

MIL-F-27272A

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MILITARY SPECIFICATION

FITTINGS, TETRAFLUOROETHYLENE HOSE, HIGH TEMPERATURE, MEDIUM
PRESSURE, GENERAL REQUIREMENTS FOR

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

1. SCOPE

1.1 This specification covers the general requirements for medium-pressure, high-temperature, tetrafluoroethylene hose fittings.

1.2 Classification.- Fittings shall be of the following classes (see 6.2):

Class 1 - All corrosion-resisting steel (+450° F)

Class 2 - Combination aluminum and corrosion-resisting steel (+275° F)
(Lightweight -8 size and larger.)

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONSFederal

TT-S-735 Standard Test Fluids, Hydrocarbon

Military

MIL-D-1000 Drawings, Engineering and Associated Lists
MIL-J-5161 Jet Fuel, Referee
MIL-H-5606 Hydraulic Fluid, Petroleum Base; Aircraft,
Missile, and Ordnance
MIL-T-5624 Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-S-7742 Screw Threads, Standard, Optimum Selected Series:
General Specification for
MIL-L-7808 Lubricating Oil, Aircraft Turbine Engine,
Synthetic Base
MIL-H-8446 Hydraulic Fluid, Nonpetroleum Base, Aircraft
MIL-A-8625 Anodic Coatings, for Aluminum and Aluminum Alloys

FSC 4730

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MIL-S-8879 Screw Threads, Radius Root, for Increased Fatigue Life and Stress Levels
 MIL-H-27267 Hose, Tetrafluoroethylene, High Temperature, Medium Pressure
 MIL-T-27602 Trichloroethylene, Oxygen Propellant Compatible

STANDARDSMilitary

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes
 MIL-STD-130 Identification Marking of US Military Property
 MIL-STD-143 Specifications and Standards, Order of Precedence for the Selection of
 MIL-STD-453 Inspection, Radiographic
 MIL-STD-831 Test Reports, Preparation of
 MIL-STD-845 Fitting, Hose, Tetrafluoroethylene, High Temperature, Medium Pressure, Classification of Defects
 MS20756 Flange, Swivel, Retaining
 MS33514 Fitting End, Standard Dimensions for Flareless Tube Connection and Gasket Seal
 MS33656 Fitting End, Standard Dimensions for Flared Tube Connection and Gasket Seal

(See Supplement 1 for list of applicable Military Standards.)

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications.- The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Standards Association

ASA B46.1 - 1962 Surface Texture (Surface Roughness, Waviness and Lay)

(Copies of the above publication may be obtained from the American Standards Association, Inc., 10 East 40th Street, New York, N. Y. 10016.)

3. REQUIREMENTS

3.1 Qualification.- The hose fittings furnished under this specification shall be products which have been subjected to and which have passed the qualification test specified herein, and which have been listed on or approved for listing on the applicable Qualified Products List.

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3.2 Materials.- Materials shall be limited to those specified on the applicable detail military standards (MS).

3.2.1 Heat treatment.- Aluminum alloy materials shall be heat treated in accordance with the applicable MS.

3.3 Selection of specifications and standards.- Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.4 Design and construction.- The design and construction of the fittings shall be in accordance with the applicable MS. Special features shall not be used on the portion of the fitting that attaches to the hose. The fittings shall be designed for use with hose in accordance with MIL-H-27267.

3.4.1 The fittings shall mate with fitting ends designed in accordance with MS33514, MS33656, or with flange MS20756, as applicable.

3.4.2 Dimensions.- Dimensions of the fittings shall be as specified on the applicable MS.

3.4.3 Surface roughness.- Surface roughness shall be in accordance with ASA B46.1 - 1962.

3.5 Performance.- The fittings shall meet the following performance requirements. (Test temperatures for class 2 fittings shall be 275° F wherever a higher temperature is specified.)

3.5.1 Lubricant wear.- (Applicable only to class 1 fittings.) The fittings shall be assembled six times and disassembled five times, not exceeding the torques listed in table III (see 4.6.2).

3.5.2 Proof pressure.- The fittings shall be subjected to the proof pressure specified in table I for at least 30 seconds but not more than 5 minutes.

3.5.3 Leakage.- The fittings shall not leak when subjected to 2 cycles in which the pressure is increased to 70 percent of burst pressure, held for 5 minutes, and then released.

3.5.4 Room temperature burst pressure.- The fittings shall not leak or blow off the hose at any pressure below the burst pressure specified in table I.

3.5.5 Stress degradation.- The fittings shall not exceed the air leakage as specified when tested in accordance with 4.6.7 and shall not leak when pressurized at low temperature.

3.5.6 Effusion.- The effusion rate of the assemblies shall not exceed the values listed in table V (see 4.6.8).

3.5.7 Pneumatic surge.- The fittings shall not leak when proof tested after being subjected to the test specified in 4.6.9.

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TABLE I. Test samples, proof and burst pressures (for assemblies)

Size	Length of 6 samples for impulse test (inches)	Length of 10 samples for all other tests (inches)	Operating pressure (psi max.)	Proof pressure (psi min.)	Burst pressure room temp. (psi min.)	Burst pressure high temp. (psi min.)	Minimum bend radius (inside of bend) (inches)
-3/-4	14	18	1,500	3,000	12,000	7,000	2
-4	14	18	1,500	3,000	12,000	7,000	2
-5	16	18	1,500	3,000	10,000	6,500	2
-6	18	18	1,500	3,000	9,000	6,500	4
-8	21	18	1,500	3,000	8,000	6,000	4-5/8
-10	23-1/2	18	1,500	3,000	7,000	5,500	5-1/2
-12	27-1/2	18	1,000	2,000	5,000	3,500	6-1/2
-16Z	18	18	1,250	2,500	5,000	3,500	7-3/8
-20Z	18	18	1,000	2,000	4,000	3,000	11
-24Z	18	18	1,000	2,000	4,000	3,000	14

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3.5.8 Impulse.- The fittings shall not loosen, leak, or blow off the hose when subjected to a minimum of 100,000 pressure impulse cycles at $400^{\circ} \pm 10^{\circ}$ F in accordance with 4.6.10.

3.5.9 High-temperature burst pressure.- The fittings shall not leak or blow off the hose at any pressure below the burst pressure specified in table I when tested in accordance with 4.6.11.

3.5.10 Fuel resistance.- The fittings shall not leak when aged and pressure tested with the applicable fuels in accordance with 4.6.12.

3.5.11 Corrosion.- The fittings shall function satisfactorily at the completion of 172 hours of cycling in accordance with 4.6.13.

3.5.12 Overtightening torque.- The fittings shall withstand overtightening 15 times in accordance with 4.6.14.

3.6 Interchangeability.- All parts having the same manufacturer's part number and MS number shall be functionally and dimensionally interchangeable. The identification and part number requirements of MIL-D-1000 shall govern the manufacturer's part number and changes thereto.

3.7 Screw threads.- Threads shall be in accordance with MIL-S-7742, except those for the coupling nuts, which shall be in accordance with MIL-S-8879.

3.8 Finish.-

3.8.1 Aluminum parts.- Unless otherwise specified, aluminum parts shall be finished in accordance with MIL-A-8625.

3.8.2 Corrosion-resisting steel parts.- Unless otherwise specified, corrosion-resisting steel parts shall be passivated by immersion in a solution of 2 percent sodium dichromate in nitric acid of a concentration of 15 to 25 percent by volume for 15 to 30 minutes at a temperature of $115^{\circ} \pm 5^{\circ}$ F. Parts shall then be thoroughly rinsed in water and dried.

3.9 Brazing.- Fittings requiring brazing operations shall be brazed as specified on the applicable MS. The requirements of paragraphs titled "Detailed data" and "Retention of radiographs" of MIL-STD-453 shall not apply to brazed corrosion resisting steel parts.

3.10 Identification of product.- Fittings shall be marked for identification in accordance with MIL-STD-130 and the applicable MS.

3.11 Workmanship.- Fittings shall be free from cracks, laps, seams, burrs, longitudinal and spiral tool marks, or any other defects which may detrimentally affect their suitability for the service use intended.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.- Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any other commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections.- The examination and testing of hose fittings shall be classified as follows:

- (a) Qualification inspections (4.4)
- (b) Quality conformance inspections (4.5)

4.3 Test conditions.-

4.3.1 Preparation of test specimens.- Test specimens shall be prepared by assembling straight-type and 90-degree elbow and fittings (see 4.4.1.2), designed to mate with fitting ends in accordance with MS33656 with hose conforming to MIL-H-27267. The length of the assemblies shall be as specified in table I, and assembly and disassembly procedures shall be as follows.

4.3.1.1 Assembly procedures.-

4.3.1.1.1 The hose shall be cut to the required length. Using a cutoff wheel, each end shall be cut square. Care shall be taken to minimize braid flareout.

4.3.1.1.2 One end of the hose wire braid shall not flare out as much as the other end. The sockets shall be placed back-to-back and the small end of the hose inserted through both sockets with a threading motion.

4.3.1.1.3 The nipple hex shall be held firmly in a vise and the hose pushed onto the nipple. The hose shall be oscillated around the nipple to separate the wire braid from the tube. This applies only to the necked-down end. (The hose shall be started onto the nipple carefully to prevent damage to the end of the tube.) The hose shall then be removed from the nipple.

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4.3.1.1.4 The sleeve shall be inserted between the hose braid and tube. If the hose is properly expanded as specified in 4.3.1.1.3, the sleeve will start easily. The sleeve shall be started by hand and completely positioned by pushing firmly against a flat surface until the tube bottoms against the shoulder inside sleeve.

4.3.1.1.5 The tube of hose shall be fitted to the sleeve by pushing the sleeve and hose onto the nipple with a steady force and a slight rotation of the hose until the sleeve bottoms against the nipple chamfer. The sleeve and hose shall be removed while rotating slightly, and a check made to insure that the tube is still bottomed against the sleeve shoulder.

4.3.1.1.6 The hose and sleeve shall be pushed again onto the nipple until the sleeve bottoms against the nipple chamfer. The socket shall be slid up and hand threaded onto the nipple. No additional lubricant (class 1 fittings only) will be required since the nipple is dry film lubricated.

4.3.1.1.7 (Applicable to class 1 fittings only.) - With the proper size torque wrench, the socket and nipple shall be tightened together until 0.031-inch gap is obtained. The 0.031-inch gap may vary from +0.015 to -0.008 inch. The final reading of the torque wrench shall be recorded. (For gap measurement, see figure 1.)

4.3.1.2 Disassembly procedures.-

4.3.1.2.1 With the proper size wrench, the nipple shall be loosened and removed from the socket and hose.

4.3.1.2.2 The socket shall be loosened from the hose by holding the hose behind the socket and firmly tapping the threaded end flat against a table or bench. The socket shall be threaded back off the end of the hose.

4.3.1.2.3 The sleeve shall be removed by gripping it lightly with pliers across the outer diameter, or by inserting the nipple slightly into the end of the sleeve and gently prying it out without damaging the metal seal area of the sleeve. The socket shall then be slid off the hose.

4.3.1.2.4 The fitting components shall be cleaned with air pressure to remove dirt or other foreign matter before reuse.

4.4 Qualification inspections.-

4.4.1 Sampling instructions.- The samples shall consist of 32 fittings of each size as specified herein and tetrafluoroethylene hose conforming to MIL-H-27267 made up into 16 assemblies of the lengths specified in table I. All samples shall be identified with the manufacturer's name, part number, and the specification number.

4.4.1.1 The samples shall also include two fittings of each size and class in each style to be qualified, flared and flareless, to be subjected to the overtightening torque test (4.6.14).

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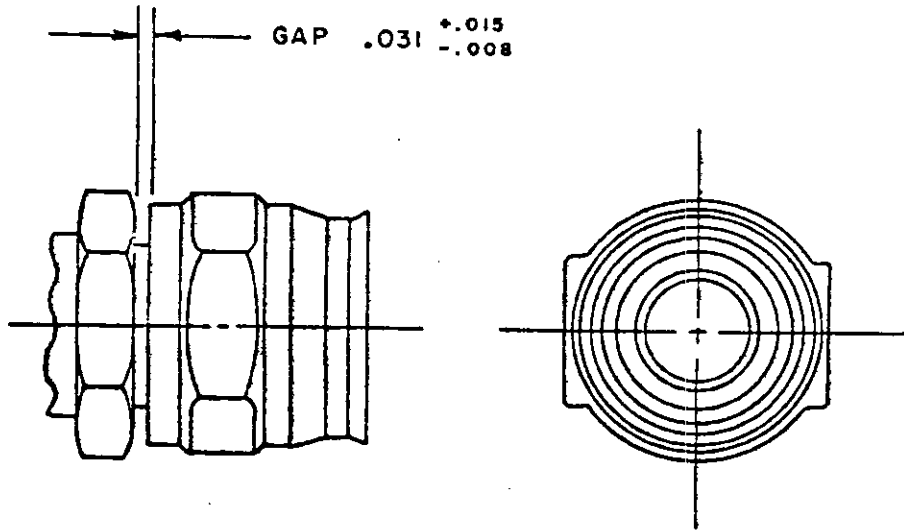


FIGURE 1. Gap measurement

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4.4.1.2 Fitting ends.- Qualification inspections shall be performed on straight-type swivel ends (MS27053), except that samples 6, 8, and 11 shall have a 90-degree elbow-swivel nut (MS27057 and MS27060). Satisfactory qualification inspections on these fitting ends shall constitute qualification approval on fitting ends (MS27053 through MS27060) in the sizes inspected. Two additional assemblies having flareless style fitting ends of the size and class to be qualified shall be subjected to the examination of product (4.6.1), proof pressure (4.6.4), leakage (4.6.5), and room temperature burst pressure (4.6.6) tests. Satisfactory test results on these fitting ends (flareless style) shall constitute qualification approval on fitting ends (MS27381 through MS27385) in the sizes inspected. All other fittings that use an identical attachment method, as in the standard fittings (MS27053 through MS27060 and MS27381 through MS27385), but have special end configurations, shall be submitted to the procuring activity for approval.

4.4.2 Qualification report and samples.- When tests are performed at a location other than the laboratory of the activity responsible for qualification (see 6.3), the following shall be furnished to that activity:

- (a) Reports: Three copies of a test report in accordance with MIL-STD-831.
- (b) Samples: All samples that were tested and three untested samples of each size for which qualification is desired, if requested by the activity responsible for qualification.

4.4.3 Inspections.- The qualification inspections shall consist of all the inspections described under 4.6. The qualification inspection schedule shall be in accordance with table II.

4.5 Quality conformance inspections.- Quality conformance inspections shall be performed in conformance with MIL-STD-105. The inspections shall consist of the following:

- (a) Individual tests (4.5.1)
- (b) Sampling tests (4.5.2)
- (c) Periodic control tests (4.5.3)

4.5.1 Individual tests.- Each fitting shall be subjected to examination of product as specified in 4.6.1.

4.5.1.1 Brazed fittings.- In addition to the test specified in 4.5.1, each fitting having a brazed joint shall be subjected to the brazed-joint proof pressure test as specified in 4.6.3.

4.5.2 Sampling tests.-

4.5.2.1 Lot.- A sampling test lot shall consist of fittings of one size, made from the same material, and submitted for inspection at the same time.

4.5.2.2 Tests.- Sampling test fittings shall be individually selected at random from each complete lot. The fittings shall be inspected for defects in accordance with MIL-STD-845. A single sampling plan shall be used. The fittings shall be assembled to the appropriate standard hose and subjected, in the order indicated, to tests listed below and described under 4.6. The Acceptable Quality Level (AQL) for each class of defects shall be as follows: Major - 1.0, Minor - 6.5, at inspection level II, and spot check - 4.0 at inspection level S-1. Failure of a fitting to pass any test listed below is considered a major defect:

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- (a) Proof pressure (4.6.4)
- (b) Leakage (4.6.5)
- (c) Room temperature burst pressure (4.6.6)

Fittings subjected to the above destructive tests shall not be delivered to the Government.

4.5.2.3 Resubmitted lots.- Before the lot is resubmitted, full particulars concerning the cause of previous rejection and the action taken to correct the defects in the lot shall be furnished (in writing) by the contractor.

4.5.3 Periodic control tests.-

4.5.3.1 Lot.- A periodic control test lot shall consist of fittings of one size, made from the same material, and submitted for inspection at the same time. The lot may be different in size from a sampling test lot.

4.5.3.2 Tests.- The following tests, as described under 4.6, shall be performed on random samples. An AQL of 1.5 percent is required for each test at special inspection level S-2 under single sampling plan.

- (a) Lubricant wear - 8 fittings (class 1, only) (4.6.2)
- (b) Impulse test - 4 unaged hose assemblies
(with 8 brazed fittings) 1/ (4.6.10)
- (c) Room temperature burst pressure - 4 hose
assemblies (4.6.6)

1/ Applies only to brazed fittings.

Fittings subjected to the above tests shall not be delivered to the Government.

4.5.3.3 Rejection and retest.- If a sample fails to pass a test, the lot it represents shall be rejected. Once a lot (or part of a lot) has been rejected by the procuring activity (Government or commercial), before it can be resubmitted for tests, full particulars concerning the cause of previous rejection and the action taken to correct the defects in the lot shall be furnished (in writing) by the contractor.

4.6 Inspection methods.-

4.6.1 Examination of product.- The fittings shall be examined to determine compliance with the material, dimension, workmanship, and marking requirements specified herein.

4.6.2 Lubricant wear (applicable only to class 1 fittings).- The fittings shall be assembled to the hose as specified in 4.3.1.1.1 through 4.3.1.1.7 six times and disassembled five times as specified in 4.3.1.2.1 through 4.3.1.2.3. If the final torque, as recorded in 4.3.1.1.7, exceeds the values specified in table III, the fittings shall be rejected. New ends of hose shall be used for each assembly.

TABLE II. Qualification inspection schedule

Sample No.	Fittings 1/ 1 through 4	Hose assemblies										13 through 18	14/ 19 and 20	
		5	2/ 6	7	2/ 8	9	10	2/ 11	12					
Paragraph	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1	4.6.1
	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2	3/ 4.6.2
	4.6.4	4.6.3	4.6.4	4.6.3	4.6.4	4.6.3	4.6.4	4.6.3	4.6.4	4.6.3	4.6.4	4.6.3	4.6.4	4.6.3
	4.6.12	4.6.4	4.6.13	4.6.4	4.6.13	4.6.4	4.6.13	4.6.4	4.6.13	4.6.4	4.6.13	4.6.4	4.6.13	4.6.4
	4.6.5	4.6.12	4.6.11	4.6.8	4.6.8	4.6.8	4.6.8	4.6.8	4.6.8	4.6.8	4.6.8	4.6.8	4.6.8	4.6.8
	4.6.6	4.6.5	4.6.11	4.6.9	4.6.9	4.6.9	4.6.9	4.6.9	4.6.9	4.6.9	4.6.9	4.6.9	4.6.9	4.6.9
		4.6.11												

1/ Two samples - flared type fittings.

2/ Two samples - flareless type fittings.

3/ These samples shall have a 90-degree elbow fitting on one end of the assembly.

4/ Applies only to class 1 fittings.

5/ These samples are with flareless fittings.

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TABLE III. Torque

Size	Socket torque (pound-inches)
-3/-4	120
-4	180
-5	240
-6	300
-8	540
-10	840
-12	1,020
-16Z	1,680
-20Z	2,760
-24Z	3,900

4.6.3 Brazed-joint proof pressure.- The brazed-joint fittings shall be subjected to the applicable proof pressure specified in table I. One end of the fitting shall be capped and the proof pressure applied through the other end for a minimum of 30 seconds and a maximum of 5 minutes. The test fluid shall be water. Any evidence of failure at the brazed joint shall be cause for rejection.

4.6.4 Proof pressure.- All test samples of each size shall be subjected to the applicable proof pressure specified in table I for a minimum of 30 seconds and a maximum of 5 minutes. The test fluid shall be water. The samples shall then be purged with compressed gas and pressurized with air or nitrogen to at least the operating pressure specified in table I for a minimum of 30 seconds. During this time, the samples shall be submerged in water containing a wetting agent. The samples shall be examined for leakage as evidenced by a stream of air bubbles. Any evidence of leakage at the end fittings shall be cause for rejection. However, random air bubbles entrapped or retained on the surface shall not be cause for rejection.

4.6.5 Leakage.- Two test samples of each size shall be subjected to the leakage test, using test fluid in accordance with MIL-H-5606. While at room temperature, the sample shall be pressurized to 25 pounds per square inch (psi) for a minimum of 5 minutes. The pressure shall be increased to a value equal to 70 percent of the rated burst pressure specified in table I and again held for a minimum of 5 minutes. The pressure shall then be completely released for 5 minutes, again increased to 70 percent of the rated burst pressure, and held for a minimum of 5 minutes. Any evidence of leakage at the end fittings shall be cause for rejection.

4.6.6 Room temperature burst pressure.- Two test samples of each size shall be subjected to a pressure sufficient to burst the samples at a rate of pressure rise equal to 20,000 \pm 5,000 psi per minute. The samples shall be observed throughout the test and the type of failure and the pressure at which failure occurred shall be recorded. The end fittings shall not leak or blow off at any pressure below the pressure specified in table I.

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4.6.7 Stress degradation.

4.6.7.1 Two hose assemblies of each size shall be subjected to this test. The hose assemblies shall be filled with oil conforming to MIL-L-7808 or one of the following:

- (a) General Electric Company F-50 oil, or equal.
- (b) Dow Chemical Company F-60 oil, or equal.
- (c) Ornite Chemical Company 8200 oil, or equal.

4.6.7.2 The hose assemblies shall then be placed in an oven which shall be maintained at a temperature of $450^{\circ} \pm 10^{\circ}$ F. Precautions shall be taken to assure that the hose assemblies do not come in contact with parts of the oven that are at a higher temperature. A pressure equal to the rated operating pressure specified in table I shall be applied to the hose assemblies.

4.6.7.3 After a minimum of 20 hours at 450° F, the pressure shall be gradually released and the assemblies shall be removed from the oven, drained, and cooled to room temperature. The assemblies shall then be flushed with a quantity of new type III fluid conforming to TT-S-735, equivalent in volume to at least twice the test sample volume and drained.

4.6.7.4 The hose assemblies shall then be filled with new type III fluid conforming to TT-S-735. A pressure equal to the rated operating pressure specified in table I shall be applied and held for a minimum of 2 hours at room temperature.

4.6.7.5 The hose assemblies shall then be emptied and filled with oil as specified in 4.6.7.1. The procedure specified in 4.6.7.2, 4.6.7.3, and 4.6.7.4 shall be repeated.

4.6.7.6 The hose assemblies shall then be filled with type III fluid conforming to TT-S-735 and individually capped. While at room temperature, the assemblies shall be bent around a mandrel having a radius equal to the minimum bend radius as specified in table I. The assemblies shall be bent around the mandrel and straightened for 20 cycles. The assemblies shall be held by the fittings while the bending is being performed. The procedure specified in 4.6.7.1, 4.6.7.2, 4.6.7.3, and 4.6.7.4 shall be performed for a third time.

4.6.7.7 Within 4 hours after the final 2-hour pressurization period with type III fluid conforming to TT-S-735, the assemblies shall be drained and flushed with trichloroethylene conforming to MIL-T-27602 and placed in an oven for 1 hour. The temperature of the oven shall be maintained at $160 \pm 10^{\circ}$ F.

4.6.7.8 Within 8 hours after completion of the drying process, the assemblies shall be subjected to an air-under-water test. To conduct this test, the hose assemblies shall be installed in an apparatus constructed in accordance with figure 2.

4.6.7.9 This apparatus, with the hose assembly installed, shall be immersed in water containing no wetting agent. A pressure equivalent to the rated operating pressure specified in table I shall be applied for a period of 15 minutes to allow any entrapped air in the hose to escape. During this period, the shield of the test apparatus shall be closed.

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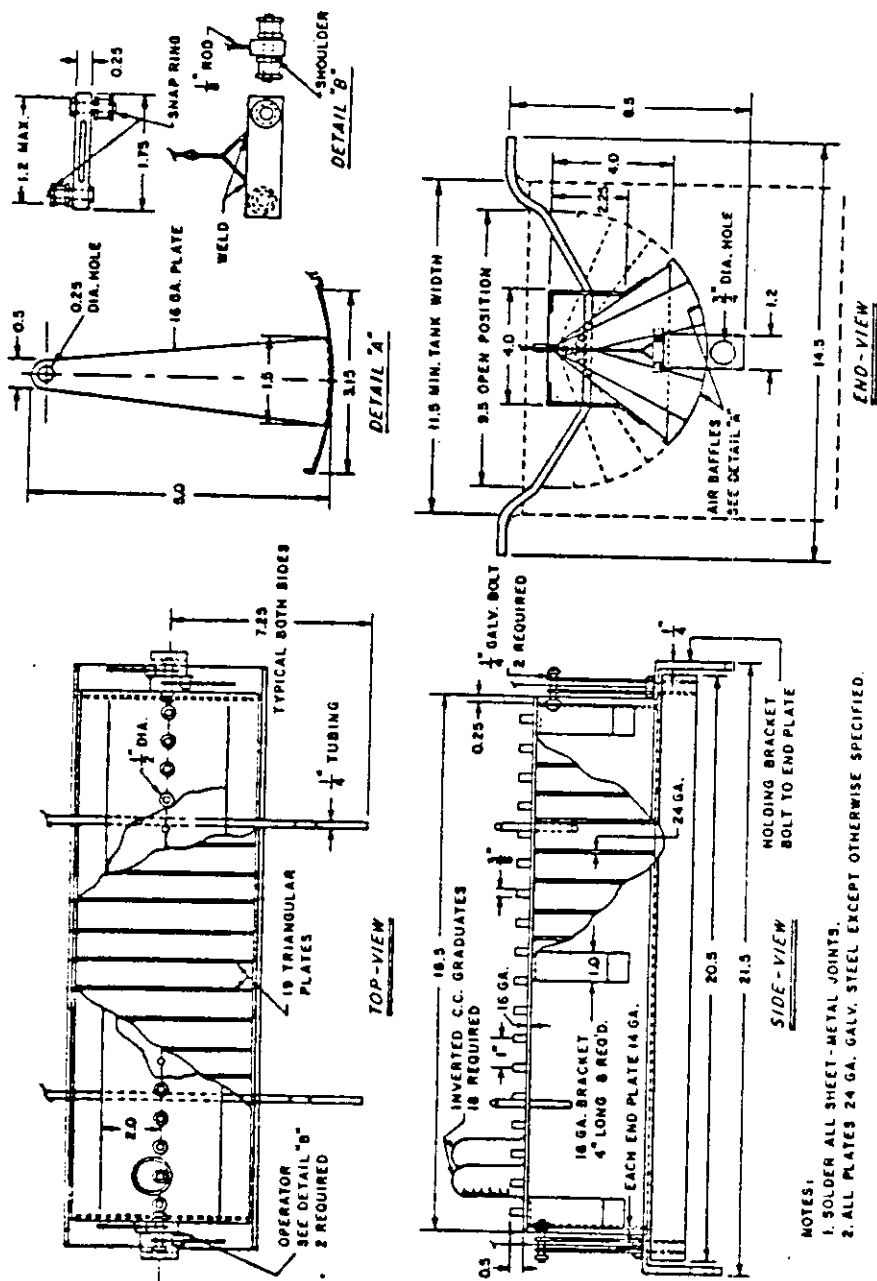


FIGURE 2. Apparatus for stress degradation tests

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4.6.7.10 The shield of the test apparatus shall then be opened and the pressure held for an additional 5-minute period. During this time, effused gas shall be collected in the increment of the apparatus which includes the juncture of the hose to the fitting. If, after the 5-minute period of pressurization, the rate of effusion at the junction of the hose to the fitting exceeds the values listed in table IV, it shall be cause for rejection and considered failure to qualify.

TABLE IV. Effusion rate

Hose size	Cubic centimeters per inch per minute
-3/-4	8
-4	8
-5	8
-6	8
-8	4
-10	2
-12	2
-16Z	2
-20Z	2
-24Z	2

4.6.7.11 At the completion of tests specified in 4.6.7.2 through 4.6.7.10, the hose assemblies shall be filled with oil and placed in a cold chamber for 8 hours while the temperature is maintained at $-67^{\circ} \pm 2^{\circ}$ F. After the 8-hour cold soak, the assemblies shall be subjected to a pressure equal to the operating pressure specified in table I. The pressure shall be held for a minimum of 5 minutes and then released. This shall be repeated for a total of 10 times with a minimum of 5 minutes between each pressure application and with the samples still in the $-67^{\circ} \pm 2^{\circ}$ F cold chamber. At the end of this time, oil at a temperature of $450^{\circ} \pm 10^{\circ}$ F shall be circulated through the samples. Within 15 seconds after introduction of the hot oil, the pressure shall be increased to the rated proof pressure specified in table I and held for a minimum of 2 minutes. Any evidence of leakage at the end fittings shall be cause for rejection.

4.6.8 Effusion.- Two hose assemblies of each size shall be used for this test. The assemblies shall be subjected to the operating pressure specified in table I for 1 hour at room temperature. The total amount of effusion through the hose and two fittings shall be collected over the last 30 minutes of testing and shall not exceed the values in table V. The collecting device should be similar to that shown on figure 3.

TABLE V. Effusion (c.c.)/ft. of hose/30-minute period

Size	-3/-4	-4	-5	-6	-8	-10	-12	-16Z	-20Z	-24Z
Effusion	4.0	4.0	5.0	5.0	5.0	5.0	6.0	8.0	8.0	8.0

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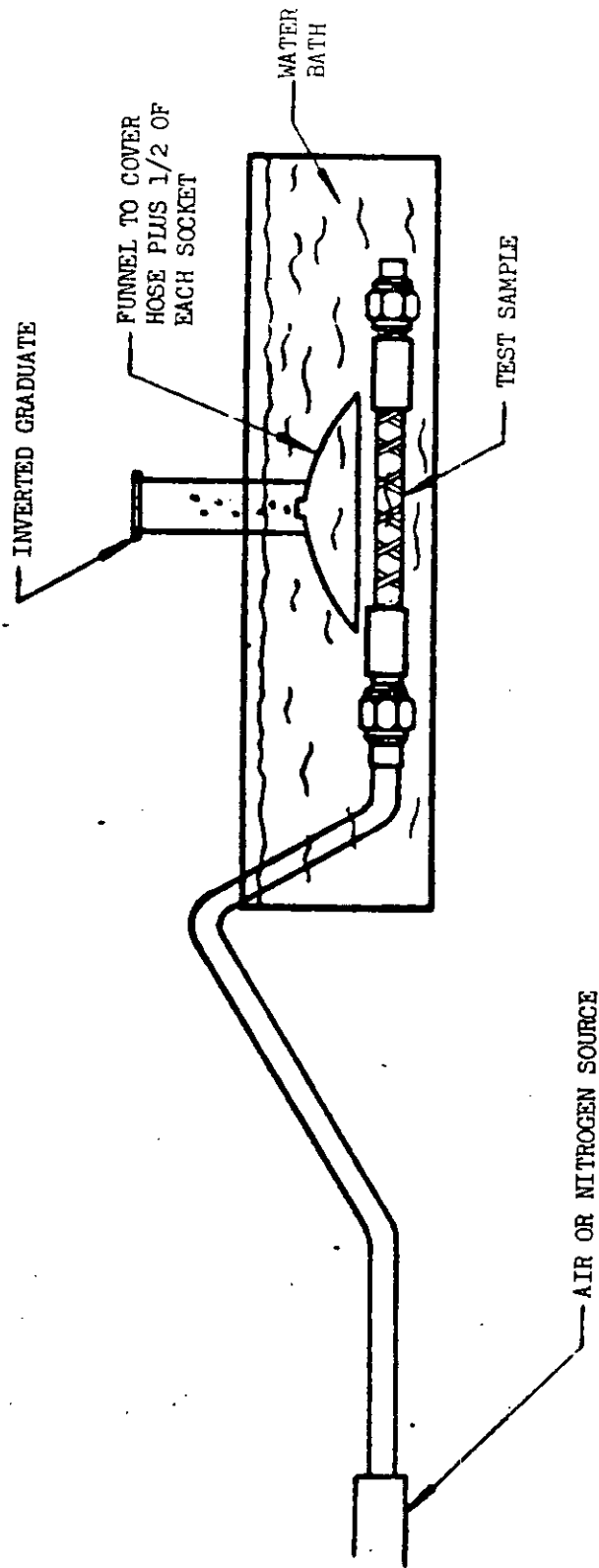


FIGURE 3. Effusion test diagram

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4.6.9 Pneumatic surge.- Two hose assemblies of each size that were subjected to the effusion test (4.6.8) shall be used for this test. The assemblies shall be installed in test apparatus in accordance with figure 4. They shall then be subjected to the rated operating pressure specified in table I for 25 minutes at room temperature. After this period of pressurization, the exhaust valve shall be opened within 50 milliseconds to permit the rapid discharge of the compressed gas. After 5 minutes, the valve shall be closed and the pressure recycled. This sequence of 25 minutes at operating pressure and 5 minutes at zero pressure shall be repeated a total of 16 times. The hose assemblies shall then be subjected to the rated proof pressure specified in table I for a minimum of 2 minutes. Any evidence of leakage at the end fitting in excess of the values shown in table V (room temperature) shall constitute failure. The filter downstream of the hose shall be examined for evidence of inner tube degradation. Any evidence of degradation shall constitute failure.

4.6.10 Impulse.- The impulse test shall be conducted as follows.

4.6.10.1 Six test samples of each size, using hose lengths as specified in table I, shall be subjected to this test. Three samples shall be immersed in hydraulic oil conforming to MIL-H-8446, or in one of the three commercial oils listed in 4.6.7.1, for 168 hours at $400^{\circ} \pm 10^{\circ}$ F. The other three samples shall be aged in air at $400^{\circ} \pm 10^{\circ}$ F for 168 hours. All samples shall then be subjected to the proof pressure test specified in 4.6.4.

4.6.10.2 All sizes through -12 shall be installed in the impulse tester with a bend radius equal to that specified in table I. Both ends of the samples shall be connected to a rigid support. Sizes -16Z and larger shall be installed straight, one end of which may be left free.

4.6.10.3 Electronic measuring devices shall be used for determining the impulse pressures within the limits of figure 2 for sizes -3/-4 through -16Z. Sizes -20Z through -24Z shall be tested similarly, except that peak pressure need not exceed the operating pressures specified in table I. All sizes shall be subjected to 100,000 pressure impulse cycles applied at a frequency of 60 to 70 cycles per minute (cpm). The temperature of the test fluid and ambient air shall be maintained at $400^{\circ} \pm 10^{\circ}$ F. The test fluid shall be one of the four specified in 4.6.7.1. Any evidence of leakage, blowoff of fittings, or other malfunction prior to completion of the 100,000 cycles shall be cause for rejection.

4.6.10.4 The curve shown on figure 5 is the approximate pressure-time cycle determined to be of proper severity for impulse testing of the assemblies. While it is mandatory only that pressure peak rises to 125 percent of the operating pressure at some point prior to leveling off at rated pressure, it is desirable that the pressure-time curve be confined to the shaded area indicated. One benefit to be gained in this manner is that results of tests performed on different test machines will be more nearly comparable.

4.6.11 High-temperature burst pressure.- Two test samples of each size shall be filled with a suitable test fluid and soaked for 1 hour with the ambient and fluid temperature at $450^{\circ} \pm 10^{\circ}$ F. After 1 hour, the pressure shall be raised to the operating pressure and held for 5 minutes. The pressure shall then be increased at a rate of 20,000 \pm 5,000 psi per minute until bursting or leakage occurs. Any leakage at the end fittings at pressures below the rated values listed in table I shall be cause for rejection.

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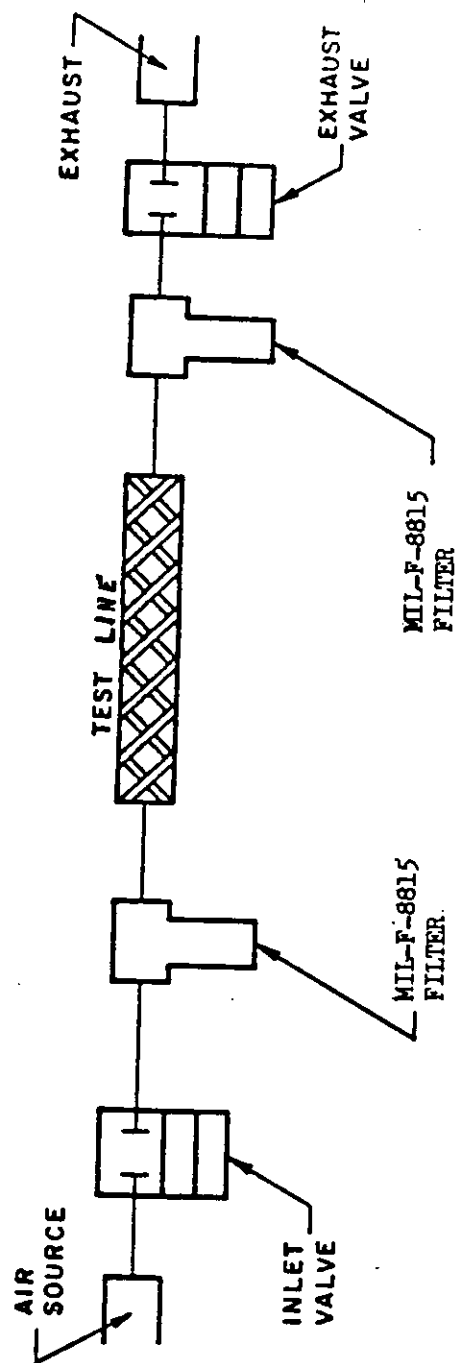
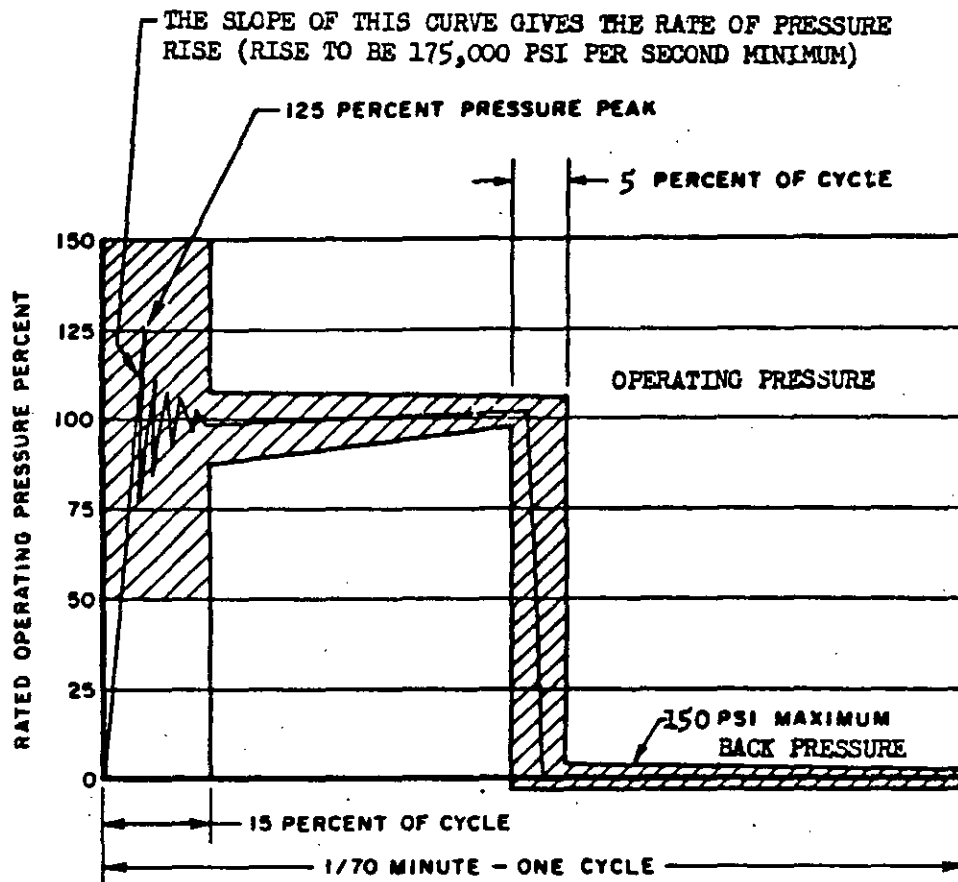


FIGURE 4. Pneumatic surge test diagram

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THE CURVE SHOWN ABOVE IS THE APPROXIMATE PRESSURE-TIME CYCLE DETERMINED TO BE OF PROPER SEVERITY FOR IMPULSE TESTING OF HYDRAULIC HOSE. IT IS CONSIDERED HIGHLY DESIRABLE THAT THE PRESSURE-TIME CURVE BE CONFINED TO THE SHADED AREA INDICATED. RATE OF RISE IS DEFINED AS THE SLOPE OF THE PRESSURE-TIME CURVE. FOR PURPOSES OF DEFINITION, THE SLOPE SHALL BE DETERMINED BY USE OF A STRAIGHT LINE BETWEEN 10 PERCENT AND 90 PERCENT OF PEAK PRESSURE. RATE OF RISE WILL BE CALCULATED AS FOLLOWS:

$$\text{RATE OF RISE (PSI/SEC)} = \frac{.9P - .1P}{T_2 - T_1}$$

WHERE: P = PEAK PRESSURE IN PSI
 T_1 = TIME AT 10% P (SEC)
 T_2 = TIME AT 90% P (SEC)

FIGURE 5. Dynamic pressure impulses

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4.6.12 Fuel resistance.- Two test samples of each size shall be subjected to a fuel resistance test as follows.

4.6.12.1 The samples shall be filled with a test fluid conforming to TT-S-735 or fuel conforming to MIL-J-5161 or MIL-T-5624 and placed in an oven maintained at a temperature of $260^{\circ} \pm 10^{\circ}$ F for a period of 48 hours. Precautions shall be taken to assure that the samples do not come in contact with parts of the oven that are at a higher temperature. Oven temperatures high enough to ignite the fuel shall be avoided. Pressures equal to the operating pressures specified in table I shall be applied to the test samples.

4.6.12.2 At the end of the 48-hour period, the test samples shall be drained and allowed to cool for 20 minutes at room temperature. The samples shall then be filled with type III fluid conforming to TT-S-735, and a pressure equal to the rated operating pressure applied and maintained for a minimum of 2 hours at room temperature. Any evidence of leakage at the end fittings during or at the completion of this test shall be cause for rejection.

4.6.13 Corrosion.- Two test samples of each size and class shall be mounted in a vertical position and immersed in a 2-1/2 percent solution of sodium chloride for 5 minutes. They shall then be air dried at 140° F for 25 minutes. This cycling shall be continued for 172 hours with the hose pressurized to normal operating pressure. Following the cycling, one sample shall be subjected to the room temperature burst pressure test (4.6.6) and the other sample shall be subjected to the high-temperature burst pressure test (4.6.11). Any evidence of leakage or malfunction below the respective burst pressures specified in table I, or any pitting corrosion, or stress corrosion that might adversely affect the life of the fitting shall be cause for rejection.

4.6.14 Overtightening torque.- Two flared type end fittings of each size shall be subjected to the following test by assembling on a fitting end of steel construction in accordance with MS33656. The threads of the MS33656 fittings shall be lubricated with oil conforming to MIL-H-5606 prior to this test. The fittings shall be tightened to the appropriate overtightening torque specified in table VI and then loosened. This sequence shall be repeated 15 times. After this sequence, there shall be no evidence of failure or deformation of the fitting assemblies, and the swivel nuts shall be free enough to permit turning on the nipple by hand. Overtightening torque shall also be applied to two flareless type end fittings of each size by assembling on a fitting end of steel construction in accordance with MS33514. Lubrication test sequence, the overtightening torques, and conditions for flareless fittings are the same as specified above for the flared type fittings.

4.6.15 Preservation, packaging, packing, and marking.- Preparation for delivery shall be examined for conformance with section 5.

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TABLE VI. Overtightening torque values

Fitting size	Class 1 fittings (pound-inches)	Class 2 fittings (pound-inches)
-3/-4	130	
-4	160	
-5	240	
-6	300	
-8	560	300
-10	700	400
-12	1,000	625
-16Z	1,550	1,050
-20Z	1,550	1,350
-24Z	1,575	1,375

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with the instructions of the procuring activity.

6. NOTES

6.1 Intended use.- The fittings covered by this specification are intended for use in high-temperature fuel, lubricating oil, water-alcohol, chemical-fluid systems, and hydraulic and pneumatic systems. The temperature range for class 1 fittings is from -65° to +450° F and for class 2 fittings from -65° to +275° F. Operating pressures are listed in table I of this specification. High-pressure pneumatic storage system applications are not recommended. Installations in which the limits specified herein are exceeded or in which the application is not covered specifically by this specification will be subject to the approval of the procuring activity.

6.2 Ordering data.- Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Size and class of fittings required (see 1.2).
- (c) Data requirements (see 4.4.2).
- (d) Applicable levels of packaging and packing (see 5.1).

6.3 Qualification.- With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List, whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is Systems Engineering Group, Research and Technology Division, Attention: SEJPF, Wright-Patterson Air Force Base, Ohio 45433, and information pertaining to qualification of products may be obtained from that activity.

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Custodians:

Army - MO
Navy - AS
Air Force - (11)

Preparing activity:

Air Force - (11)

Project No. 4730-0217

Reviewer activities:

Army - MO
Navy - AS
Air Force - (11), (69)

User activities:

Army - MI
Navy - SH

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POSTAGE AND FEES PAID
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DEFENSE SUPPLY AGENCY
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Commander, SEG

Attn: SEPS

Wright-Patterson AFB, Ohio 45433

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SPECIFICATION ANALYSIS SHEET

Form Approved Budget
Bureau No. 119-RO04INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.

SPECIFICATION

MIL-F-27272A Fittings, Tetrafluoroethylene Hose, etc., Gen. Requirements for

ORGANIZATION

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A

 Direct Government Contract Subcontract

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

 YES NO

IF "YES" IN WHAT WAY?

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.)

SUBMITTED BY (Printed or typed name and activity)

DATE