



INCH-POUND
MIL-H-24606B(SH)
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SUPERSEDING
MIL-H-24606A(SH)
6 December 1985
(See 6.11)

MILITARY SPECIFICATION

HOSE, FIRE, SYNTHETIC FIBER, DOUBLE JACKETED, TREATED FOR ABRASION RESISTANCE, WITH COUPLINGS, FIRE FIGHTING AND OTHER WATER SERVICE

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 heavy duty, treated, double synthetic fiber woven jacket fire hose for fire fighting and other water service.

1.2 Classification. Fire hose is of the sizes and lengths specified in table I, as specified (see 6.2 and 6.8).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, SEA 03R42, Naval Sea Systems Command, 2531 Jefferson Davis Hwy, Arlington, VA 22242-5160 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 4210

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

TABLE I. Hose assembly size and length.

Size code no.	Assembly size (inches)	Assembly length (feet)
150	1.50	25
150	1.50	50
175	1.75	50
250	2.50	50
300	3.00	50
350	3.50	50
400	4.00	50

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

FEDERAL

- WW-C-621 - Coupling Assembly, Hose (Fire, Woven-Jacketed, Rubber- or Fabric-lined and Unlined).

MILITARY

- MIL-H-775 - Hose, Hose Assemblies; Rubber, Plastic, Fabric, or Metal (Including Tubing) and Associated Hardware: Packaging of.

STANDARDS

FEDERAL

- FED-STD-H28 - Screw Thread Standards for Federal Services.
- FED-STD-H28/10 - American National Hose Coupling and Fire-Hose Coupling Threads.
- FED-STD-162 - Hose, Rubber, Visual Inspection Guide for.
- FED-STD-191 - Textile Test Methods.
- FED-STD-595 - Colors Used in Government Procurement.
- FED-STD-601 - Rubber: Sampling and Testing.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, BLDG. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- B 134 - Standard Specification for Brass Wire. (DoD adopted)
- D 380 - Standard Test Methods for Rubber Hose. (DoD adopted)
- D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension. (DoD adopted)
- D 413 - Standard Test Methods for Rubber Property - Adhesion to Flexible Substrate. (DoD adopted)
- D 518 - Standard Test Method for Rubber Deterioration - Surface Cracking. (DoD adopted)
- D 573 - Standard Test Method for Rubber - Deterioration in an Air Oven. (DoD adopted)
- D 1149 - Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber. (DoD adopted)
- D 2240 - Standard Test Method for Rubber Property - Durometer Hardness. (DoD adopted)
- D 2256 - Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method.

(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 (except for related associated detail specifications, specifications, specification sheets or MS standards), 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 and shall consist of the materials specified in 3.2.1, 3.2.2, and 3.2.3 (see 6.3). The hose shall have been manufactured not greater than 1 year prior to date of delivery. Coupling materials shall be as specified in 3.3.6 and in accordance with WW-C-621.

3.2.1 Linex.

3.2.1.1 Rubber. Rubber, if used in the liner, shall be compounded from natural, synthetic, or a mixture of the two stocks.

3.2.1.2 Plastic. Plastic, if used, shall be extruded from virgin polyester based urethane.

3.2.2 Jacket yarns. The yarns used in both jackets shall be of virgin synthetic yarns as specified below:

- (a) Filler yarn: A high strength, low stretch filament polyester.
- (b) Warp yarn: A high strength, low stretch filament polyamide nylon 6 or 6,6 stable high bulked yarn comprising an entangled convoluted mass of continuous filaments, the bulked yarn as supplied for weaving having a denier not less than 8 percent greater than the denier of the unbulked yarn. The bulk in the yarn shall be retained during the weaving process such that the denier of the bulked yarn in the woven jacket is not less than 6 percent greater than the denier of the unbulked yarn.

or

Spun polyester yarn made from high strength, low stretch staple filament.

or

For inner jacket only, high strength, low stretch filament polyester.

Yarns that do not accept total saturation by any means of treatment with abrasion compounds are not acceptable.

3.2.2.1 Abrasion - taber method. The number of abrasion cycles required to completely abrade through one or more filler yarns of the outer jacket for all sizes of hose shall be not less than 3000 cycles.

3.2.2.2 Abrasion - Factory Mutual Research Corporation method. The number of abrasion cycles required to completely abrade through the outer jacket for all sizes of hose shall be not less than 10,000 cycles.

3.2.3 Color. The color of the outer jacket shall approach color chip 22510 of FED-STD-595. No color variation which approaches another chip number shall be permitted.

3.3 Construction. The hose shall consist of a seamless liner of rubber or plastic bonded to the inner woven jacket over which the treated outer woven jacket is placed. Unpressurized hose shall assume the shape of a flattened oval to facilitate storage.

3.3.1 Liner. The liner shall be a single ply, synthetic rubber or urethane extrusion of uniform thickness. The liner shall be free from dirt, blisters, and other imperfections. Inside surface shall be smooth and free from corrugations. Liner thickness shall be as specified in table II when measured as specified in 4.6.2. Liner properties before and after aging shall be as specified in table III.

TABLE II. Liner thickness.

Hose size	Min. thickness (inches)	
	Rubber	Urethane
150	0.040	0.012
175	.040	.012
250	.040	.012
300	.049	.015
350	.049	.015
400	.058	.018

TABLE III. Liner properties.

Property	Value
Shore hardness, A scale	50 ± 5 (rubber) 80 ± 10 (urethane)
Tensile strength, before aging	1200 psi minimum (rubber) 3000 psi minimum (urethane)
Tensile strength, after aging	70 percent retention after aging
Ultimate elongation, before aging	400 percent minimum
Ultimate elongation, after aging	70 percent retention after aging
Ozone resistance	No cracks after 100 hours exposure

3.3.1.1 Adhesion. The adhesion between the liner and the jacket shall be such that the rate of separation of a 1.50 inch strip of lining, transversely cut, shall be not greater than 1 inch per minute (for rubber) and 0.25 inch per minute (for urethane) under a 12 pound weight.

3.3.2 Jackets. The jackets shall be seamless and have the polyester filler yarns woven tightly and evenly around the liner throughout its length, with the warp ends interwoven with and completely covering the filler yarns. At no point shall the tube show through the inner jacket. The yarns shall have a tensile strength adequate to meet the requirements specified in table IV and filler pick count shall meet the requirements of table V. The jackets shall be free of defects, mis-weaves, dirt, knots, lumps, and irregularities that might affect the serviceability of the finished product.

TABLE IV. Yarn tensiles.

Hose size	Tensile strength (psi min)			
	Warp		Filler	
	Inner jacket	Outer jacket	Inner jacket	Outer jacket
150	30	40	132	100
175	30	40	145	132
250	40	40	176	145
300	50	50	264	176
350	50	50	264	264
400	50	50	264	264

 TABLE V. Filler pick count/inch (min).

Hose size	Inner jacket	Outer jacket
150	9.5	9.5
175	9.5	9.5
250	9.5	9.5
300	9	9
350	9	9
400	9	9

3.3.3 Outer jacket treatment. The outer jacket shall be treated in such a manner that the hose will be able to pass the abrasion tests and other requirements of this document. Treatment shall be cured by a mechanical process. Treatments cured with natural evaporation are not acceptable. Treatment shall be completed and cured prior to the jackets being combined.

3.3.3.1 Saturation. Total saturation shall consist of total immersion of the outside jacket into a liquid compound of treatment chemical and shall include a method to force the compound to all surfaces in the jacket.

3.3.4 Inside diameter. The inside diameter of the hose shall be not less than the trade size of the hose as specified in table I.

3.3.5 Length and weight. Unless otherwise specified (see 6.2), the fire hose lengths and weights shall be furnished as specified in table VI.

TABLE VI. Length and weight of hose assembly.

Size	Length (feet) (+ 3 in. - 0 in)	Weight of coupled length (pounds, max)
150	25	15
150	50	20
175	50	21.5
250	50	35
300	50	46.5
350	50	62
400	50	72

3.3.6 Couplings and gaskets. Unless otherwise specified (see 6.2), each length of hose shall be fitted with a set (one male and one female) of cast or forged couplings, with rubber gaskets (Buna N 65-75 durometer). Couplings shall conform to type A, style 1 of WW-C-621 and as follows. The female swivel shall be held onto the coupling bowl by snap ring or ball bearing as indicated in table VII. Coupling threads shall be as indicated in table VII. Snap ring retention details shall be as specified on figure 1. Unless otherwise specified, swivel nut and female/male hose bowls shall be fabricated of brass, in accordance with WW-C-621.

TABLE VII. Coupling threads/swivel retention.

Hose size	Thread designation FED-STD-H28 & FED-STD-H28/10	Swivel retention
150	1-1/2 - 11-1/2 NPSH	Snap ring
175	1-1/2 - 11-1/2 NPSH	Snap ring
250	2-1/2 - 7-1/2 NH	Snap ring
300	3 - 6 NH	Ball bearing
350	3-1/2 - 6 NH	Ball bearing
400	4 - 6 NH	Ball bearing

3.3.6.1 Snap ring. Snap rings shall be fabricated of spring brass, alloy C26000 of ASTM B 134. Snap rings shall be either square or rectangular. No other cross section is acceptable. Snap ring and snap ring groove dimensions shall be as specified on figure 1. Snap ring shall have a 50 to 60 percent engagement with the swivel.

3.3.6.2 Ball bearings. Retaining balls for sizes 300 and larger couplings shall be fabricated of grade 1000 Naval brass. Bearing insertion hole in the coupling swivel shall be closed with a set screw. Set screw shall be staked to prevent accidental removal.

3.3.6.3 Washers. Washers shall be inserted at the face of the expansion ring in both the female and male coupling bowls and in the swivel ring of the female coupling.

3.4 Performance.

3.4.1 Hydrostatic proof pressure. The hose, complete with couplings, shall not sweat or show leakage at the hose or couplings, and shall not show breakage of jacket yarns when it is subjected to the applicable hydrostatic pressure as specified in table VIII for a minimum of 15 seconds and tested for elongation, twist, warp, and rise as specified in 4.6.1.1.

TABLE VIII. Pressure testing requirements.

Hose size	Proof pressure (psi)	Kink pressure (psi)	Burst pressure (psi)	
			Inner jacket only	Complete dbl jacket assembly
150	600	500	585	900
175	600	500	585	900
250	600	500	585	900
300	600	400	585	900
350	600	300	540	900
400	400	300	540	600

3.4.1.1 Hose elongation. When subjected to the proof pressure test as specified in 4.6.1.1, the hose shall elongate not greater than 8 percent for sizes 150 through 250, not greater than 10 percent for size 300, and not greater than 13 percent for sizes 350 and 400 when measured from an initial pressure of 10 pounds per square inch (psi).

3.4.1.2 Hose twist. When subjected to the proof pressure test as specified in 4.6.1.1, the hose shall twist not greater than that specified in table IX. A maximum twist to the left of 2 degrees per foot shall be permitted while the pressure is being raised; but any final twist shall be to the right.

TABLE IX. Hose twist.

Hose size	Hose twist (degrees per foot)
150 through 175	29
250 through 400	12.5

3.4.1.3 Hose warp. When subjected to the proof pressure test as specified in 4.6.1.1, the hose shall deviate not greater than 20 inches (for 50 foot hose length) or 10 inches (for 25 foot hose length) from a straight line drawn from center to center of the fittings at the ends of the hose.

3.4.1.4 Rise. When subjected to the proof pressure test as specified in 4.6.1.1, the hose shall not rise or lift off the flat surface upon which it rests.

3.4.1.5 Kink. When tested as specified in 4.6.1.3, the hose shall not leak, burst or show other signs of failure.

3.4.1.6 Low temperature flexibility. When tested as specified in 4.6.3, the hose shall show no damage to the jackets or lining, and shall not leak when subjected to the proof pressure test upon completion of the low temperature flexibility test.

3.4.1.7 Water absorption. When tested as specified in 4.6.4, the maximum weight gain shall be not greater than that specified in table X.

TABLE X. Water absorption weight gain.

Hose size	Weight gain pounds (max) per 50 foot length
150	5
175	5
250	7
300	8.5
350	12
400	15

3.4.2 Burst pressure. The hose shall not burst at pressures less than those as specified in table VIII for the respective size of hose when tested as specified in 4.6.1.2. The pressure shall be applied to the hose when it is lying straight and when it is held in a circular arc of 27-inch radius.

3.5 Friction or head loss. The first article sample shall conform to the friction or head loss maximum requirements as specified in table XI when tested as specified in 4.6.5.

TABLE XI. Maximum allowable friction loss psi per 50 feet.

Hose size	Flow rate (gallons per minute)	Allowable loss per 50 feet (psi)
150	100	17
175	125	9
250	250	8
300	308	8.5
350	295	4
400	300	2.5

3.6 Marking. Each hose assembly shall be marked at a point beginning not less than 4 feet from each end with stenciled letters not less than 1 inch high in indelible ink of a contrasting color. Marking shall include:

- (a) Number of this specification, including revision letter.
- (b) Size and length.
- (c) The words "Service test pressure ____" (see table XII).
- (d) Month and year of manufacture.
- (e) Manufacturer's name or commercial and Government entity (CAGE) code number.

TABLE XII. Service test pressure.

Hose size	Service test pressure (psi)
150	300
175	300
250	300
300	300
350	300
400	200

3.7 Labeling of hose. When specified (see 6.2), hose shall be approved and labeled by a nationally recognized testing group or agency (see 6.6) adequately equipped to perform testing of fire hose.

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. For the purpose of quality conformance inspection and test sampling, a lot is defined as all the hose lengths with couplings, of the same size, produced in one facility, using the same production processes and materials, and being offered for delivery at one time.

4.3 First article inspection. Unless otherwise specified (see 6.2), first article inspection shall be performed on one hose assembly (see 6.4). The inspection shall include the examination of 4.5 and the tests of 4.6 (see 6.3). The first article may be a standard production item from the contractor's current inventory provided that the unit meets the requirements of this specification and is representative of the design, construction, and manufacturing techniques applicable to the remaining units to be furnished under the contract.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the following:

- (a) Individual examination and tests (see 4.4.1).
- (b) Sampling for tests (see 4.4.2).

4.4.1 Individual examination and tests. Each length of hose or hose assembly shall be subjected to the following examination and tests:

- (a) Visual examination and dimensional inspection, except for inside diameter (see 4.5 through 4.5.2.1).
- (b) Hydrostatic pressure test (see 4.6.1.1).

4.4.2 Sampling for tests.

4.4.2.1 Sampling for construction, accelerated aging, tensile strength, ultimate elongation, ozone resistance, liner thickness, hardness, adhesion, pick count, and inside diameter. As a minimum, the contractor shall randomly select a sample quantity of completed hose lengths as specified in table XIII and test them as specified in 4.5.2.2, 4.6.2, 4.6.6, 4.6.7, 4.6.9, 4.6.10, and 4.6.11 (see 6.9). From each sample selected, a 3-foot section shall be cut and subjected to the tests specified herein. Samples for the tests specified herein may be obtained from the samples used in the burst test provided the samples are of sufficient size for testing.

4.4.2.2 Sampling for burst test (see 3.4.2). As a minimum, the contractor shall randomly select a sample quantity from each lot of completed hose lengths as specified in table XIII and test them as specified in 4.6.1.2 and the applicable test methods as specified in table XIV (see 6.9). From each sample selected, a 3-foot section shall be removed for test purposes. Tests of the sample shall alternate between bursting the inner jacket only sample and the complete double jacket assembly sample. Both of the inner jacket only samples and the complete double jacket assembly samples shall alternate between bursting the straight sample and the curved sample.

TABLE XIII. Sampling for burst, 4.4.2.1 and 4.4.2.5 tests.

Lot size	Sample size
2 to 25	2
26 to 50	3
51 to 90	4
91 to 150	5
151 to 280	6
281 to 500	7
501 to 1,200	8
1,201 and over	9

TABLE XIV. Tests for physical properties.

Property	Requirement	ASTM or FED-STD-601 method	Reference or footnote
Color	3.2.3		4.5.1
Construction	3.3	Method 5050	4.6.2
Accelerated aging	3.3.1 & table III	ASTM D 573	4.6.9
Tensile strength of liner	3.3.1 & table III	ASTM D 412	<u>1</u> /4.6.10
Ultimate elongation of liner	3.3.1 & table III	ASTM D 412	<u>1</u> /4.6.10
Hardness of liner	3.3.1 & table III	ASTM D 2240	4.6.11
Thickness of liner	3.3.1 & table II	Method 2011	4.6.2
Adhesion	3.3.1.1	ASTM D 380	4.6.7
Ozone resistance	3.3.1 & table III	ASTM D 1149	<u>2</u> /4.6.6
Yarn tensile	3.3.2 & table IV	ASTM D 2256	4.6.12
Pick count	3.3.2 & table V	-	4.6.2
Inside diameter	3.3.4	Method 2341	4.5.2.2
Length and weight	3.3.5 & table VI	Method 2411	4.5.2.1 & 4.5.2.3
Hydrostatic proof pressure	3.4.1 & table VIII	ASTM D 380	4.6.1.1
Burst pressure	3.4.2 & table VIII	ASTM D 380	4.6.1.2
Elongation	3.4.1.1	ASTM D 380	4.6.1.1
Twist, degrees per foot	3.4.1.2	ASTM D 380	4.6.1.1
Warp	3.4.1.3	ASTM D 380	4.6.1.1
Rise	3.4.1.4	ASTM D 380	4.6.1.1
Kink under pressure	3.4.1.5 & table VIII	ASTM D 380	4.6.1.3
Low temperature flexibility	3.4.1.6	-	4.6.3
Water absorption	3.4.1.7 & table X	-	4.6.4
Friction or head loss	3.5 & table XI	-	4.6.5

1/ For rubber lining, die A of ASTM D 412 shall be used for cutting the specimen.
2/ Specimen shall be prepared in accordance with ASTM D 518, procedure C.

4.4.2.3 Sampling for water absorption. One 50-foot length each of size 150 and 250 hose without end couplings shall be subjected to the test as specified in 4.6.4 (see 6.9).

4.4.2.4 Sampling of yarn construction. Four packages of each type of yarn used in the construction shall be retained from the yarn lot corresponding to that material used for producing a given hose lot. Three samples shall be used from each of these packages to determine the average minimum yarn tensile strength and for the determination of the warp yarn composition and type. If yarn is supplied directly from a fiber producer, certification of yarn test results may be supplied in lieu of in plant tests.

4.4.2.5 Sampling for weight determination. As a minimum, the contractor shall randomly select a sample quantity of completed hose lengths in accordance with table XIII and test them in accordance with 4.5.2.3 (see 6.9).

4.4.2.6 Sampling for abrasion - taber method. As a minimum, the contractor shall randomly select a sample quantity of completed hose lengths, each 30 inches long, with one sample selected for every 500 lengths per lot and subject them to the tests as specified in 4.6.8.1. A minimum of one sample shall be selected for each lot. In addition, the Government quality assurance representative will select one additional 30-inch sample per 500 lengths per lot prior to acceptance, with a minimum of one sample selected from each lot. The Government reserves the right to perform the abrasion test on additional lengths at the destination for a period of 60 days after receipt of any hose lot.

4.4.2.7 Sampling for abrasion - Factory Mutual Research Corporation method. A second sample shall be selected from the lot as specified in 4.4.2.6 and tested as specified in 4.6.8.2.

4.5 Examination.

4.5.1 Visual examination. Each length of hose shall be examined for the defects listed in FED-STD-162. In addition, each hose shall be examined to determine if the color meets the requirements as specified in 3.2.3.

4.5.2 Dimensions.

4.5.2.1 Length. The distance between the inside edges of the couplings shall be determined as specified in method 2411 of FED-STD-601, except that the measurement shall be made while a hydrostatic pressure of 10 psi is applied to the specimen as specified in ASTM D 380. The lengths of all hose in the lot shall be as specified in 3.3.5. An individual hose assembly shall be rejected if it is less than the corresponding length specified in table VI.

4.5.2.2 Inside diameter. The inside diameter shall meet the requirements of 3.3.4 and be determined in accordance with method 2341 of FED-STD-601, except that not less than two measurements shall be made on the test unit. The measurements of hose with couplings shall be made when the 3-foot length is taken for the burst test, or when the 3-foot length is taken for low temperature flexibility testing.

4.5.2.3 Weight determination. The 25-foot and 50-foot samples for the weight determination shall be drained of any residual water and shall then be weighed to the nearest 0.1 pound and the weight recorded.

4.6 Tests. Hose samples selected shall be subjected to the applicable tests as specified in table XIV.

4.6.1 Pressure testing.

4.6.1.1 Hydrostatic proof pressure. Each length of hose in the lot with couplings attached, or length of hose remaining after removal of portions on which couplings have been attached by the manufacturer for use in other tests, shall be subjected to a hydrostatic pressure test in accordance with ASTM D 380 for conformance to the requirements of table VIII and 3.4.1.1 through 3.4.1.4. The hose assembly shall be held for a minimum of 15 seconds at the test pressure. Each hose assembly shall be index-marked with a pencil or other suitable device at a point immediately adjacent to the back side of each coupling. No slippage or leakage at the couplings or hose shall occur when the pressure specified in table VIII is applied to the length. Individual hose assemblies shall be rejected if they fail to meet the requirements of 3.4.1 and table VIII.

4.6.1.2 Burst pressure. Hose assemblies from each lot shall be subjected to the burst pressure specified in table VIII (see 3.4.2). Samples shall alternate between the inner jacket only burst and the double jacket hose assembly burst. The burst pressure test shall be determined in accordance with ASTM D 380, except the outer jacket shall be carefully removed without damaging the inner jacket for the inner jacket only burst samples.

4.6.1.3 Kink. One full length of hose from each lot shall be completely filled with water, taking care to remove all the air from within the hose. The hose shall be pressurized to not less than 10 psi and then kinked 18 inches from the free end by tying the hose back against itself so that there will be a sharp kink. The pressure shall then be raised to the kink pressure specified in table VIII and then immediately released. The sample shall meet the requirements of 3.4.1.5 (see 6.9).

4.6.2 Construction and physical property tests. The thickness of the lining shall be determined in accordance with method 2011 of FED-STD-601. After removal of the specimens used in tests of the lining, the remaining specimens of hose jacket shall be unraveled as necessary and tested in accordance with method 5050 of FED-STD-601 for consistency. In addition to the above test, the filler pick count shall be determined and checked as specified in 3.3.2 and table V.

4.6.3 Low temperature flexibility. A 3-foot section of hose shall be exposed to a temperature of minus 40 ± 25 degrees Fahrenheit ($^{\circ}$ F) for a period of 24 hours. At the end of the exposure period and while maintained at the above temperature, the hose shall be rapidly bent 180 degrees double on itself, first one way and then the other. The hose shall then be examined for evidence of cracking or breaking of the jacket and liner. The hose shall then be allowed to return to room temperature over a 24-hour period, after which it shall be subjected to the applicable hydrostatic proof pressure. The sample shall meet the requirements of 3.4.1.6 (see 6.9).

4.6.4 Water absorption. The 50 foot sample hose selected as specified in 4.4.2.3 shall be conditioned in an oven at $158 \pm 5^{\circ}\text{F}$ for 72 hours, then cooled to room temperature. The sample shall then be weighed to the nearest 0.1 pound and the weight recorded. The sample shall then be submerged in water for 1 hour, removed from the water and allowed to drip dry for 10 minutes by hanging vertically. The sample shall then be weighed again to the nearest 0.1 pound. The dry, or first weight, shall be subtracted from the wet, or second weight, to determine compliance as specified in 3.4.1.7 and table X. The sample shall meet the requirements of 3.4.1.7 and table X (see 6.9).

4.6.5 Friction or head loss. The friction or head loss test shall be made with the coupling gaskets in place. Two or more lengths shall be coupled together. Friction or head loss from hose inlet to outlet shall be measured with calibrated gauges, a manometer, or through the use of a gauge and a calibrated flow meter. The maximum allowable head loss shall be not greater than the values as specified in table XI.

4.6.6 Ozone resistance. Specimens for ozone resistance of the liner shall be prepared in accordance with ASTM D 518, procedure C. Specimens shall be tested in accordance with ASTM D 1149. Specimens shall be elongated 15 percent, and the ozone concentration shall be 100 ± 5 parts per hundred million by volume. Temperature shall be $100 \pm 3^{\circ}\text{F}$ and exposure time shall be 100 hours. The sample shall meet the requirements of 3.3.1 and table III (see 6.9).

4.6.7 Adhesion. The adhesion test specimens shall be prepared in accordance with the procedure specified in ASTM D 380 for woven jacketed rubber or plastic lined hose. The specimens shall then be tested in accordance with the static mass method specified in ASTM D 413 using a 180 degree peel strip specimen. The sample shall meet the requirements of 3.3.1.1 (see 6.9).

4.6.8 Abrasion.

4.6.8.1 Taber method. The abrasion test shall be conducted in accordance with FED-STD-191, method 5306. The abrasion machine shall be of the type equipped with a vacuum nozzle to continuously remove dust, lint, and any disintegrated or worn cloth from the test specimen. The vacuum level shall be maintained at a setting of 60. The abrasion machine shall be equipped with a pair of H-22 calibre wheels and the test shall be conducted with a 1000 gram load. Five specimens shall be cut from the outer jacket of each sample selected as specified in 4.4.2.6 so that both folds of the jacket shall be included in the abrasion path. The specimens shall measure 4.25 inches square and tested as follows:

- (a) The specimen shall be affixed to Taber No. S-36 mounting cards, with the inside portion of the outer jacket fabric in contact with the adhesive side of the cards. A 0.25 inch diameter hole shall be punched into the center of the specimen and card, and a rubber cement shall be applied to the perimeter of the fabric to prevent displacement of the filler yarns during the test. It may be necessary to unravel one or two warp ends on the sides of the specimens before applying the cement to properly anchor the filler yarns.

- (b) The card and specimen shall then be placed on the E 100-125 specimen holder, with the outer surface of the fabric facing up. The clamp plate and nut shall then be lightly tightened to anchor it to the specimen holder.
- (c) The tester shall be started and the specimens shall be examined at intervals not greater than one-hundred cycles until the end point is reached. The end point shall be that point at which one or more filler yarns is completely abraded through or severed in two, with the number of cycles recorded to the nearest 10 cycles.
- (d) The number of cycles to complete abrasion of the filler yarns from the five specimens from each sample shall be averaged and recorded. Also, each individual value of the average shall be recorded.

The average number of cycles to completely abrade the filler yarn for any one sample shall be not less than the requirement of 3.2.2.1 (see 6.9).

4.6.8.2 Factory Mutual Research Corporation method. The 30-inch samples selected as specified in 4.4.2.7 shall be attached with couplings at each end. A cap shall be placed on one end of the sample and it shall be filled with water at a pressure of 125 psi and firmly anchored horizontally. A Norton standard 5- by 2- by 0.5 inch abrasion wheel designation 37C36-K.V.K., or equal, shall be reciprocated back and forth along the crown of the hose (see 6.4). The wheel shall be prevented from rotating and shall exert on the hose its full weight plus half of the 1 pound of the moving arm. The stroke of the abrading wheel shall be 14 inches. The frequency of the cycle shall be not greater than 30 per minute. The contact surface of the abrasion wheel shall be unused at the start of the test. The abrasion wheel shall be cleaned of fibers, dust, and other hose material every 500 cycles.

4.6.8.2.1 Examination during test. The samples shall be examined at 500 cycle intervals until the end point is reached. The end point shall be the total number of cycles until the outer jacket is completely abraded through and the wheel first makes contact with the inner jacket warp yarns or 10,000 cycles, whichever comes first. The sample shall meet the requirements of 3.2.2.2 (see 6.9).

4.6.9 Accelerated aging. Hose samples selected shall be tested for accelerated aging as specified in ASTM D 573 (see 3.3.1, table III, and table XIV).

4.6.10 Tensile strength and ultimate elongation. Hose samples selected shall be tested for tensile strength and ultimate elongation as specified in ASTM D 412 (see 3.3.1, table III, and table XIV).

4.6.11 Hardness of liner. Hose samples selected shall be tested for hardness of liner as specified in ASTM D 2240 (see 3.3.1, table III, and table XIV).

4.6.12 Yarn tensile. Hose samples selected shall be tested for yarn tensile strength as specified in ASTM D 2256 (see 3.3.2, table IV, and table XIV).

4.7 Inspection of packaging. Sample packages and the inspection of the packaging (preservation, packing and marking) for shipment and stowage 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 Preservation, packing, and marking. Packaging requirements (preservation, packing and marking) shall be in accordance with MIL-H-775 for the level of preservation (A, C, or commercial), the level of packing (A, B, C, or commercial), and marking including other packaging acquisition options therein, as specified (see 6.2).

6. NOTES

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

6.1 Intended use. This hose is intended for use in shipboard applications wherever double cotton jacket hose or rubber covered hose is used and where additional abrasion resistance is required such as non-skid decks on shipboard. This hose is not for use in AFFF/PKP hose reels.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Classification (see 1.2).
- (c) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (d) Whether or not first article is required (see 3.1).
- (e) If length is other than specified (see 3.3.5).
- (f) If couplings are other than specified (see 3.3.6).
- (g) Whether couplings should be as specified, one male and one female, or should be both male or both female (see 3.3.6).
- (h) If coupling thread is other than specified (see 3.3.6 and table VII).
- (i) When approval and labeling is required (see 3.7).
- (j) Number of first article hose assemblies if other than specified (see 4.3).
- (k) Level of preservation, level of packing, and other options required (see 5.1).

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 (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's 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>
3.2	DI-MISC-80678	Certification/data report	10.3.1 does not apply
4.3	DI-NDTI-80809	Test/inspection reports	---

The above DID's 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 DID's are cited on the DD Form 1423.

6.4 First article. When a first article inspection is required, the unit should be a first production item or it may be a standard production item from the contractor's current inventory as specified in 4.3. The first article should consist of one hose assembly. The contracting officer should 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.

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 Recognized testing agency or laboratory. The testing agency or laboratory should be one which is regularly engaged in the examination, testing, and evaluation of fire hose, which has an established factory inspection listing and labeling program; and which has published standards for listing and labeling that are nationally recognized. For example, the Underwriters' Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062 and the Factory Mutual Engineering Division, 1151 Boston-Providence Turnpike, Norwood, MA 02062 are considered recognized testing agencies.

6.6.1 Recognition of prior testing. It should be noted that all applicable requirements of this specification should be verified in accordance with section 4. However, hose bearing the label of a recognized testing agency or laboratory will require additional testing only for those requirements, as applicable, which have not been performed or confirmed by the agency label service.

6.7 Norton standard abrasion wheel. Information for the Norton standard abrasion wheel specified in 4.6.8.2 may be obtained from the Norton Co., 1 New Bond, Worchester, MA 01606.

6.8 Part or identifying number (PIN). The PIN for the hose assemblies covered by this specification shall consist of the letter "M", the basic number of the specification, and coded dash numbers (see 6.8.1 and 6.8.3) as shown in the following example:

M24606 - 250 - 50

Basic number of specification			
Hose assembly size code no.			
Hose assembly length			

6.8.1 Hose assembly size. The hose assembly size (nominal inside diameter) is identified by three digits (see table I).

6.8.2 Hose length. The hose length is identified by two digits (see table I).

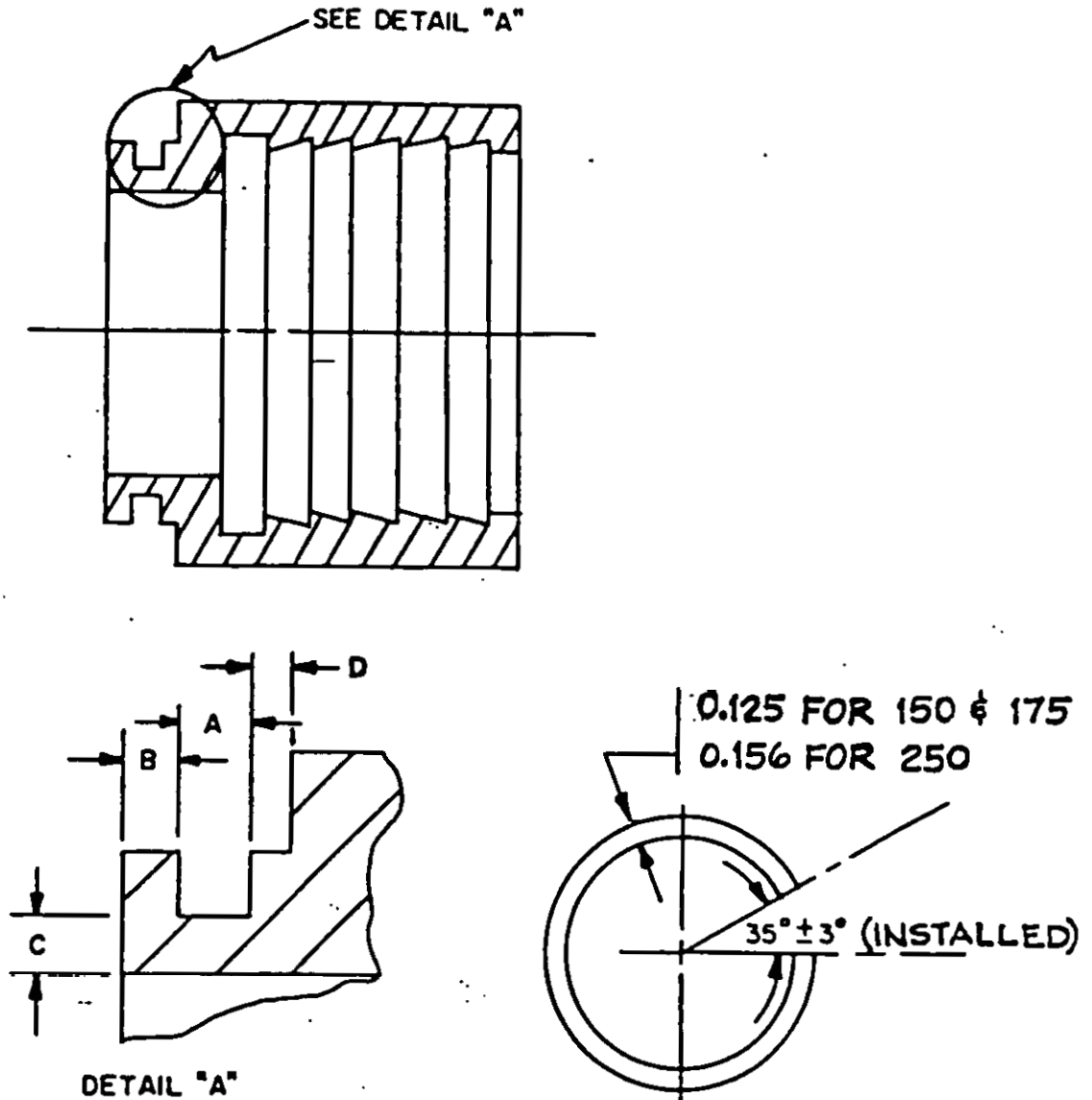
6.9 Lot acceptance and rejection criteria. If one or more defects are found in any sample, the entire lot represented by the sample should be rejected. If a lot is rejected, the contractor has the option of screening 100 percent of the lot for the defective characteristic(s) or providing a new lot which should be tested in accordance with the sampling plan contained herein.

6.10 Subject term (key word) listing.

Pressure testing
Synthetic yarn

6.11 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.

Preparing activity:
Navy - SH
(Project 4210-N440)



SNAP-RING GROOVE

SIZE	A(MAX)	B(MIN)	C(MIN)	D(MIN/MAX)
150	0.148	0.110	0.089	0.107/0.128
175	0.148	0.110	0.089	0.107/0.128
250	0.176	0.160	0.155	0.169/0.192

Note: SIZES 300 AND LARGER USE BEARINGS TO RETAIN SWIVEL.

SNAP-RING MAY BE SQUARE OR RECTANGULAR. NO OTHER CROSS SECTION IS ACCEPTABLE. WHEN ASSEMBLED, THE SNAP-RING SHALL HAVE A 50 TO 60% ENGAGEMENT WITH THE FEMALE SWIVEL.

SNAP-RING MUST BE FLAT WITHIN 0.047 INCH.

FIGURE 1. Snap-ring groove and snap ring details.

