside diameter, outside diameter and length shall be measured on each of the sample hose assemblies selected in accordance with 4.4.2.2. Tube thickness and cover thickness shall be measured at six points equally spaced along the length of the sample hose selected in accordance with table X. Each point shall be spaced 60 degrees apart around the circumference. The thickness values found shall not be averaged. Each thickness value shall conform to the requirements specified in table VI.

4.6.2 Weight of hose. The weight of each sample hose assembly, complete with couplings, selected in accordance with 4.4.2.2, shall be determined with a precision of plus or minus 0.5 percent and shall conform to the requirements of table VI.

#### 4.6.3 Resistance to vacuum (type NC only).

4.6.3.1 Initial. Each of the sample hose assemblies selected in accordance with table X shall be subjected to a vacuum equivalent to a 22-inch height of Hg for a period of not less than 5 minutes. The hose shall not collapse or otherwise deform more than 15 percent of original diameter. The decreases in diameter of the hose where deformation occurs shall be measured in accordance with ASTM D 380.

4.6.3.2 After holding test fluid. A 5-foot length shall be cut from the sample hose assembly submitted in accordance with table X, a and b. One end shall be plugged and the hose filled with medium number 6 of method 6001 of FED-STD-601. The other end shall then be closed and the hose let stand for 46 hours at a temperature of 70 to 80 degrees Fahrenheit (°F). At the end of this period, the fluid shall be drained from the hose. Within 5 minutes after removal of the fluid, the hose length shall be bent to a radius of 15 inches for the 1-1/2 inch id hose, or 18 inches for the 2-1/2 inch id hose. The bent hose length shall then be subjected to a vacuum equivalent to a 22-inch height of Hg for a period of not less than 15 minutes. The decrease in diameter of the hose where deformation occurs shall be measured. After release of the vacuum, the hose shall be dissected longitudinally and examined for evidence of failure by ply separation, blistering, collapse or other damage.

4.6.4 Resistance to proof pressure. Each length of hose selected in accordance with 4.4.1 and previously used for the vacuum test (see 4.6.3) shall be measured for length and circumference as specified in ASTM D 380. Each hose shall then be subjected to a hydrostatic pressure of 300 psig in accordance with table VI for a period of not less than 10 minutes. At the end of this period,

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while the hose is still under pressure, its length and circumference shall again be measured, it shall be examined for leakage or other signs of weakness, and the contact assembly shall be checked electrically to assure that there is no electrical contact between the couplings and intercontrol cable.

4.6.5 Resistance to burst. A 3-foot length shall be cut from the sample hose selected in accordance with table X, footnote 2(a). Couplings shall be attached to the 3-foot length and the ends blanked off. The hose shall then be subjected to increasing hydrostatic pressure to the pressure stated in table VI with the rate of pressure rise not exceeding 100 psi per minute. The pressure at which leakage occurs shall be noted.

4.6.6 Low temperature flexibility. A 4-foot length shall be cut from the sample hose submitted in accordance with table X. One end shall be plugged and the length filled with medium number 6 of method 6001 of FED-STD-601. The other end of hose shall then be plugged, and the hose exposed to a temperature of minus  $22 \pm 2^\circ\text{F}$  for 24 hours while held straight. At the end of this period and while at minus  $22^\circ\text{F}$ , the hose shall be bent 90 degrees around a mandrel 30 inches in diameter within 4 seconds. The fluid shall be drained from the hose, and the hose cut in half longitudinally. The tube and cover shall be examined for cracks or other damage.

4.6.7 Cleanliness test.

4.6.7.1 Specimen. A 4-foot length shall be cut from the sample hose submitted in accordance with table X. Extraneous dust or other contaminants shall not enter the hose tube. The hose shall be closed with clean plugs at each end. Each plug shall have an outlet hole connected via a pipe nipple to a valve as shown on figure 6. The interiors of the pipe nipples and valves shall be carefully cleaned prior to use.

4.6.7.2 Apparatus. A machine is required that will impart a rotary motion in a vertical plane to a rigid bar that is attached at its center to a horizontal axle driven at  $12 \pm 1$  revolutions per minute (rpm). Four adjustable band clamps shall be attached symmetrically to the rigid bar to hold the specimen firmly. Such an apparatus is shown on figure 6.

4.6.7.3 Procedure. The specimen, having been sealed at one end by a prepared plug, shall be filled with medium number 6 of method 6001 of FED-STD-601 and hung vertically for 16 to 24 hours. The fluid shall then be drained from the specimen and 2 liters of fresh medium number 6 added, and the open end plugged. The specimen shall then be clamped securely to the rotating bar so that the ends are spaced evenly from its center. After 120 minutes of rotary motion at 12 rpm and  $70$  to  $80^\circ\text{F}$ , the first liter of the fluid shall be withdrawn for analysis. The amount of sediment shall be determined in milligrams per liter in accordance with ASTM D 2276 using an 0.8 micrometer pore filter. The tests shall be performed in duplicate and the results averaged. A control analysis shall determine the amount of contaminant present per liter in the medium number 6 used for the test. The average amount of sediment found in the specimen shall be reduced by the amount found present in the control, and the difference recorded as the amount of particulate contaminant in the hose.

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4.6.8 Tests performed on rubber components. Tests, except the test for volume increase of the friction compound after immersion in test fluid (see 4.6.8.3), shall be performed on specimens prepared from the sample hose selected in accordance with 4.4.2.2 to determine conformance to 3.3.2.2.

4.6.8.1 Tensile properties. Tests for tensile properties shall be performed on dumbbell specimens in accordance with ASTM D 412.

4.6.8.1.1 Initial tensile properties. Initial tensile strength and ultimate elongation at break shall be determined in accordance with ASTM D 412.

4.6.8.1.2 Tensile properties after immersion. The tensile strength and ultimate elongation after immersion in medium number 6 of method 6001 of FED-STD-601 shall be determined by method 6111 of FED-STD-601. Tensile strength shall be based on the swollen cross-sectional areas of the specimen.

4.6.8.1.3 Tensile properties after oven aging. The tensile strength and ultimate elongation shall be determined after oven aging for  $70 \pm 1/4$  hours at  $212 \pm 2^\circ\text{F}$  in accordance with ASTM D 573.

4.6.8.2 Adhesion. The adhesion between the several parts of the hose shall be determined initially and after immersion in test fluid. The adhesion shall be such that the rate of separation shall be not greater than 1 inch per minute under the minimum loads shown in table VII.

4.6.8.2.1 Initial adhesion. The initial adhesion between the tube and breaker ply, between the cover and outer reinforcement plies, and between the reinforcement plies and the filler on the wire helix shall be determined in accordance with ASTM D 413.

4.6.8.2.2 Adhesion after immersion. The adhesion after immersion shall be determined as specified in 4.6.8.2.2.1 through 4.6.8.2.2.3.

4.6.8.2.2.1 Test specimen. A 2-foot length shall be cut from the sample hose obtained as specified in table X.

4.6.8.2.2.2 Apparatus. The apparatus for subjecting the test specimen to the action of the immersion fluids shall be as shown on figure 7, or equivalent.

4.6.8.2.2.3 Procedure. The specimen shall be positioned in the apparatus and filled with medium number 6 of method 6001 of FED-STD-601 to at least the height of the fluid on the outside of the specimen. The fluid surrounding the outside of the specimen shall be medium number 4 of method 6001 of FED-STD-601. The specimen shall remain in contact with the test fluids for a period of  $46 \pm 1/4$  hours at a temperature of 70 to  $80^\circ\text{F}$ . At the end of this period, the specimen shall be removed and dried for a period of time not to exceed 30 minutes. The adhesion test specimens shall be cut from the specimen hose length during the drying period. The adhesion shall be determined within 2 minutes after completion of the drying period in accordance with ASTM D 413.

4.6.8.3 Change in volume. The percent change in volume after immersion shall be determined in accordance with method 6211 of FED-STD-601. The specimen shall be immersed in medium number 6 of method 6001 of FED-STD-601 for  $46 \pm 1/4$  hours at 70 to  $80^\circ\text{F}$ .

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4.6.8.4 Resistance to ozone.

4.6.8.4.1 Test specimen. The specimen shall be a strip 1 by 5 inches taken lengthwise from the cover of the sample hose obtained as specified in 4.4.2.2. The specimen shall be buffed smooth on both sides. The maximum thickness after buffing shall be 0.100 inch. Duplicate specimens shall be tested.

4.6.8.4.2 Apparatus. The apparatus shall consist of a test chamber with an ozone generating source outside the chamber that shall maintain an ozone-air atmosphere in the chamber at the temperature concentration desired, a circulating-air oven, in accordance with ASTM D 573 and adjustable specimen holders similar to the holder shown on figure 7311A of method 7311 of FED-STD-601.

4.6.8.4.3 Procedure. The specimen shall be clamped firmly at the ends in the holder at 20 percent extension and placed in an oven for 16 to 24 hours at  $100 \pm 2^\circ\text{F}$ . After this preliminary exposure period, the specimen shall be placed in an ozone chamber at  $100 \pm 2^\circ\text{F}$  with an ozone-air atmosphere of  $1.00 \pm 0.05$  parts of ozone per one million parts of air by volume. After exposure for  $166 \pm 1/2$  hours, the specimen shall be removed from the ozone chamber and examined for surface cracking with a 7X magnifying lense. Cracks in the rubber within  $1/8$  inch of the clamps shall be ignored since they may be due to excessive strain in this region.

4.6.8.5 Nonvolatile extract.

4.6.8.5.1 Test specimen. The specimen shall consist of strips of the hose tube about  $1/16$  inch wide by  $1/16$  inch thick by 1-1/2 inches long cut from the sample hose specified in 4.4.2.2. The total weight of strips shall be about 5 grams. Duplicate specimens shall be tested.

4.6.8.5.2 Procedure. The weighed specimen shall be placed in an extraction thimble, then inserted in a syphon cup of an extraction apparatus as shown in method 6001 of FED-STD-601. One hundred milliliters of medium number 4 of method 6001 of FED-STD-601 shall be added to the extraction flask. Extraction shall be carried out for  $46 \pm 1/2$  hours at such a rate that 2-1/2 to 3 minutes are required to fill and empty the syphon cup. The specimen and flask shall be rinsed with 25 milliliters of fresh fluid, and the wash added to the extract. The nonvolatile residue from the extract shall be determined in accordance with ASTM D 381, except that the evaporation time shall be 45 minutes. The weight of the residue shall be expressed as percent of the original weight of the specimen. The results of duplicate tests shall be averaged. The residue shall be saved for the test for phosphate plasticizer (see 4.6.8.7).

4.6.8.6 Saybolt color number. The specimen shall consist of a 15-inch length cut from the sample hose obtained as specified in 4.4.2.2. The specimen shall be sealed at one end, filled within 2 inches of the top with medium number 6 of method 6001 of FED-STD-601 and capped to prevent evaporation or adulteration by extraneous material. A suitable arrangement is shown on figure 8. After  $168 \pm 2$  hours, the Saybolt color number of the fluid extract shall be determined in accordance with ASTM D 156. Two duplicate tests shall be performed and the results averaged. The Saybolt color number of the uncontaminated medium number 6 used shall be plus 25, minimum.

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4.6.8.7 Phosphate plasticizer. The presence of phosphate plasticizers in the tube of the hose shall be determined qualitatively in accordance with method 15825 of FED-STD-601, using about 0.2 gram of the nonvolatile residue from 4.6.8.5.2. The procedure shall be repeated if phosphorous is found, omitting addition of the nonvolatile residue in order to determine whether phosphorous was present in any of the reagents used.

4.6.9 Tests performed on helix wire.

4.6.9.1 Tensile strength. The tensile strength of the wire shall be determined in accordance with FED-STD-151.

4.6.9.2 Wrapping test. Each of the samples of helix wire selected in accordance with 4.4.2.2 shall be wrapped six full turns around a mandrel having a diameter three times the diameter of the wire. The wrapped wire shall be examined for defects.

4.6.10 Electrical continuity test. Each hose assembly shall be tested with an ohmmeter to verify conformance to 3.5. Hose assembly shall be tested coupling to coupling and contact button to contact button.

4.7 Inspection of packaging. Sample packages and packs, and the inspection of the preservation, packing and marking for shipment, stowage and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

## 5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.5.)

5.1 General.5.1.1 Navy fire-retardant requirements.

5.1.1.1 Lumber and plywood. Unless otherwise specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping container and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Level A and B	- Type II - weather resistant.
	Category 1 - general use.
Level C	- Type I - non-weather resistant.
	Category 1 - general use.

5.1.1.2 Fiberboard. Fiberboard used in the construction of class-domestic, non-weather resistant fiberboard, and cleated fiberboard boxes shall meet the flammability and smoke requirements of PPP-F-320 and amendments thereto.

5.2 Preservation. Preservation of hose and hose assemblies shall be level A, C, or commercial as specified (see 6.2).



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5.2.1 Level A and C. Level A and C preservation shall be in accordance with MIL-H-775.

5.2.2 Commercial. Commercial preservation shall be in accordance with ASTM D 3951

5.3 Packing. Packing of hose and hose assemblies shall be level A, B, C, or commercial as specified (see 6.2).

5.3.1 Levels A, B and C. Levels A, B and C packing requirements shall be in accordance with MIL-H-775.

5.3.2 Commercial. Commercial packing shall be in accordance with ASTM D 3951.

5.4 Marking.

5.4.1 Levels A, B and C. In addition to any special markings required (see 3.4 and 6.2), marking shall be in accordance with MIL-H-775 including bar coding.

5.4.2 Commercial. In addition to any special markings required (see 3.4 and 6.2), marking shall be in accordance with ASTM D 3951. Bar code markings shall be in accordance with MIL-H-775.

## 6. NOTES

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

6.1 Intended use. Hose, fittings and hose assemblies covered by this specification are intended for use as aircraft refueling hoses on board ships.

6.2 Acquisition requirements. Acquisition documents 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 specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (c) Number of lengths of hose and hose assemblies required.
- (d) Type of hose or hose assembly required (see 1.2.1.1).
- (e) Type of fittings required (see 1.2.1.3).
- (f) Length of hose or hose assembly required (see 1.2.1.4).
- (g) When first article is required (see 3.1).
- (h) If first article inspection is to be performed on more than one hose assembly (see 4.3).
- (i) When fire-retardant requirements are not required (see 5.1.1.1).
- (j) The level of preservation and packing required (see 5.2 and 5.3).
- (k) Special marking required (see 5.4.1 and 5.4.2).

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6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DIDs) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DIDs are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DoD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference paragraph</u>	<u>DID number</u>	<u>DID title</u>	<u>Suggested tailoring</u>
4.3	DI-T-4902	First article inspection report	-----
4.4.2.2 and 6.6	DI-MISC-80678	Certification data/report	-----

The above DIDs were those cleared as of the date of this specification. The current issue of DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.4 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item should be a preproduction sample, a first article sample, a first production item, a sample selected from the first \_\_\_ production items, a standard production item from the contractor's current inventory (see 3.1), and the number of items to be tested as specified in 4.3. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.5 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.6 Certification data/report. Vulcanized samples for quality conformance inspection (see table X, note 2(b)) should be accompanied by a written certification from the manufacturer that the samples have the same compositions as the friction and filler, respectively, used in the hose and have equivalent cures.

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6.7 Acceptable quality level (AQL) for vacuum test. The AQL, acceptance numbers and rejection numbers for vacuum test (see 4.6.3) are as follows:

Number of hose assemblies in lot	Number of hose assemblies in sample	AQL - 1.5 percent	
		Acceptance numbers (test failures)	Rejection numbers (test failures)
8 and under	all	0	1
9 to 90	8	0	1
91 to 280	32	1	2
281 to 500	50	2	3
501 to 1200	80	3	4

6.8 Subject term (key word) listing.

Hose, collapsible  
Hose, noncollapsible  
Spider assembly

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

Review interest:  
DLA-DCSC

Preparing activity:  
Navy - SH  
(Project 4720-N008)

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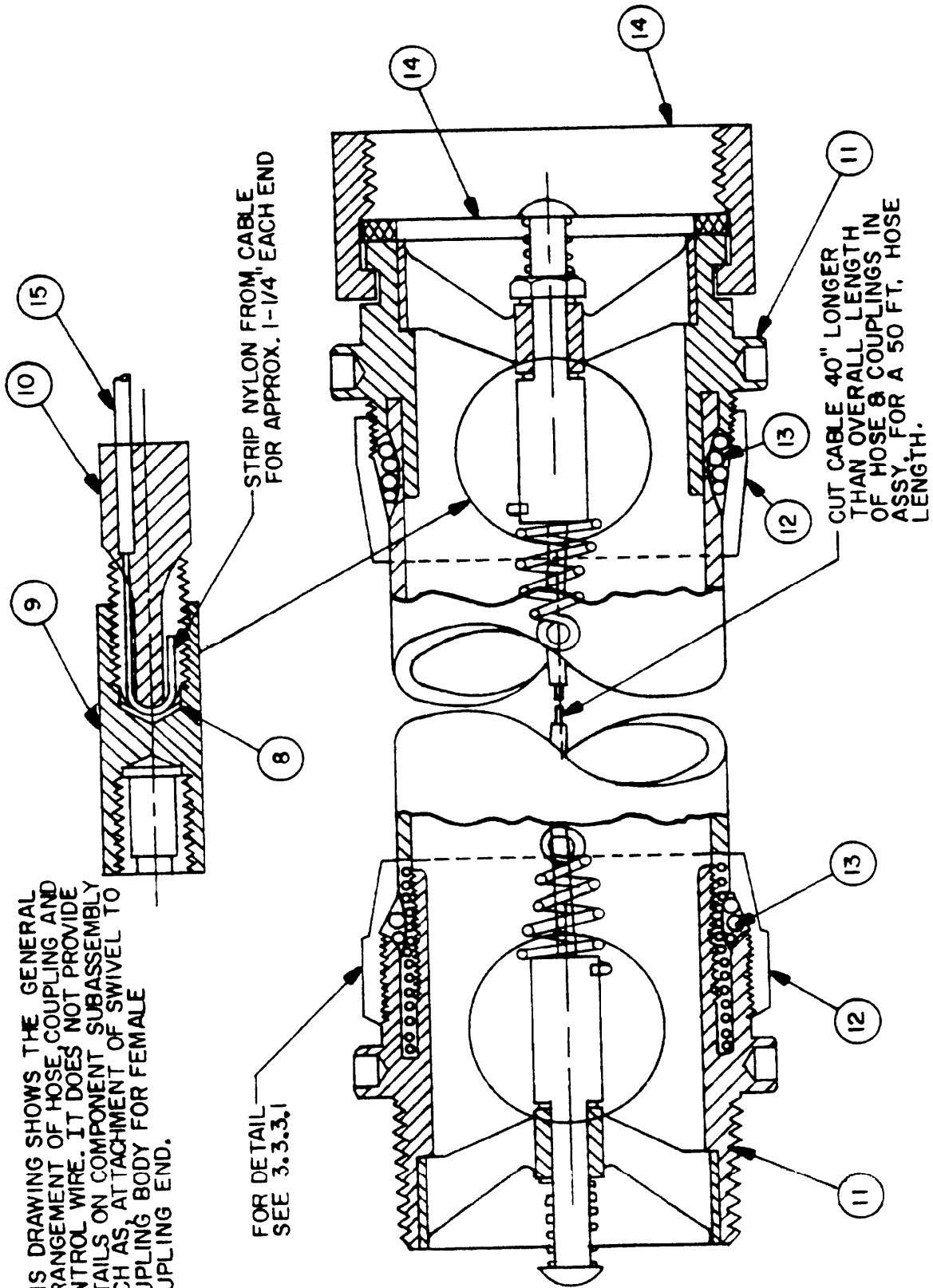
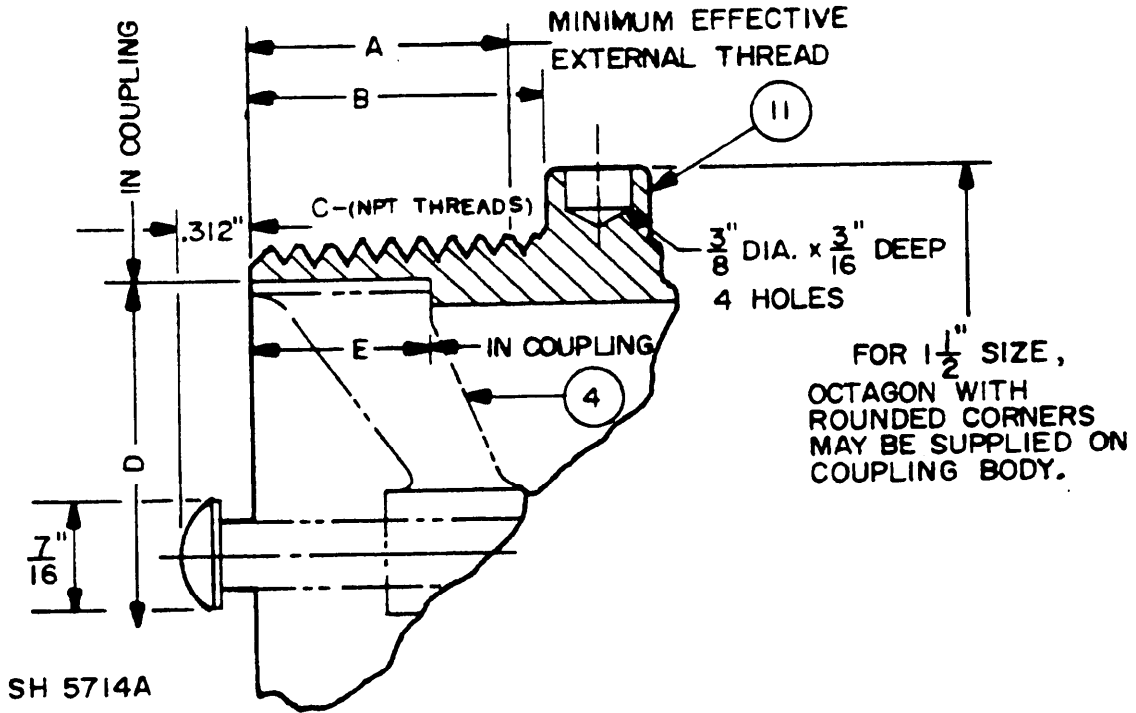


FIGURE 1. Hose and control wire assembly.

SH 5715A

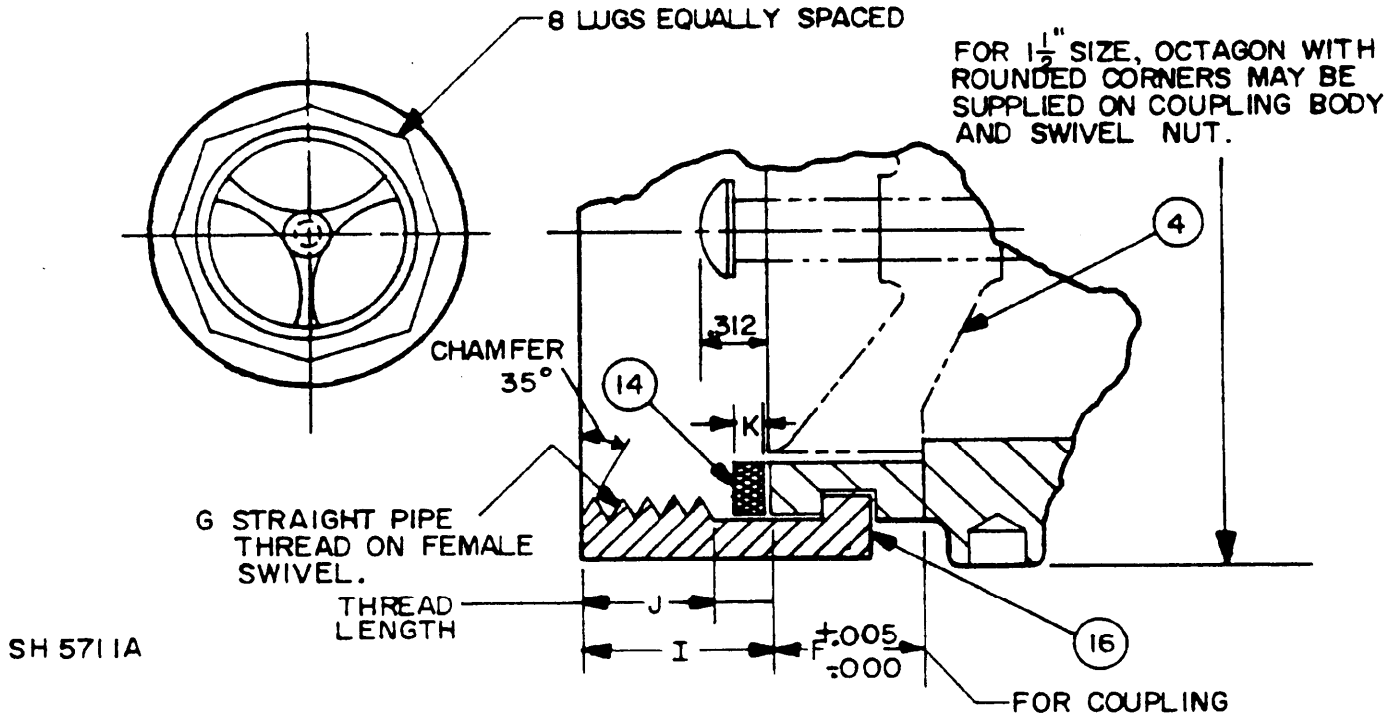
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SIZE	A	B MINIMUM	C	D	E
1-1/2	0.7235	15/16	1-1/2 - 11-1/2 NPT	1.520 ± .005	0.560 <sup>+.005</sup> <sub>-.000</sub>
2-1/2	1.1375	1-1/4	2-1/2 - 8 NPT	2.520 ± .005	.781 <sup>+.005</sup> <sub>-.000</sub>

FIGURE 2. Male coupling dimensions.

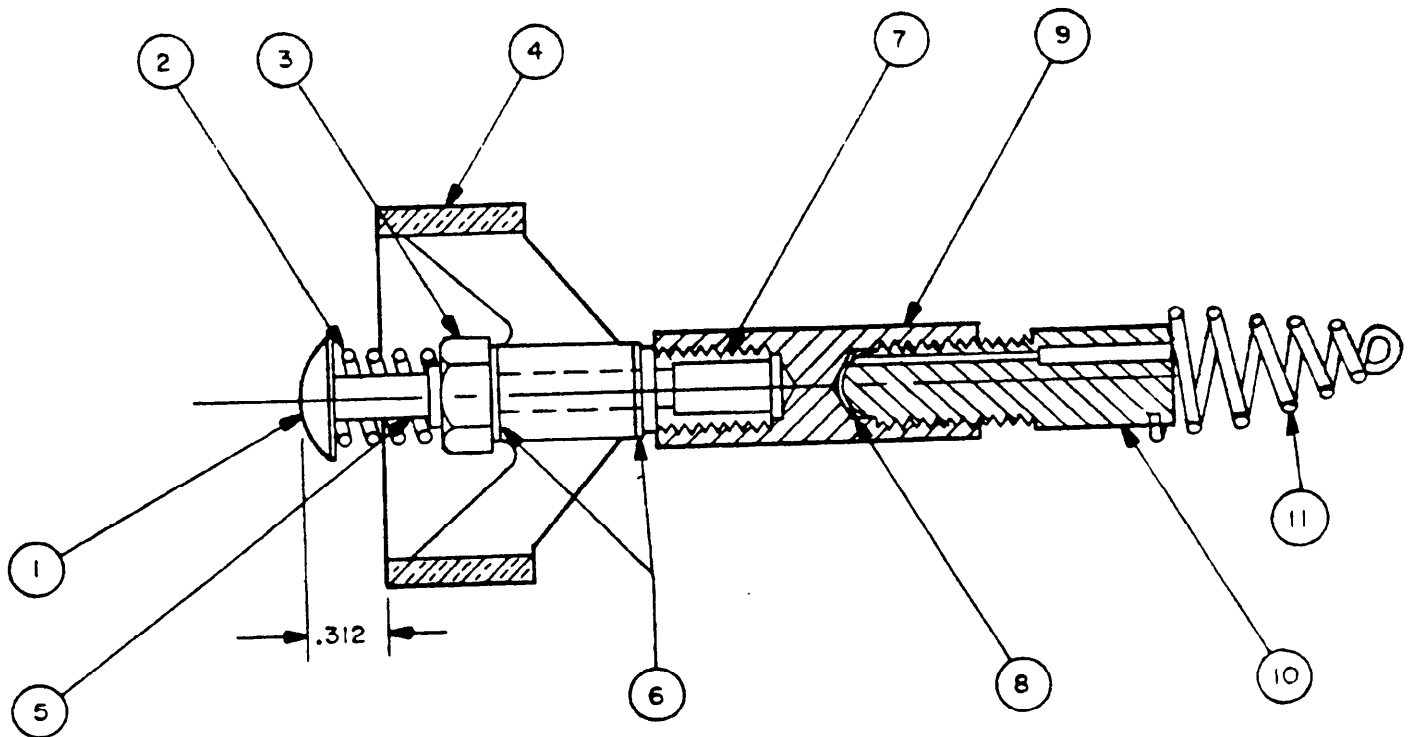
MIL-H-17902F(SH)



SIZE	F	G	H	I	J	K
1-1/2	0.560	1-1/2 - 11-1/2 NPT	1/2	19/32	15/32	1/8
2-1/2	.781	2-1/2 - 8 NPT	5/8	15/16	11/16	3/16

FIGURE 3. Partial detail of female coupling end.

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SH 5713

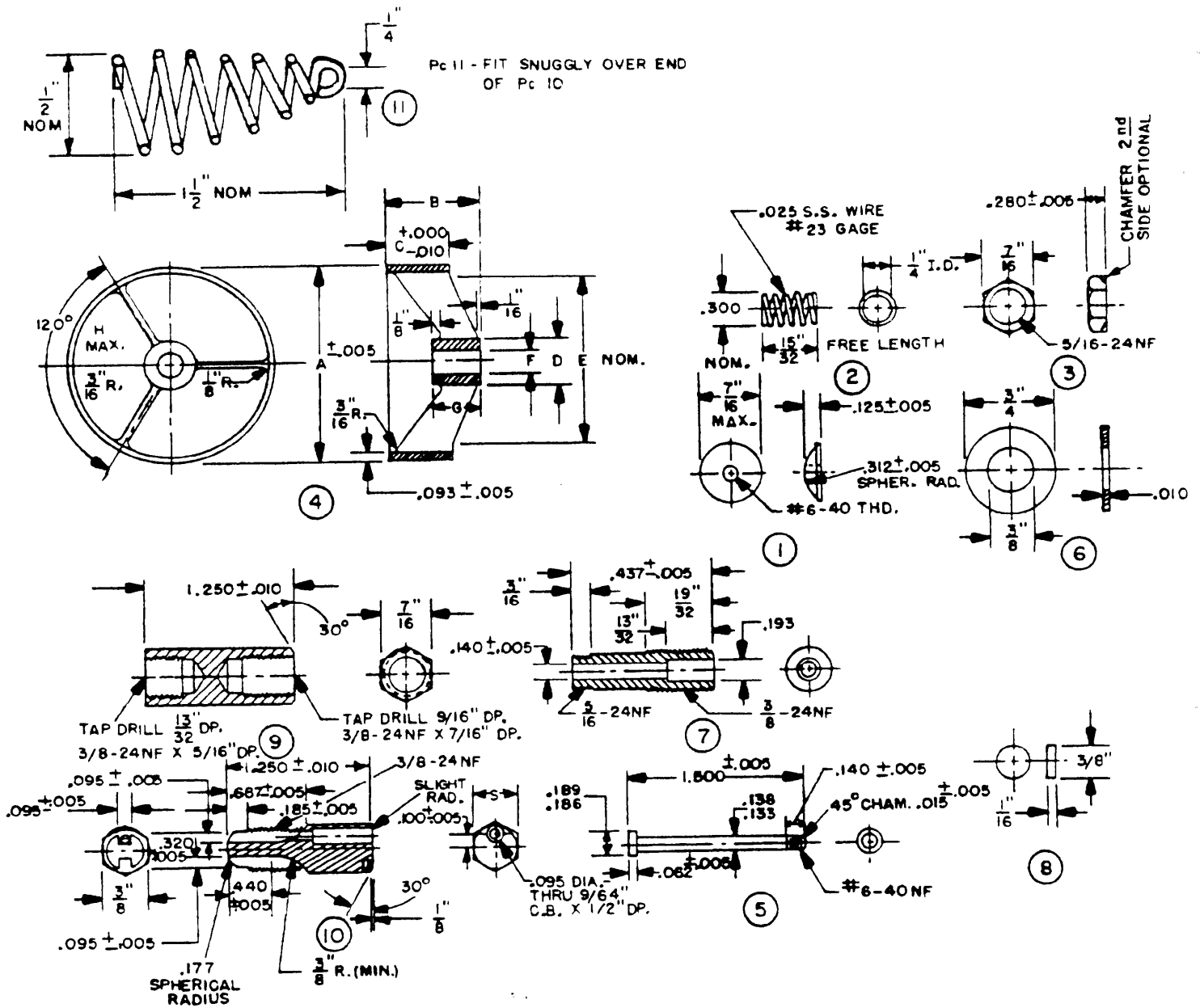
## Parts list

Part no.	Name
1.	Contact button
2.	Spring
3.	Front nut
4.	Spider
5.	Contact rod
6.	Washer (2 required)
7.	Contact rod guide
8.	Blind lead washer
9.	Double securing nut
10.	Cable connector
11.	Cable support spring

Note: One of each required except for piece 6 which requires two for each spider assembly. Two spider assemblies required per hose.

FIGURE 4. Contact assembly.

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NOTE: Piece 4 is critical to the spider assembly. Piece 4 dimensions are nondeviation. Other components of the spider assembly may be modified.

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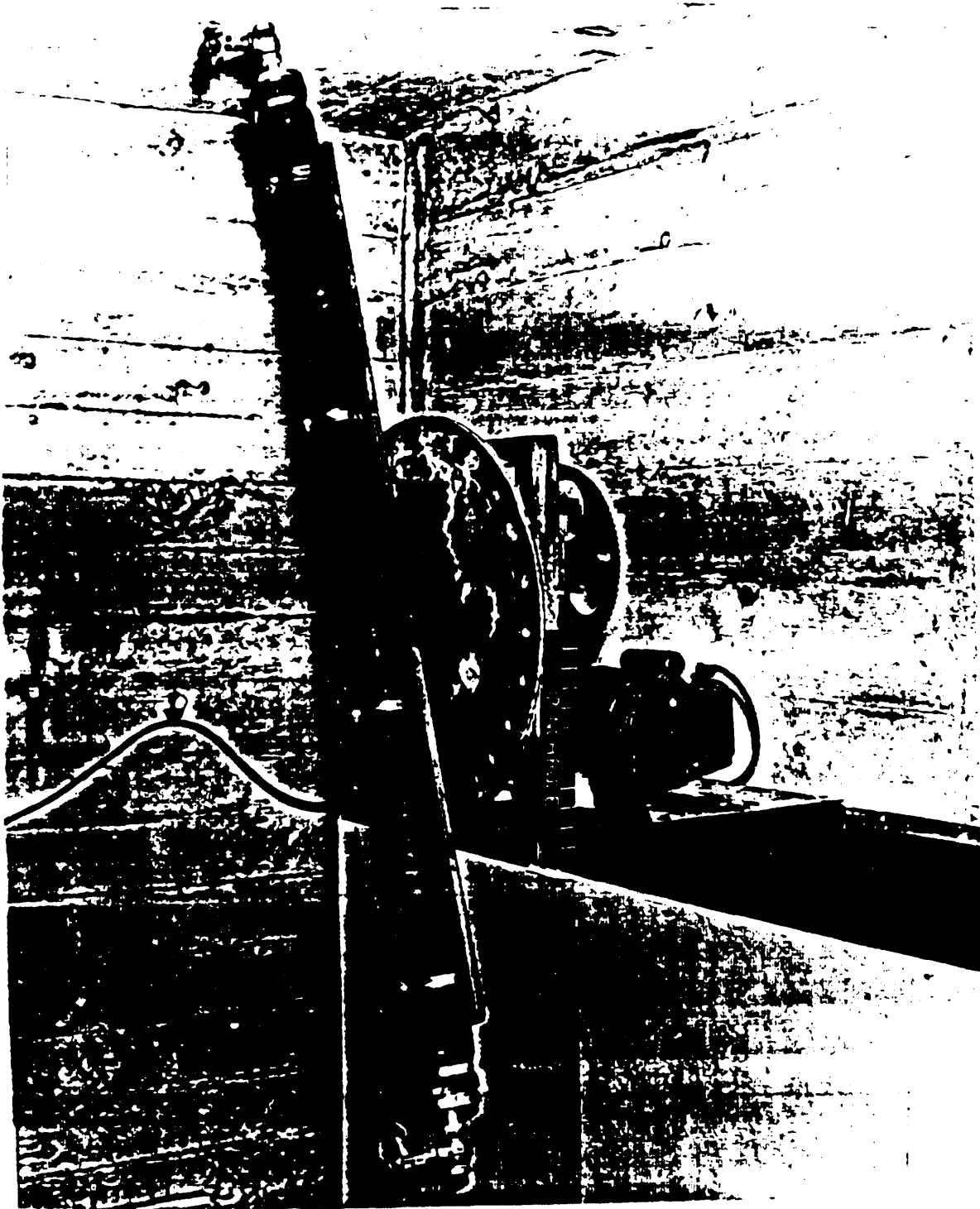
Part 4. Spider dimensions

Size	A	B	C	D	E	F	G	H
1-1/2	1.500	1.187	0.560	9/16	1-5/16	5/16	5/8	3/32
2-1/2	2.500	1.187	0.781	9/16	2-1/4	5/16	5/8	3/32

FIGURE 5. Spider assembly components.



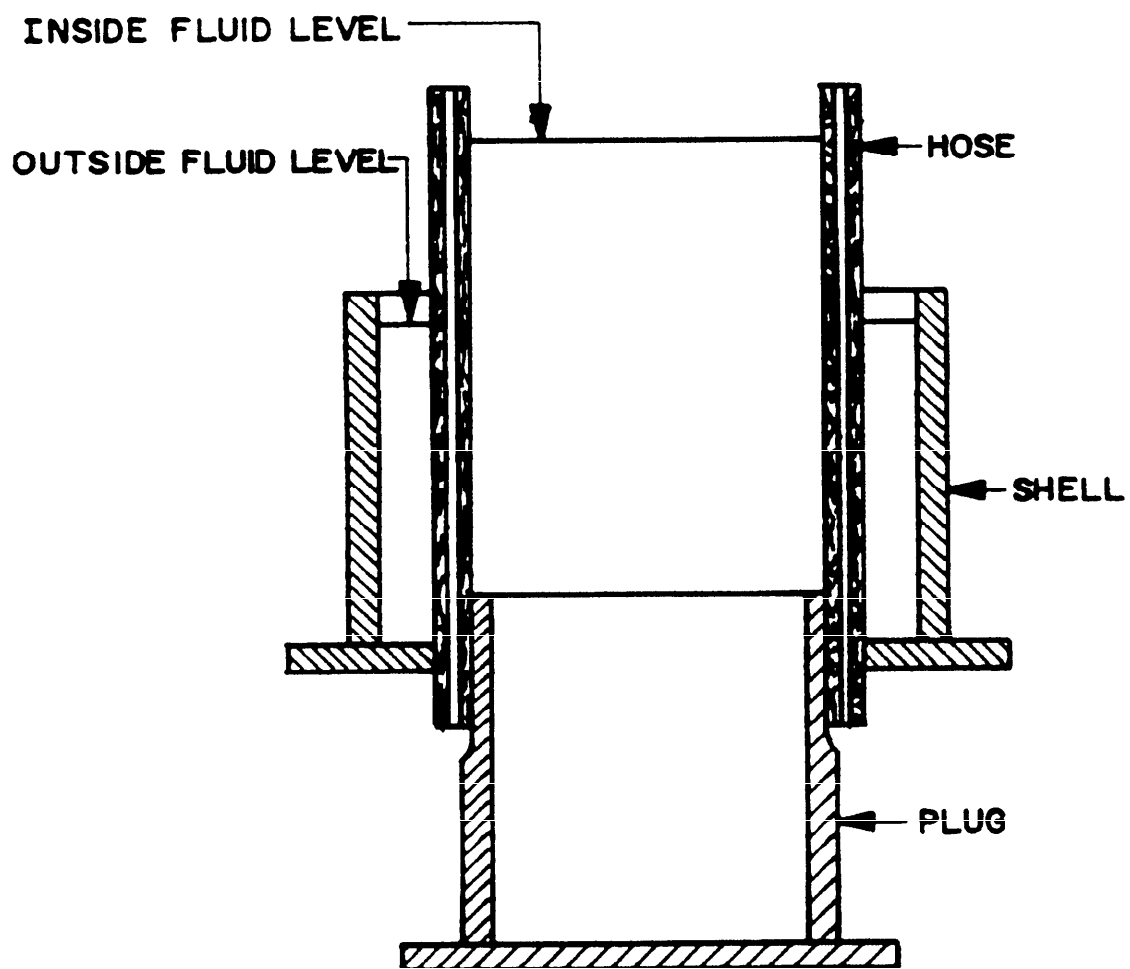
MIL-H-17902F(SH)



SH 13203096

FIGURE 6. Rotary apparatus used in sedimentation test of 2-1/2 inch id aircraft fueling hose.

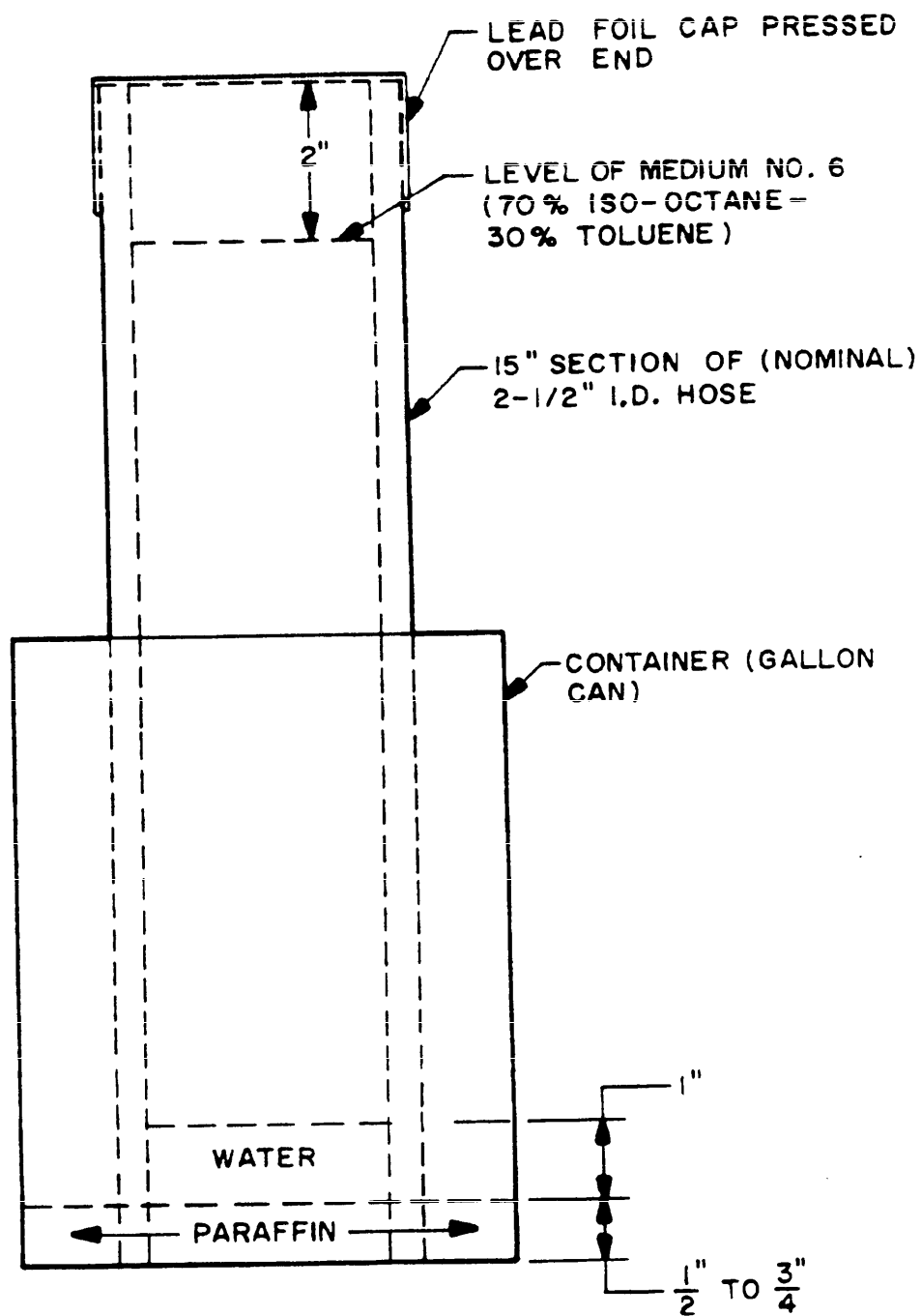
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SH 4433A

FIGURE 7. Jig for conditioning straight section of hose.

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SH 8042

FIGURE 8. Assembly for obtaining extract for use in determining Saybolt color number.

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**NOTE:** This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification 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.

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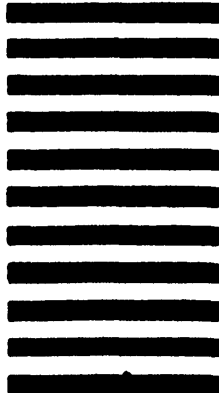
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(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-H-17902F(SH)	2. DOCUMENT TITLE HOSE, END FITTINGS AND HOSE ASSEMBLIES, SYNTHETIC RUBBER, AIRCRAFT FUELS
3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION (Mark one) <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____
b. ADDRESS (Street, City, State, ZIP Code)	
5. PROBLEM AREAS a. Paragraph Number and Wording:           b. Recommended Wording:           c. Reason/Rationale for Recommendation:	
6. REMARKS	
7a. NAME OF SUBMITTER (Last, First, MI) - Optional	b. WORK TELEPHONE NUMBER (Include Area Code) - Optional
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