# ADOPTION NOTICE

AS 1946 "Hose Assembly, Polytetrafluoroethylene, (PTFE), up to 450 degree F (232 degree C) and 1500 psi (10 500 kPa), was adopted on 15 April 1994 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: U.S. Army Aviation and Troop Command, ATTN: AMSAT-R-EDS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. DoD activity may obtain copies of this standard from the Standardization Document Order Desk, 700 Robbins Avenue, Building) 4D, Philadelphia, PA 19111-5094. The private sector and the other government agencies may purchase copies from the Engineering Society For Advancing Mobility Land Sea Air and Space, 400, Commonwealth Drive, Warrendale, PA 15096-0001.

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# AEROSPACE STANDARD

SAE AS1946

Issued 1990-07-13

Submitted for recognition as an American National Standard

## HOSE ASSEMBLY, POLYTETRAFLUOROETHYLENE (PTFE), UP TO 450°F (232°C) AND 1500 psi (10 500 kPa), PROCUREMENT SPECIFICATION

1. SCOPE:

1.1 Application:

This Aerospace Standard (AS) covers the requirements for polytetrafluoroethylene (PTFE) hose assemblies for use in aerospace hydraulic, fuel, and lubricating oil systems at temperatures between -67°F and 450°F for Class I assemblies, -67°F and 275°F for Class II assemblies, and at nominal pressures up to 1500 psi. The hose assemblies are also suitable for use within the same temperature and pressure limitations in aerospace pneumatic systems where some gaseous diffusion through the wall of the PTFE liner can be tolerated.

The use of these hose assemblies in pneumatic storage systems is not recommended. In addition, installations in which the limits specified herein are exceeded, or in which the application is not covered specifically by this standard, for example oxygen, shall be subject to the approval of the purchaser.

1.2 Classification:

The hose assemblies shall be of the following classes:

Class I - All corrosion resistant steel or titanium combination fittings, 450°F (232°C)
Class II - Combination aluminum alloy and corrosion resistant steel fittings, 275°F (135°C), size -08 and larger

2. APPLICABLE DOCUMENTS:

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

2.1 Specifications:

2.1.1 Federal Specifications:

| | |
|---|---|
| P-D-680 | Dry Cleaning Solvent |
| QQ-S-763 | Steel Bars, Wire Shapes, and Forgings, Corrosion-Resisting |

2.1.2 Military:

| | |
|---|---|
| MIL-C-5501 | Caps and Plugs, Protective, Dust and Moisture Seal, General Specification for |
| DOD-D-1000 | Drawings, Engineering and Associated Lists |
| MIL-STD-130 | Identification Marking of U.S. Military Property |
| MIL-STD-831 | Test Reports: Preparation of |
| MIL-STD-105 | Sampling Procedures and Tables for Inspection by Attributes |
| MIL-S-8879 | Screw Threads, Controlled Radius Root, With Increased Minor Diameter, General Specification for |
| MIL-T-8504 | Steel, Corrosion-Resisting (304) Aerospace Vehicle Hydraulic Systems, Annealed, Seamless and Welded |
| MIL-T-8808 | Tubing, Steel, Corrosion-Resistant (18-8 Stabilized), Aircraft Hydraulic Quality (Composition 321 and 347) |

2.1.3 Industry Publications:

SAE Material Specifications:

| | |
|---|---|
| AMS-4069 | Tubing, Seamless, Drawn, Close Tolerance, 2.5 Mg 0.25 Cr |
| AMS-4079 | Tubing, Seamless, Drawn, Round Close Tolerance, 1.0 Mg 0.60 Si 0.28 Cu 0.20 Cr |
| AMS-4082 | Tubing, Seamless, Drawn, 1.0 Mg 0.60 Si 0.28 Cu 0.20 Cr, Solution and Precipitation Heat Treated |
| AMS-4112 | Bars, Rods, and Wire, Rolled, Drawn or Cold Finished -4.4 Cu 1.5 Mg 0.60 Mn |
| AMS-4117 | Bars and Flash Welded Rings, 1.0 Mg 0.60 Si 0.28 Cu 0.20 Cr, Solution and Precipitation Heat Treated |
| AMS-4121 | Bars, Rods, and Wire, Rolled, Drawn or Cold Finished -4.5 Cu 0.85 Si 0.80 Mn 0.50 Mg |
| AMS-4127 | Forgings - 1.0 Mg 0.60 Si 0.28 Cu 0.20 Cr, Solution and Precipitation Heat Treated |
| AMS-4928 | Titanium Alloy Bars and Forgings, 6Al4V, Annealed, 120,000 psi (827 MPa) Yield |
| AMS-4945 | Titanium Alloy Tubing, Seamless, Hydraulic, 3Al - 2.5V, Texture Controlled, 105,000 psi (724 MPa) Yield Strength |

2.1.3 (Continued):

AMS-4965 Bars, Forgings and Rings 6Al4V, Solution and Precipitation Heat Treated
AMS-5639 Steel Bars, Forgings, Tubing, and Rings, Corrosion-Resistant 19 Cr - 10 Ni (SAE 30304)
AMS-5643 Steel Bars, Forgings, Tubing, and Rings, Corrosion Resistant 16.5 Cr - 4.0 Ni - 4.0 Cu
AMS-5644 Steel, Bars, and Forgings, Corrosion and Heat Resistant 17 Cr - 7 Ni - 1 Al
AMS-5645 Steel Bars, Forgings, Tubing, and Rings, Corrosion and Heat Resistant 18 Cr - 10 Ni - 0.40 Ti (SAE 30321)
AMS-5646 Steel Bars, Forgings, Tubing, and Rings, Corrosion and Heat Resistant 18 Cr - 11 Ni - 0.60 (Cb + Ta) (SAE 30347)
AMS-5647 Bars, Forgings, Tubing and Rings 19 Cr 9.5 Ni, Solution Heat Treated
AMS-5689 Wire, Corrosion and Heat Resistant 18 Cr - 9.5 Ni - Ti (SAE 30321) Solution Heat Treated
AMS-5690 Wire, Corrosion and Heat-Resistant 17 Cr - 12 Ni - 2.5 Mo (SAE 30316)
AMS-5697 Wire, Corrosion Resistant 19 Cr - 9.5 Ni (SAE 30304)
AMS-5743 Bars and Forgings 15.5 Cr - 4.5 Ni - 2.9 Mo - 0.10 N, Solution Heat-Treated, Subzero Cooled, Equalized, and Over Tempered

SAE Aerospace Recommended Practices:

ARP603 Impulse Testing of Hydraulic Hose Assemblies, Tubing and Fittings
ARP908 Hose Fitting Installation and Qualification Test, Torque Requirements
ARP1153 Methods for Determining Relative Specific Gravity
ARP1835 Preparation for Delivery, General Requirements for Hose Assemblies

American Society for Testing and Materials:

ASTM A 262 Standard Recommended Practices for Detecting Susceptibility to Intergranular Attack in Stainless Steel
ASTM D 792 Tests for Specific Gravity and Density of Plastics by Displacement

2.1.3 (Continued):

SAE Aerospace Standards:

| | |
|---|---|
| AS1055 | Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings and Similar System Components |
| AS1072 | Sleeve, Hose Assembly, Fire Protection |
| AS603 | Impulse Testing of Hydraulic Hose, Tubing and Fitting Assemblies |
| AS611 | Tetrafluoroethylene Hose Assembly Cleaning Methods |
| AS2078 | Aerospace - Fluid Systems - Test Methods for Polytetrafluoroethylene (PTFE) Hose Assemblies |
| | Hose Polytetrafluoroethylene, Metal Braid, Medium Pressure, Hydraulic, 450°F (232°C) |

Copies may be obtained from the SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

AIA National Aerospace Standards:

| | |
|---|---|
| NAS 1760 | Fitting End, Flareless Acorn, Standard Dimensions for |

Copies may be obtained from the National Standards Association, Inc., 5161 River Road, 1200 Quince Orchard Road, Gaithersburg, MD 20878.

2.1.4 Order of Precedence: In the event of a conflict between the text of this specification and the reference cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS:

3.1 Qualification:

Hose assemblies supplied in accordance with this international standard shall be representative of products which have been subjected to and which have successfully passed the material and qualification tests specified in this standard. They shall be listed on or approved for listing on the applicable qualified products list.

3.2 Materials:

The hose assemblies shall be uniform in quality and free from defects in material as is consistent with good manufacturing practice, and shall conform with the applicable specifications and requirements specified in this Standard. All materials not specifically described herein shall be of the highest quality and suitable for the purposes intended.

3.2.1 Metals: Metals used in the hose shall be corrosion-resistant steel, and fittings shall be corrosion-resistant steel, titanium, or aluminum alloy suitably treated to resist corrosion when in storage or during normal service use. All end fitting sockets (collars) crimped or swaged, fabricated from type 304 stainless steel, are required to be capable of

3.2.1 (Continued):

passing an embrittlement test as specified in ASTM A 262, practice E, prior to assembly to the nipple or swaging operation. Sockets fabricated from stabilized austenitic steel are acceptable without being subjected to the embrittlement test. Metals used in the hose and fittings shall be as listed below:

a. Bars and Forgings:

Corrosion-resistant steel, austenitic, annealed or as rolled

| | |
|---|---|
| 304 | AMS-5639 |

Heat-stabilized corrosion-resistant steel, austenitic, annealed or as rolled

| | |
|---|---|
| 321 | AMS-5645 |
| 347 | AMS-5646 |

Precipitation-hardening corrosion-resistant steel - resolution heat treated and artificially aged condition

| | |
|---|---|
| 17-4 PH | AMS-5643 |
| 17-7 PH | AMS-5644 |
| AM-355 | AMS-5743 |

Titanium

| | |
|---|---|
| 6Al-4V | AMS-4928 |

Aluminum

| | |
|---|---|
| Aluminum Alloy, 2014-T6 | AMS-4121 |
| Aluminum Alloy, 2024-T6 | AMS-4112 |
| Aluminum Alloy, 6061-T6/T651 | AMS-4117 |
| Aluminum Alloy, 6061-T6 | AMS-4127 |

b. Tubing:

| | |
|---|---|
| Aluminum Alloy, 5052 | AMS-4069 |
| Aluminum Alloy, 6061 | AMS-4082 |

Corrosion-resistant steel, austenitic, seamless or welded, annealed

| | |
|---|---|
| 304 | MIL-T-8504 |

Heat stabilized corrosion-resistant steel, austenitic, seamless or welded

| | |
|---|---|
| 321 | MIL-T-8808 |
| 347 | MIL-T-8808 |

Titanium

| | |
|---|---|
| 3Al-2.5V | AMS-4945 |

3.2.1 (Continued):

c. Wire:

Corrosion-resistant steel, austenitic, cold drawn

| | |
|---|---|
| 321 | AMS-5689 |
| 316 | AMS-5690 |
| 304 | AMS-5697 |

3.3 Construction:

The hose assembly shall consist of a seamless PTFE inner tube, corrosion-resistant steel-wire reinforcement, and aluminum, corrosion-resistant steel, or titanium end fittings as required to meet the construction and performance requirements of this specification, and as required for its intended use.

3.3.1 Inner Tube: The inner tube shall be of a seamless construction of virgin PTFE resin of uniform gage. It shall have a smooth bore and shall be free from pitting or projections on the inner surface. Additives may be included in the compound from which the tube is extruded.

3.3.2 Reinforcement: The reinforcement shall consist of corrosion-resistant steel wires. The wires shall be so arranged over the inner tube as to provide sufficient strength to ensure conformance with the requirements specified herein. Broken or missing reinforcing wires or buckled wires more than 0.06 in above the outside diameter surface shall be cause for rejection. Crossed-over reinforcing wires shall not be cause for rejection of the hose assembly.

3.3.3 Fittings: All fittings shall be proven to meet the requirements herein. The hose attachment fittings may be of a permanent or of a reusable design. Forgings are permitted. Unless specified otherwise by the user, the hose assembly end fittings shall have 24° cone fittings in accordance with NAS 1760, or flared fittings in accordance with AS1708.

3.3.3.1 Insert Fittings: Insert fittings shall be of one-piece construction wherever possible. Those made of other than one-piece construction shall have either welded joints using butt-welded or lap-weld design, or braze joints using lap-braze design, and fabricated from annealed corrosion-resistant steel, titanium, or aluminum alloy tubing. Welded and redrawn tubing may be used for corrosion-resistant steel.

3.3.3.2 Fitting Finish:

3.3.3.2.1 Aluminum Parts: Unless otherwise specified, aluminum parts shall be finished in accordance with MIL-A-8625, type II, and dyed yellow on flareless parts and blue on flared parts. The color fastness requirement of MIL-A-8625 does not apply.

3.3.3.2.2 Corrosion-Resistant Steel Parts: Unless otherwise specified, corrosion-resistant steel parts shall be passivated by immersion in a solution of 2% sodium dichromate in nitric acid of a concentration of 15 to 25% by volume for 15 or 30 min at a temperature of 125°F + 5. Parts shall then be thoroughly rinsed in water and dried.

3.3.3.2.3 Titanium Alloy Parts: Titanium alloy fittings and nuts shall be fluoride phosphate coated per AMS-2486.

3.4 Inner Tube Requirements:

3.4.1 Density and Relative Density: The relative density of the hose inner tube shall not exceed 2.155 when tested in accordance with ARP1153. The density shall not exceed a value of 2.204 g/cm$^3$ when tested as specified in ARP1153.

3.4.2 Tensile Strength: When tested in accordance with AS2078, paragraph 4.2, the longitudinal tensile strength for all sizes of tubes shall be 15.1 MPa minimum. The transverse tensile strength for sizes -10 and larger shall be 12.4 MPa minimum. For sizes under -10, the transverse strength need not be tested.

3.4.3 Elongation: When tested in accordance with AS2078, paragraph 4.2, the elongation shall be a minimum of 200%.

3.4.4 Tube Roll: The tube shall not leak, split, burst, or show any evidence of malfunction, when tested through the sequence as specified in AS2078, paragraph 4.3.1.

3.4.5 Tube Proof Pressure: Following tube roll test per 3.4.4, the tube, without reinforcing wires, shall not leak, burst, or show any evidence of malfunction when tested as specified in AS2078, paragraph 4.3.2.

3.4.6 Electrical Conductivity: When tested in accordance with AS2078, paragraph 4.4, the electrical current shall be equal to or greater than 10 μA for sizes -03 through -08, and equal to or greater than 20 μA for sizes -10 and over.

3.5 Hose, Dimensional and Physical Requirements:

3.5.1 Dimensions: The hose assembly dimensions, except for length, shall be as specified in Figure 1 and Table 1.



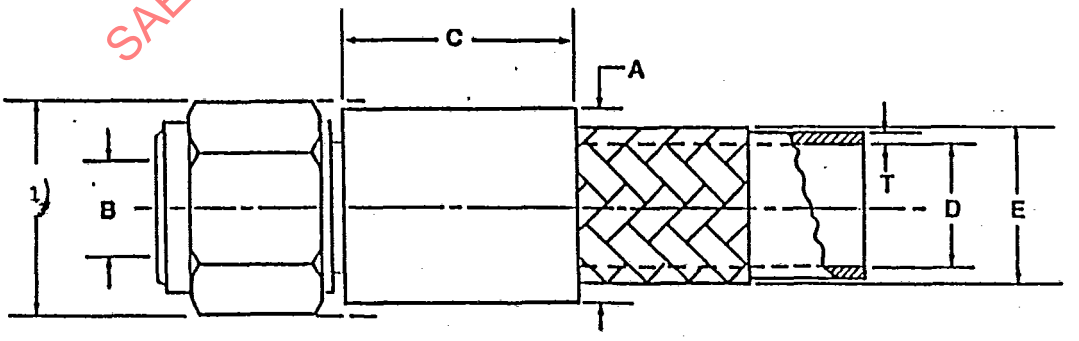


FIGURE 1 - Hose and Fitting Dimensions (Table 1)

1) The dimensions across the corners of nut and socket dimensions may exceed "A" dimensions.

TABLE 1 - Hose and Fitting Dimensions as Shown in Figure 1 (inch)[1)]

| Hose Size (Ref) | Fitting O.D. A[2)] Max | Str. Fitting I.D. B[3)] Min | Attachment Length C Max | Hose I.D. Braided D Min | Hose O.D. Braided E Min | Hose O.D. Braided E Max | Wall Thickness, Inner Tube T Min | Wall Thickness, Inner Tube T Max | Number of Braids |
|---|---|---|---|---|---|---|---|---|---|
| 03 | .49 | .080 | 1.25 | .110 | .234 | .285 | .035 | .047 | 1 |
| 04 | .55 | .132 | 1.25 | .173 | .304 | .374 | .035 | .047 | 1 |
| 05 | .63 | .193 | 1.35 | .235 | .367 | .417 | .035 | .047 | 1 |
| 06 | .70 | .256 | 1.45 | .298 | .430 | .500 | .035 | .047 | 1 |
| 08 | .83 | .340 | 1.72 | .391 | .546 | .614 | .038 | .050 | 1 |
| 10 | .97 | .430 | 1.93 | .485 | .641 | .799 | .042 | .054 | 1 |
| 12 | 1.17 | .548 | 2.16 | .615 | .766 | .906 | .042 | .054 | 1 |
| 16 | 1.52 | .778 | 2.50 | .851 | 1.078 | 1.140 | .042 | .054 | 2 |
| 20 | 2.00 | 1.00 | 2.55 | 1.101 | 1.328 | 1.390 | .045 | .057 | 2 |
| 24 | 2.28 | 1.25 | 2.68 | 1.344 | 1.637 | 1.707 | .065 | .077 | 2 |

1) Dimensions listed in this table are for reference only, refer to applicable 'AS' standards.
2) The dimensions across the corners of nut and socket hexagon may exceed "A" dimension.
3) Minimum I.D. through the elbow area may be less than the values shown. Refer to applicable 'AS' Assembly Specification.

3.5.2 Physical Requirements: Hose assemblies shall meet the physical and weight requirements per Table 2.

TABLE 2 - Physical Requirements of Hose Assemblies and Weight of Hose

| Hose Size | Hose Weight[1)] Max lb/in | Operating Pressure psig | Proof Pressure psig | Burst Pressure Room Temp. Min psig | Burst Pressure High Temp. Min psig | Bend Radius at Inside of Bend Min in | Volumetric Expansion Max cc/in | Effusion (per 1/2 hour) cc/ft | Effusion After Stress Degred. (per minute) cc/in/ Min | Negative Pressure in Hg |
|---|---|---|---|---|---|---|---|---|---|---|
| 03 | .005 | 1500 | 3000 | 12000 | 7000 | 2.00 | 0.028 | 4.0 | 8.0 | 28 |
| 04 | .007 | 1500 | 3000 | 12000 | 7000 | 2.00 | 0.028 | 4.0 | 8.0 | 28 |
| 05 | .008 | 1500 | 3000 | 10000 | 6500 | 2.00 | 0.040 | 5.0 | 8.0 | 28 |
| 06 | .010 | 1500 | 3000 | 9000 | 6500 | 4.00 | | 5.0 | 8.0 | 28 |
| 08 | .013 | 1500 | 3000 | 8000 | 6000 | 4.63 | | 5.0 | 4.0 | 28 |
| 10 | .017 | 1500 | 3000 | 7000 | 5500 | 5.50 | | 5.0 | 2.0 | 28 |
| 12 | .022 | 1000 | 2000 | 5000 | 3500 | 6.50 | | 6.0 | 2.0 | 20 |
| 16 | .048 | 1250 | 2500 | 5000 | 3500 | 7.38 | | 8.0 | 2.0 | 14 |
| 20 | .062 | 1000 | 2000 | 4000 | 3000 | 11.00 | | 8.0 | 2.0 | 10 |
| 24 | .084 | 1000 | 2000 | 4000 | 3000 | 14.00 | | 8.0 | 2.0 | 8 |

1) Hose weight shall be determined on a minimum length of 12 in.

3.5.3 Bore Check: When bent to the appropriate minimum bend radius as specified in Table 2, the hose assembly shall permit the free passage of a solid rigid sphere throughout its length. The diameter of the sphere shall be 90% of the appropriate minimum inside diameter "B" of the end fittings as specified in Table 1. For elbow fittings see note 3 of Table 1.

3.6 Screw Threads:

Unless otherwise specified (see 3.3.3), fitting threads shall be in accordance with MIL-S-8879. NOTE: Fitting nut thread tolerance increase of 10% following proof testing shall not be cause for rejection of the hose assembly.

3.7 Part Numbering of Interchangeable Parts:

All parts complying with this standard and having the same manufacturer's or standard part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of DOD-D-1000 shall govern the manufacturer's part numbers and changes thereto.

3.8 Identification of Product:

The assembly and its component parts shall be permanently marked for identification in accordance with MIL-STD-130. The following special marking shall be added:

3.8.1 Fittings: The manufacturer's name or trademark shall be permanently marked on one element of all end fittings.

3.8.2 Assembly: A permanent marking shall be applied on a fitting or on a permanent band or bands securely attached on the hose. Marking bands shall be so designed as to remain tight on the hose to prevent relative movement and resultant chafing. Bands shall be no wider than 1 in and shall not impair the flexibility or the performance of the hose. Unless otherwise specified, the marking on the fitting or band shall include the following information:

a. Assembly manufacturer's name or trademark, and specification number
b. Complete hose assembly part number, and hose liner source Federal Supply Code for Manufacturer's (FSCM) number
c. Nominal pressure "1500 psi", or as applicable per Table 2
d. Operating temperature "450°F" or 275°F (as applicable) if required
e. Pressure test symbol "PT"
f. Date of hose assembly manufacture expressed in terms of month and year, or batch number

3.9 Workmanship:

The hose assembly, including all parts, shall be constructed and finished to a good quality. All surfaces shall be free from burrs and sharp edges. All sealing surfaces shall be smooth, except that annular tools marks up to 100 µin $R_A$ per ANSI B46.1 maximum will be acceptable.

3.9.1 Dimensions and Tolerances: All pertinent dimensions and tolerances, where interchangeability, operation, or performance of the hose assembly may be affected, shall be specified on all drawings.

3.9.2 Cleaning: All hose assemblies shall be free from oil, grease, dirt, moisture, cleaning solvents and other foreign materials both internally and externally. Hose assemblies shall be cleaned per Class 0 of ARP611 and shall meet the following requirements when properly cleaned.

3.9.2.1 Internal Cleanliness Test:

3.9.2.1.1 Visually inspect hose assembly ends for installation of plug or cap at fitting. Both ends should be firmly capped. An uncovered fitting nipple end shall be cause for rejection.

3.9.2.1.2 Remove caps or plugs, place a light source at one end of the hose assembly and visually examine the hose assembly, without magnification, from the opposite end. Oil, grease, dirt, moisture or other foreign materials shall be cause for rejection.

3.10 Hose Assembly, Test and Performance Requirements:

3.10.1 Proof Pressure: When tested in accordance with AS2078, paragraph 5.8, each hose assembly shall withstand the proof pressure listed in Table 2 without malfunction or leakage.

3.10.2 Elongation and Contraction: When tested in accordance with AS2078, paragraph 5.5, there shall be no change in length by more than 2% in 10 in gauge length. Two sample hoses shall be subjected to this test.

3.10.3 Volumetric Expansion: When tested in accordance with AS2078, paragraph 5.6, the volumetric expansion shall not exceed the limits specified in Table 2. Two sample hose assemblies shall be subjected to this test.

3.10.4 Pneumatic Effusion: When tested in accordance with AS2078, paragraph 5.2, the hose assemblies shall not exceed a total effusion rate as shown in Table 2. Two sample hose assemblies shall be used for this test.

3.10.5 Pneumatic Surge: When tested in accordance with AS2078, paragraph 5.16, the inner tube of the hose assembly shall not collapse nor show evidence of degradation. Two sample hose assemblies shall be used for this test.

3.10.6 Fuel Resistance: When tested in accordance with AS2078, paragraph 5.12, the hose assemblies shall not leak or show evidence of degradation. Two sample hose assemblies shall be used for this test.

3.10.7 Impulse:

3.10.7.1 Preconditioning: Six sample hose assemblies having a 90° elbow fitting on one end and a straight fitting on the other end shall be used for this test. If approval is being sought for both the bent-tube and the forged-elbow configuration, then one-half of the samples as shown in Table 3 shall use the bent elbows, while the other half of the samples shall have the forged elbows.

3.10.7.2 Preparation: Two assemblies shall be oil aged, two shall be air aged, and two shall be unaged (see 4.5.2). The assemblies shall then be subjected at room temperature to the proof pressure specified in Table 2 for a minimum of 5 min.

3.10.7.3 Requirement: The hose assemblies shall then be tested in accordance with AS2078, paragraph 5.10, except that sizes 16, 20, and 24 shall be tested straight, without bending. The specimens shall pass 100 000 cycles of impulse testing without any evidence of leakage (see also 6.h).

NOTE: The high temperature portion of the impulse test shall be conducted at 400°F.

3.10.8 Stress Degradation: When tested in accordance with AS2078, paragraph 5.1.2, the hose assembly shall not exceed an average effusion rate as shown in Table 2. Two sample hose assemblies shall be used for this test.

3.10.9 Low Temperature Flexing: When tested in accordance with AS2078, paragraph 5.13, the hose assembly shall not show damage after flexing. Three sample hose assemblies shall be used for this test.

3.10.10 Leakage: When tested in accordance with AS2078, paragraph 5.7, there shall be no leakage. Two sample hose assemblies shall be subjected to this test.

3.10.11 Corrosion: Two assemblies shall be tested in accordance with the following procedure. Assembly shall be pressurized to the operating pressure for Table 2, and immersed in a 2.5% ± 0.1 NaCl solution for a period of 5 min then hot air dried at 140°F for a period of 25 min. This cycle shall be repeated for a total of 172 h. Following completion, one assembly shall be room temperature burst tested per 3.10.13 and one assembly high temperature burst tested per 3.10.14.

3.10.12 Repeated Installation: When tested in accordance with the procedure outlined below, the assembly end fittings shall show no evidence of leakage, galling or other malfunction. Two sample hose assemblies shall be used for this test. The test procedure shall be as follows: End fittings on hose assemblies shall be screwed to appropriate union adaptors eight times using system fluid or an equivalent lubricant. Each of the eight cycles shall include the complete removal of the hose fitting from the manifold union. Fitting nuts shall be tightened to the torques specified in ARP908, one-half shall be tested to the minimum, one-half to the maximum tightening torques. Following the first,

TABLE 3 – Qualification Test Sequence and Number of Samples[1)]

| | Inner Tube | Hose Assemblies | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 3.3 Examination[2)] | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| 3.4.1 Density, relat. dens.[2)] | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| 3.4.2 Tensile strength[2)] | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| 3.4.3 Elongation[2)] | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| 3.4.4 Flattening, rounding[2)] | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| 3.4.5 Proof pressure[2)] | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| 3.4.6 Electr. conductivity[2)] | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| 3.5–3.9 Examination[2)] | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.10.1 Proof pressure | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| 3.10.2 Elongation | | | | | 0 | | | | | | | 0 | | | | | | | | | | | |
| 3.10.3 Volumetric expansion | | | | | 0 | | | | | | | 0 | | | | | | | | | | | |
| 3.10.4 Pneumatic effusion | | | | | | | | 0 | 0 | | | | | | | | | | | | | | |
| 3.10.5 Pneumatic surge | | | | | | | | 0 | 0 | | | | | | | | | | | | | | |
| 3.10.6 Fuel | | | | 0 | 0 | | | | | | | | | | | | | | | | | | |
| 3.10.7 Impulse: Unaged<br>Air aged<br>Hydr. aged | | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 3.10.8 Stress degradation | | | | | | | | | | 0 | 0 | | | | | | | | | | | | |
| 3.10.9 Flexing, Low Temp. | | | | 0 | | | | | | | 0 | 0 | | | | | | | | | | | |
| 3.10.10 Leakage | | | | | | | | 0 | 0 | | | | | | | | | | | | | | |
| 3.10.11 Corrosion | | | | | | 0 | 0 | | | | | | | | | | | | | | | | |
| 3.10.12 Repeated use installation | | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| 3.10.13 Burst – room temp. | | | | | | 0 | | 0 | | | | | | | | | | | | | | | |
| 3.10.14 Burst – high temp. | | | | | | | 0 | | 0 | | | | | | | | | | | | | | |
| 3.10.15 Vacuum | | | | 0 | | | | | | | 0 | 0 | | | | | | | | | | | |
| 3.10.16 Pneumatic leakage | | | | | | | | | | | | | 0 | 0 | | | | | | | | | |
| 3.10.17 Electr. conductivity | | | | | | | | | | | | | | | | | | | | | 0 | | |
| 3.10.18 Fire (when required) | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |

[1)] One circle "0" means one inspection

[2)] Production lot records may be used to verify conformance to these tests when the PTFE tube or hose assembly being used is an established production item

3.10.12 (Continued):

fourth, and eighth installation, proof tests shall be conducted in accordance with 3.10.1. Following the eighth installation the hose fittings shall be pressure tested with air or nitrogen for 5 min at the nominal operating pressure.

3.10.13 Room Temperature Burst Pressure: When tested in accordance with AS2078, paragraph 5.9 and 5.9.1, the hose assembly shall not leak or burst at any pressure below the room temperature burst value specified in Table 2. Two hose assemblies shall be tested.

3.10.14 High Temperature Burst Pressure: When tested in accordance with AS2078, paragraph 5.9 and 5.9.2 the hose assembly shall not leak or burst at any pressure below the high temperature burst value specified in Table 2. Two hose assemblies shall be tested.

3.10.15 Vacuum: When tested in accordance with AS2078, paragraph 5.15, the hose shall not collapse or buckle. After completion of the test a spherical ball of a diameter as shown in Table 4 shall be rolled freely through the length of the hose assembly. Three sample assemblies shall be used for this test.

TABLE 4 - Spherical Ball Size for Verifying Hose I.D. After Vacuum Test

| Hose Size | 03 | 04 | 05 | 06 | 08 | 10 | 12 | 16 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ball Dia. (in) | .078 | .125 | .188 | .250 | .312 | .406 | .531 | .750 | 1.00 | 1.25 |

3.10.16 Pneumatic Leakage: When tested in accordance with AS2078, paragraph 5.14, each assembly shall withstand the operating pressure listed in Table 2 without leakage. The test assemblies shall be prepared without the use of any oil during assembly. Two assemblies shall be tested.

3.10.17 Electrical Conductivity: When tested in accordance with AS2078, paragraph 5.3, hose assemblies of sizes 04 through 08 shall be capable of conducting a direct current equal to or greater than 6 µA and sizes 10 and over a current equal to or greater than 12 µA. One sample shall be used for this test.

3.10.18 Resistance to Fire:

a. When the hose assemblies are required to withstand a specified resistance to fire, two sample hose assemblies, which may be fitted with fire sleeves per AS1072 or an extrusion silicone fire sleeve, shall be tested in accordance with AS1055.

NOTE: On occasion a test may not be valid because of failure to hold the flame temperature at the specified value. For this reason it is advised to prepare three hose assemblies for this test.

b. The hose assemblies shall withstand the effects of the flame without leakage for the following periods as appropriate:

1. Fire resistant assemblies 5 min
2. Fire proof assemblies 15 min

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 commercial laboratory acceptable to the procuring activity. The purchaser 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 assemblies shall be classified as:

a. Qualification inspections 4.3
b. Quality conformance inspections 4.4

4.3 Qualification Inspections:

4.3.1 Qualification Test Samples: Test samples shall consist of the number of samples specified in Table 3 and the specimen numbers and lengths specified in Table 5.

If a supplier qualifies one type end fitting sealing design as defined herein and desires to qualify another sealing design, two hose assemblies of each size to be qualified shall be subjected to the tests specified in 4.5.1.1.

TABLE 5 - Lengths of Hose Assemblies for Test

| Hose Size | Six Assemblies for Impulse Test (3.10.7) | Two Assemblies for Fire Test (3.10.18) | Thirteen Assemblies for Other Tests[1] |
|---|---|---|---|
| Dash | in | in | in |
| 03 | 14 | 24 | 18 |
| 04 | 14 | 24 | 18 |
| 05 | 16 | 24 | 18 |
| 06 | 18 | 24 | 18 |
| 08 | 21 | 24 | 18 |
| 10 | 23.5 | 24 | 18 |
| 12 | 27.5 | 24 | 18 |
| 16 | 18 | 24 | 18 |
| 20 | 18 | 24 | 18 |
| 24 | 18 | 24 | 18 |

1) One additional sample of each size in lengths as shown in AS2078, paragraph 5.12, shall be used for electrical conductivity tests (3.10.17).



4.3.2 Test Report, Test Samples, and Data for the Purchaser: When the tests are conducted at a location other than the laboratory of the purchaser, the following shall be made available if requested by the purchaser:

a. Test report in accordance with MIL-STD-831. Three copies of a test report which shall include a report of all tests and outline description of the tests and conditions.

b. Test samples. The samples that were tested, when requested for qualification approval by the purchaser.

c. List of sources of hose or hose components, including source's name and product identification for inner tube, hose, and fitting if other than assembly supplier.

NOTE: Log sheets, containing required test data, shall remain on file at the source test facility and are not to be sent to the qualifying activity unless specifically requested.