Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE STANDARD

AS 1501

Issued November 1978
Revised

HOSE, AIR DUCT, FLEXIBLE, NONMETALLIC, AIRCRAFT

1. SCOPE

This specification covers two types of lightweight flexible and semiflexible, reinforced and unreinforced air hoses fabricated from laminated and impregnated fabric, intended for use in aircraft heating, air conditioning, ventilating, defrosting and/or deicing systems.

1.1 TYPES

Hose assemblies furnished under this specification shall be of the following types:

Type I -65° to +250°F (-54°C to +121°C) Operating temperature range.
Type II -65° to +500°F (-54°C to +260°C) Operating temperature range.

2. APPLICABLE DOCUMENTS

The following specifications and standards, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.1 SPECIFICATION

2.1.1 Federal

FAR 25.853	Federal Aviation Regulation, Volume III, Part 25.
QQ-P-35	Passivation Treatments for Corrosion-Resisting Steel.
QQ-A-355	Aluminum Alloy, Plate and Sheet, 2024.
QQ-P-416	Plating, Cadmium (Electrodeposited)
QQ-W-423	Wire, Steel, Corrosion-Resisting.
QQ-W-461	Wire, Steel, Carbon (Round, Bare, and Coated).
QQ-C-533	Copper-Beryllium Alloy Strip (Copper Alloy Numbers 170 and 172).
TT-S-735	Standard Test Fluids, Hydrocarbon

2.1.2 Military

MIL-Y-1140	Yarn, Cord, Sleeving, Cloth, and Tape-glass.
MIL-P-5425	Plastic, Sheet Acrylic, Heat Resistant.
MIL-F-5566	Fluid, Anti-icing (Isopropyl Alcohol).
MIL-H-5606	Hydraulic Fluid, Petroleum Base; Aircraft, missile, and Ordnance
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5.
MIL-L-6082	Lubricating Oil, Aircraft Reciprocating Engine (Piston)
MIL-L-6085	Lubricating Oil, Aircraft Instrument, Low Volatility.
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base.
MIL-S-18729	Steel Plate, Sheet and Strip, Alloy 4130, Aircraft Quality
MIL-L-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

2.2 STANDAROS

2.2.1 Military

MIL-STD-100	Engineering Drawing Practices.
MIL-STD-129	Marking for Shipment and Storage.
MIL-STD-130	Identification Marking of U.S. Military Property.
MIL-STD-810	Environmental Test Methods.
MS2192D	Clamp, Hose (Flat Band, 500°F).
MS33660	Tubing End, Hose Connection, Standard Dimensions for.
MS35842	Clamp, Hose: Low Pressure, Type "F".

2.2.2 Industry

AS 1241	Fire Resistant Hydraulic Fluid for Aircraft.
AS 1502	Hose, Air Duct, Flexible, Helical, Metallic Wire Supported (Exposed), Self Extinguishing.
AS 1503	Hose, Air Duct, Flexible, Helical, Metallic Wire Supported (Covered), Self Extinguishing.
AS 1504	Hose, Air Duct, Flexible, Helical, Nonmetallic Wire Supported (Exposed), Self Extinguishing.
AS 1505	Hose, Air Duct, Flexible, Annular Convoluted, Self Extinguishing.
AS 1506	Hose, Air Duct, Semiflexible, Sleeve Section, Unreinforced, Self Extinguishing.
AS 1541	Hose, Air Duct, Flexible, Helical Convoluted, Metallic Wire Supported (Covered), Self Extinguishing.
AS 1542	Hose, Air Duct, Flexible, Helical Convoluted, Self Extinguishing.
AS 1543	Hose, Air Duct, Semiflexible, Sleeve Section Unreinforced, Self Extinguishing, Nomex
AS 1544	Hose, Air Duct, Flexible, Helical, Nonmetallic Wire Supported (Covered), Silicone Rubber, Self Extinguishing.
ASTM B 117	Salt Spray (Fog) Testing, Method of Test for (ANSI Z11B.1-74)

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3. REQUIREMENTS

3.1 QUALIFICATION

Any hose assembly furnished under this specification shall be a product identical in construction to the specimens which have been tested and passed the qualification tests specified herein.

3.2 MATERIALS

The hose assembly materials shall be uniform in quality, free from defects, suitable for its intended use, consistent with good manufacturing practices, and in conformance with the applicable specifications and requirements specified herein. Materials used in these hose assemblies shall be selected from those listed in Table I.

TABLE I
HOSE ASSEMBLY MATERIALS

COMPONENT	MATERIAL DESCRIPTION	SPECIFICATION	FINISH
COATED FABRIC	FIBERGLASS, NEOPRENE RUBBER IMPREGNATED (OR EQUIVALENT)	MIL-Y-1140 (FABRIC ONLY)	AS MANUFACTURED UNLESS SPECIFIED
	FIBERGLASS, SILICONE RUBBER IMPREGNATED (OR EQUIVALENT)		
	NOMEX, SILICONE RUBBER IMPREGNATED (OR EQUIVALENT)		
CORDAGE	FIBERGLASS (OR EQUIVALENT)	MIL-Y-1140	
REINFORCEMENT	CARBON STEEL	QQ-W-461	COPPERED PER QQ-W-461, FINISH 2
			TINNED PER QQ-W-461; FINISH 3
			ZINC-COATED PER QQ-W-461, FINISH 5 CLASS 2
			CADMIUM-PLATED PER QQ-P-416, TYPE II, CLASS 2
	300 SERIES CRES.	QQ-W-423	PASSIVATE PER QQ-P-35
	NONMETALLIC MATERIAL MEETING REQUIREMENTS OF PARAGRAPH 3.5.B.		AS MANUFACTURED UNLESS SPECIFIED

3.3 DESIGN AND CONSTRUCTION

The hose shall be constructed to conform with the following configurations in reference to Type and Form (available type and form combinations are shown in Table II).

Type I -65°F to +250°F (-54°C to +121°C) Operating Temperature Range.

Type II -65°F to +500°F (-54°C to +260°C) Operating Temperature Range.

Form 1 Helical - wire (metallic or nonmetallic) reinforcement (Can be axially compressed but not elongated beyond free length).

Form 2 Helical convoluted - wire (metallic) reinforcement if specified (Can be axially compressed and elongated)

Form 3 Annular convoluted - wire ring reinforcement if required for pressure (Can be axially compressed and elongated).

Form 4 Sleeve - No reinforcement other than fabric (Can not be axially compressed or elongated).

3.3.1 Soft End Couplings

Soft end couplings shall be formed by omitting the reinforcement wire (metallic or nonmetallic) from the end portion of the hose. See Para. 3.3.3 for termination of wire ends. For multilayer hose assemblies, the inner layer shall be continuous for the entire length of the hose and couplings. An additional ply (or plies) of coated fabric shall be added as required over the soft end to prevent clamp damage. The soft ends shall be smooth and may be dipped or coated with the basic elastomeric material to facilitate joint sealing. The soft ends shall have sufficient resilience for a snug fit over a rigid tube end conforming to Type A of MS33660 but shall be resistant to flow deformation to prevent clamp loosening and hose blow-off during service. For higher pressure hose assemblies, a bead shall be added to the soft ends when specified on applicable standard or drawing. The bead shall be fabricated of the same material as the hose. Width of the bead shall be 0.12 to 0.19 inch for hose diameters of 4.00 inches and smaller and 0.25 to 0.38 inch for hose diameters 4.25 inches and larger. Height of the bead shall be 0.13 inch minimum with shape optional.

3.3.2 Cut Ends

Cut or plain ends shall be the same as the hose body. Reinforcement wire (metal or nonmetallic) ends shall be crimped and/or terminated in such a manner as to prevent damage to the hose. Cut ends shall be used to a minimum extent possible and shall be used in lower pressure systems and where higher joint leakage can be tolerated.

3.3.3 Wire Reinforcement (Metal or Nonmetallic) and Cordage

Wire helical reinforcement shall be inside the hose for one ply construction and between layers for a multilayered hose. The nonmetallic reinforcement wire shall be flame retardant to meet requirements of 3.5.8. For multilayered hoses and where bonding of layers is critical, the fiberglass cordage shall be placed tight to both sides of the reinforcement wire when specified on applicable standard or drawing. The reinforcement wire shall be securely bonded to the fabric over its entire length. Wire ends shall be crimped and shall be terminated between layers at the soft ends to prevent piercing or damage to hose. When specified on standard or drawing, external fiberglass cordage (single or multicord) shall be securely bonded for its entire length and shall follow helical troughs formed by wire reinforcement.

3.3.3.1 Wire Heat Resistance

The metallic wire shall show no evidence of losing its spring characteristics when tested in accordance with Para. 4.5.3.1.

3.3.3.2 Wire Corrosion Resistance

The metallic wire shall show no evidence of corrosion of the base metal when tested in accordance with Para. 4.5.3.2.

3.3.4 Coatings

The surface of the hoses may be coated with a self-extinguishing and/or temperature-resistant material to conform to the requirements of this specification or procurement drawing. Hoses may also be coated with a resin to decrease effusion rates and to provide additional rigidity, except that no resin shall be applied over the attachment areas, unless specified on the procurement drawing. The coating material shall not be detachable from the hose surface by the air stream and shall not emit a noxious odor when subjected to any temperature within the design range.

3.3.5 Coated Fabric Abrasion Resistance

There shall be no evidence of fabric exposure after abrasion test per Para. 4.5.3.3.

3.4 DIMENSIONS AND WEIGHTS

3.4.1 Hose Diameter

The hose diameter is determined by the hose inside diameter and corresponds to the outside diameter of the rigid tube to which it attaches. The tolerance of the inside diameter of convoluted hose assemblies, the hose soft ends, and the sleeve type hoses shall be -0.01 to +0.03 inch. The hose outside diameter at the convolution crest for convoluted hose assemblies shall be specified on applicable standard (or drawing).

3.4.2 Hose Length

The hose length shall be measured in increments and tolerance as specified on standards and drawings. The length shall be measured when the hose is in an undistorted condition and shall include soft end coupling lengths.

3.4.3 Weight

Hose weight shall be kept to a minimum, consistent with good design practices and shall comply with maximum weights specified on applicable standards (or drawings).

3.5 PERFORMANCE

The hose assembly minimum bend radius, leakage and operating, proof and burst pressure ratings shall be verified by demonstration of meeting or exceeding the following performance requirements through qualification testing specified herein. Confidence in hose assembly performance shall be maintained by adherence to the quality assurance provisions as specified herein. Hose assemblies shall not show evidence of failure, delamination, cracking, collapse or permanent deformation during demonstration of performance requirements per Para. 3.5.2, 3.5.3, 3.5.4, 3.5.6, and 3.5.7 as follows:

Definition Notes

Failure---------Any discrepancy that precludes a hose assembly from meeting performance requirements specified herein.

Delamination----A bubble or fabric separation exceeding 0.1 square inch area in any portion of the hose assembly except immediately adjacent to the reinforcement wire of a multilayered hose assembly or a bubble or fabric separation that grows with continued working of hose material.

Cracking--------Internal or external separation of hose surface that grows with continued working of hose material.

Collapse--------Any ovality of the hose that causes a reduction in hose cross sectional area of 5 percent or greater as defined in Para. 3.5.3.

Permanent deformation---Any change in size or shape in excess of the envelope parameters defined by standard or drawing.

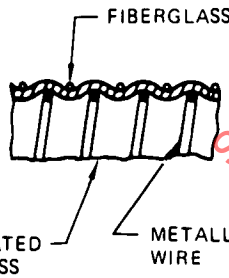
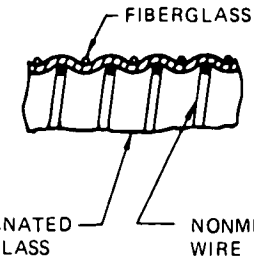
3.5.1 Examination of Product

Each hose assembly must conform dimensionally and materially to applicable standard (or drawing) and to all requirements of this specification. Examination shall be conducted in accordance with Para. 4.6.1.

3.5.2 Proof Pressure

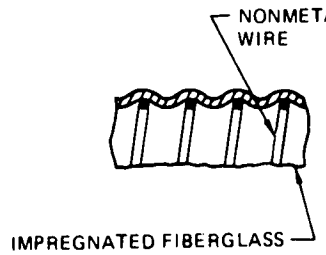
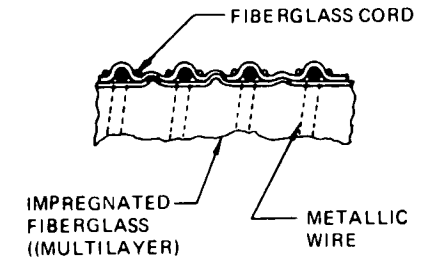
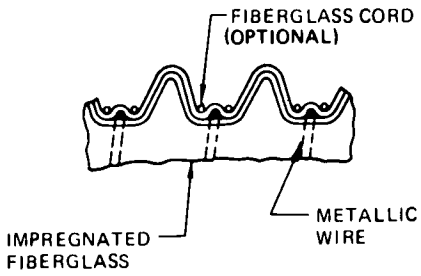
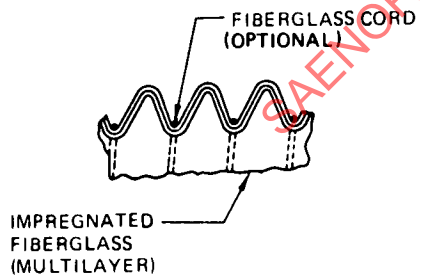
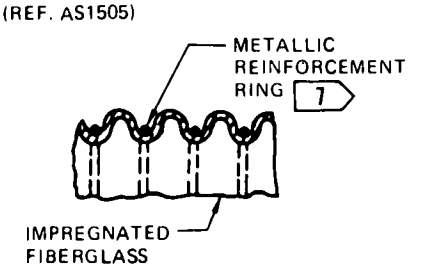
The hose assembly shall withstand a room temperature (Ref. 70°F, 21°C) proof pressure of twice the positive operating pressure specified on applicable standard (or drawing). When a negative operating pressure is specified on the standard (or drawing), the hose assembly shall withstand one psi below the negative pressure. Testing shall be accomplished in accordance with Para. 4.6.2.

TABLE II
HOSE ASSEMBLY DATA (1) (2)

CONSTRUCTION	MAXIMUM WEIGHT (LBS/FT/ IN. DIA)	MINIMUM INSIDE BEND RADIUS (IN.)	CRUSH RESISTANCE (LBS/FT/ IN. DIA)	MAX. HOSE LEAKAGE (SCFM/FT/ IN. DIA)	MAX. TOTAL JOINT LEAKAGE (SCFM/IN. HOSE DIAMETER)	AVAILABLE TYPES	(3)	(4)
FORM 1, HELICAL (REF. AS1502)  	0.10	0.50 X HOSE I.D.	N/A	0.02	0.20	I & II	6	N/A
FORM 1, HELICAL (REF. AS1504) (3.25 INCH I.D. AND OVER)  	0.065	2.0 X HOSE I.D.	(5)	0.02	0.20	I	6	N/A

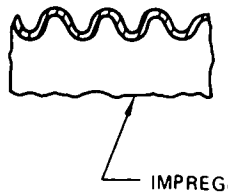
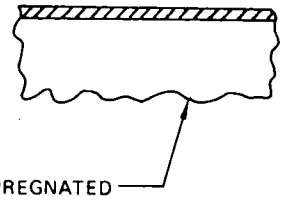
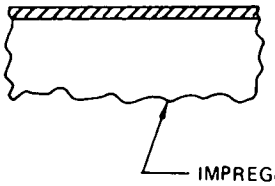
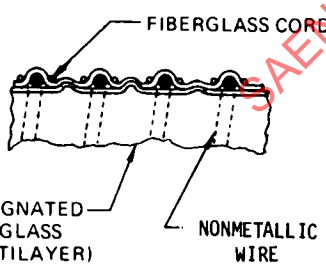
SEE PAGE 6 FOR FLAG NOTES

TABLE II (CONTINUED)
HOSE ASSEMBLY DATA [1] [2]

CONSTRUCTION	MAXIMUM WEIGHT (LBS/FT/ IN. DIA)	MINIMUM INSIDE BEND RADIUS (IN.)	CRUSH RESISTANCE (LBS/FT/ IN. DIA)	MAX. HOSE LEAKAGE (SCFM/FT/ IN. DIA)	MAX. TOTAL JOINT LEAKAGE (SCFM/IN. HOSE DIAMETER)	AVAILABLE TYPES	[3]	[4]
FORM 1, HELICAL (REF. AS1504) (3.00 INCH I.D. AND UNDER)  	0.065	1 X HOSE I.D.	[5]	0.02	0.20	I	6	N/A
FORM 1, HELICAL (REF. AS1503)  	0.16	1 X HOSE I.D.	N/A	0.01	0.10	I & II	6	N/A
	0.12			0.02	0.20			
FORM 2, HELICAL (REF. AS1541)  	0.17	1.5 X HOSE I.D.	N/A	0.01	0.10	I & II	6	6
FORM 2, HELICAL (REF. AS1542)  	0.09	1 X HOSE I.D. (3 IN. I.D. AND UNDER) 2 X HOSE I.D. (3.25 IN. I.D. AND OVER)	N/A	0.02	0.20	II	20	20
FORM 3, ANNULAR CONVOLUTED (REF. AS1505)  	0.24	2 X HOSE I.D.	N/A	0.01	0.10	II	6	6

SEE PAGE 6 FOR FLAG NOTES

TABLE 11 (CONTINUED)
HOSE ASSEMBLY DATA [1] [2]

CONSTRUCTION	MAXIMUM WEIGHT (LBS/FT/ IN. DIA)	MINIMUM INSIDE BEND RADIUS (IN.)	CRUSH RESISTANCE (LBS/FT/ IN. DIA)	MAX. HOSE LEAKAGE (SCFM/FT/ IN. DIA)	MAX. TOTAL JOINT LEAKAGE (SCFM/IN. HOSE DIAMETER	AVAILABLE TYPES	[3]	[4]
FORM 3, ANNULAR CONVOLUTED (REF. AS1505) 	0.12	0.75 X HOSE I.D.	N/A	0.015	0.15	I & II	10	10
	0.18	1.0 X HOSE I.D.	N/A	0.01	0.10	II	10	10
FORM 4, SLEEVE (SEMI-RIGID) (REF. AS1506) 	0.060	N/A	[6]	0.02	0.20	I & II	N/A	N/A
	0.085			0.01	0.10			
FORM 4, SLEEVE (SEMI-RIGID) (REF. AS1543) 	0.045	N/A	[6]	0.02	0.20	1	N/A	N/A
	0.07			0.01	0.10			
FORM 1, HELICAL (REF. AS1544) 	0.10	1.0 X HOSE I.D. (2.75 IN. I.D. AND UNDER) 2.0 X HOSE I.D. (3.00 IN. I.D. AND OVER)	N/A	0.02	0.20	I	6	N/A

[1] MAXIMUM OPERATING PRESSURE (PSI) SPECIFIED ON "AS" STANDARDS OR DRAWINGS VARIES WITH HOSE CONSTRUCTION AND DIAMETER.

[2] INSIDE DIAMETER RANGE SHALL BE PER "AS" STANDARD OR DRAWING.

[3] COMPRESSIBILITY PERCENT = Δ L/L X 100. (WHERE L IS THE CONVOLUTED LENGTH LESS 1-1/2 INCHES FOR WIRE TERMINATION)

[4] EXTENSIBILITY PERCENT = Δ L/L X 100. (WHERE L IS THE CONVOLUTED LENGTH LESS 1-1/2 INCHES FOR WIRE TERMINATION)

[5] HOSE CAPABLE OF BEING CRUSHED FOR FOUR INCHES OF LENGTH TO 50 PERCENT OF ITS DIAMETER WITHOUT DAMAGE OR PERMANENT SET. HOSE WILL RETURN UNPRESSURIZED TO FULL DIAMETER AFTER REMOVAL OF DEFORMING FORCE.

[6] SLEEVE TYPE HOSE SHALL BE DEFORMABLE WITHOUT PERMANENT SET.

[7] WIRE RING REINFORCED—RINGS SHALL BE BUTT WELDED OR BRAZED WITH A SMOOTH JOINT AND SHALL FIT SNUG TO HOSE CONVOLUTIONS. ONE RING PER CONVOLUTION EXCEPT NONE ADJACENT TO SOFT END.

3.5.3 Bend Radius

The hose assembly shall show no indication of buckling, collapse, reduction in cross sectional area in excess of 5 percent, delamination, or any other indication of failure during bend radius test in accordance with Para. 4.6.3 and after completion of applicable room temperature proof pressure test per Para. 3.5.2. Test is not required for sleeve constructed hose assemblies (Table II Form 4). Reduction in area shall be determined by:

$$\left(1 - \frac{D_{(MAX)} \times D_{(MIN)}}{D^2\ (FREE)}\right) \times 100 \leq 5 \text{ PERCENT}$$

where "D" is hose assembly outside diameter.

3.5.4 Leakage

The hose assembly shall not exceed the maximum allowable leakage rates specified in the applicable standard (or drawing), when tested at room temperature in accordance with Para. 4.6.4.

3.5.5 Blow-off

The hose assembly shall not blow off of a MS33660 beaded rigid tube nor show evidence of the hose creeping from under clamp, when tested at two times specified applicable standard (or drawing) operating pressure in accordance with Para. 4.6.5.

3.5.6 Burst Pressure

The hose assembly shall not burst nor show evidence of failure when tested at three times the operating pressure specified in the applicable standard (or drawing). The test shall be conducted for both the minimum and the maximum operating temperatures in accordance with Para. 4.6.6.

3.5.7 Flexure and Pressure Cycling

Hose assembly shall show no evidence of delamination, cracking or deterioration and shall satisfactorily pass proof pressure test, Para. 3.5.2, after flexure test per paragraph 4.6.7.

3.5.8 Self-extinguishing

The hose assemblies, when tested vertically in accordance with Para. 4.6.8, shall meet the self-extinguishing requirements of Federal Aviation Regulation, FAR 25-32, Para. 25.853 (b), as follows:

a. Self-extinguishing - 15 seconds maximum
b. Maximum burn length - 8.0 inch maximum
c. Drippings self-extinguishing time - 5 seconds maximum

3.5.9 Odor and Fungus

This hose assembly shall not be a nutrient to fungi, contain any substance which is injurious to the skin, health, or emit a toxic or unpleasant odor when subjected to any temperature within the applicable operating temperature range and when tested in accordance to Para. 4.6.9.

3.5.10 Fluid Resistance

The hose assembly shall show no evidence of delamination, wicking, tackiness or structural degradation when exposed to Table III fluids. Tests shall be conducted in accordance with Para. 4.6.10.

TABLE III
TEST FLUIDS

FLUID	SPECIFICATION
Standard Test Fluids, Hydrocarbon	TT-S-735, Types I and II
Anti-icing (Isopropyl Alcohol)	MIL-F-5566
Hydraulic Fluid, Petroleum Base	MIL-H-5606
Hydraulic Fluid, Phosphate Ester	AS 1241
Fuel	MIL-T-5624, Type JP-5
Lubricating Oil, Engine	MIL-L-6082
Lubricating Oil, Instrument	MIL-L-6085
Lubricating Oil, Turbine Engine	MIL-L-7808 or MIL-L-23699
Water	3.5% NaCl solution

3.5.11 Plexiglass Polycarbonate Crazing

Plasticizer, extracted from hose material(s) shall not craze plexiglass or polycarbonates conforming to MIL-P-5425, when tested per Para. 4.6.11.

3.5.12 Corrosion

Polished metal samples shall show no evidence of corrosion, when tested with hose samples in accordance with Para. 4.6.12.

3.6 HOSE CLAMP

The hose clamp and torque requirements must be specified on installation drawing and/or specification. See design note below. For hose qualification testing, hose installation and clamping shall be in accordance with Figure 1 and Table IV.

Design Note: Allowable hose pressure and hose end leakage are dependent on type clamp used, clamp torque and stiffness and configuration of rigid hose end.

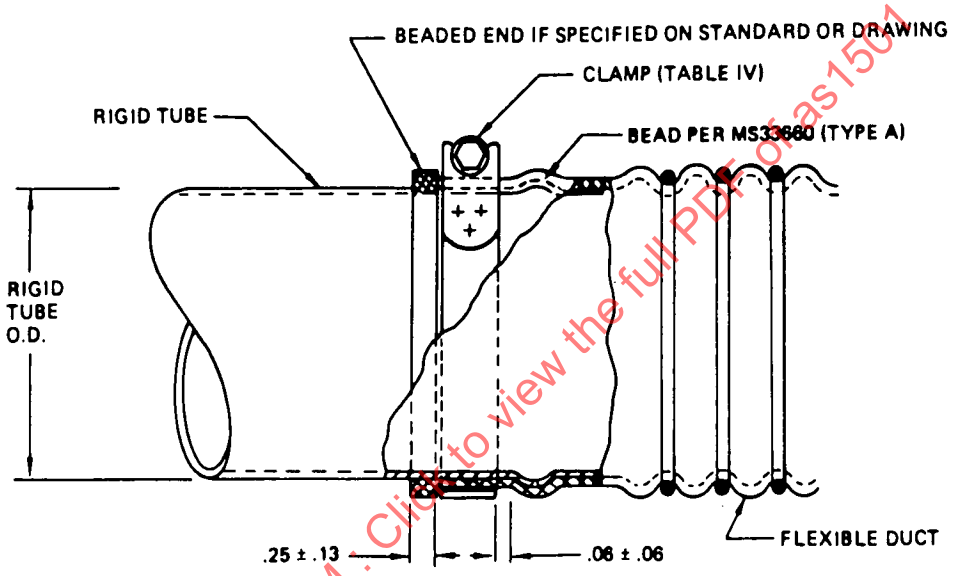


FIGURE 1
HOSE CLAMP INSTALLATION

TABLE IV
TIGHTENING TORQUES

CLAMP	TORQUE (INCH-POUNDS)	SPECIMEN DIAMETER (IN.)
MS21920	20 - 25	4 and 6
MS35842	18 - 22	2

3.7 PART NUMBERING OF INTERCHANGEABLE PARTS

All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-100 shall govern the manufacturer's part number and changes thereto.

3.8 IDENTIFICATION OF PRODUCT

Each hose assembly shall be durably and legibly marked with an oil-resistant marking fluid in no less than two suitable places, size permitting or tagged per MIL-STD-130, with the following information:

a. Federal supply code number/manufacturer's part number.
b. Manufacturer's name or trademark.
c. Complete standard, specification control, or drawing number.
d. Date of hose manufacture expressed in terms of month and year.

3.9 WORKMANSHIP

The hose assembly shall be free of defects and shall be constructed and finished in a thoroughly workmanlike manner.

4. QUALITY ASSURANCE PROVISIONS

4.1 SUPPLIER'S RESPONSIBILITY

The supplier shall be responsible for the performance of all quality assurance provisions and inspections specified herein. Qualification testing shall be conducted by supplier. Accurate records of the testing shall be kept by the supplier and shall be available to the purchaser on request. The supplier's test data shall be subject to approval by the purchaser. The purchaser reserves the right to perform any of the inspections and tests set forth in this specification to assure conformance to this specification.

4.2 USER'S RESPONSIBILITY

The purchaser should establish adequate inspection procedures to ensure that all requirements of this specification are met. Receiving inspections should consist of, but not limited to, the following verifications:

a. Dimensional conformance.
b. Material, finish, and workmanship.
c. Marking.
d. Pressure and leakage test.

4.3 CLASSIFICATION OF INSPECTIONS

The examining and testing of the hose assemblies are classified as follows:

a. Qualification inspections.
b. Quality conformance inspections.

4.4 QUALIFICATION INSPECTIONS

The qualification inspections are intended to qualify the manufacturer's design, materials, and manufacturing processes to produce a hose that meets the performance requirements of this specification. The purchaser shall be notified at least fourteen days prior to the start of test and shall reply within seven days prior to start of test of intent to witness the test. Any changes in the manufacturing process, parts or materials that affect the quality assurance provisions of this specification shall have prior approval from the purchaser.

4.4.1 Test Specimens

Seven hose assemblies of each grade (defining type, weight, and construction) as specified by each applicable standard (or drawing) shall be used for qualifying performance of the manufacturer's product. The assemblies shall be fabricated according to the manufacturer's production procedures and drawing and shall be the length and diameter specified on Table V.

TABLE V
SPECIMEN DIAMETER AND LENGTH (INCHES)

SPECIMEN NUMBER	1	2	3	4	5	6	7
Hose Diameter	2	2	2	4	4	6	6
Hose Length (Form 1)	12	12	12	16	16	20	20
Hose Length (Form 2)	6	6	6	9	9	12	12
Hose Length (Form 3)	6	6	6	9	9	12	12
Hose Length (Form 4)	6	N/R	6	6	N/R	20	6

4.4.2 Test Schedule and Sequence

4.4.2.1 Hose Assembly Test

Test specimens shall be subjected to qualification tests in the order indicated in Table VI (from top to bottom).

TABLE VI
TEST SCHEDULE AND SEQUENCE FOR QUALIFICATION TESTING

HOSE ASSEMBLY QUALIFICATION TEST	SPECIMEN NUMBER						
	1	2	3	4	5	6	7
Examination of Product (4.6.1)	X	X	X	X	X	X	X
Leakge Rate Test (4.6.4) 2	X	X	X	X	X	X	X
Proof Pressure Test (4.6.2)	X	X	X	X	X	X	X
Bend Radius Test (4.6.3) 1	X			X		X	
Leakage Rate Test (4.6.4) 2	X			X		X	
Proof Pressure Test (4.6.2)	X			X		X	
Blow-off Test (4.6.5)	X			X		X	
Burst Pressure Test (4.6.6)	X			X		X	
Flexure and Pressure Cycling Test (4.6.7) 1		X			X		X
Leakage Rate Test (4.6.4) 1 2		X			X		X
Proof Pressure Test (4.6.2) 1		X			X		X
Self-Extinguishing Test (4.6.8)						X	
Odor and Fungus Test (4.6.9)			X				
Hydraulic Fluid and Water Resistance Test (4.6.10)			X				
Plexiglass and Polycarbonate Crazing Test (4.6.11)							X
Corrosion Test (4.6.12)							X

1 Not required for sleeve type (Form 4) hose assemblies.

2 Leakage test may be performed in conjunction with proof pressure test.

4.4.2.2 Materials Tests

The material test of paragraph 4.5.3 shall be performed on representative samples of the hose materials.

4.5 QUALITY CONFORMANCE INSPECTIONS

Quality conformance inspections shall consist of the following inspections:

a. Individual tests (100 percent inspection except as noted) (Para. 4.5.1).
b. Sampling tests (Para. 4.5.2).
c. Material tests (Para. 4.5.3).

4.5.1 Individual Tests (Functional Tests)

All production hoses shall be tested as follows:

a. Examination of product (Para. 4.5.1.1).
b. Leakage and proof pressure test (Para. 4.5.1.2).
c. Bend radius test (Para. 4.5.1.3).

4.5.1.1 Examination of Product

Each hose assembly shall be inspected to assure dimensional conformance and product construction in accordance with applicable standard (or drawing). One hose assembly out of each production run shall be weighed to ensure compliance with weight requirement.

4.5.1.2 Leakage and Proof Pressure Test

One hose assembly out of each production run of hose assemblies having the same diameter, material, and construction shall be tested at room temperature. A leakage test in accordance with Para. 4.6.4 and a proof pressure test in accordance with Para. 4.6.2 shall be conducted. Operations may be combined to facilitate testing. A hose failure to pass either or both of the tests is reason for 100 percent testing (prior to shipment to the purchaser) of the remaining hose assemblies having the same diameter, material and construction as the failed item in the production run.

4.5.1.3 Bend Radius Test

One hose out of each production run of hose assemblies of the same diameter, material, and construction shall be tested per Para. 4.6.3 except at room temperature without prior conditioning, and length permitting. A hose failure to pass the bend radius test is reason for 100 percent testing of remaining hose assemblies of the same diameter, material and construction as the failed item in the production run.

4.5.2 Sampling Test

In a period of time not exceeding two years, a self-extinguishing test in accordance with Para. 4.6.8 shall be conducted for each type and form hose assembly constructed by the manufacturer in accordance with this specification. The hose assembly to be tested shall be selected at random from production hose assemblies.

4.5.3 Material Tests

4.5.3.1 Wire Heat Resistance Test

A sample of wire shall be subjected for a minimum of 50 hours to a temperature of 100°F (38°C) above maximum hose operating temperature.

4.5.3.2 Wire Salt Spray Test

A wire sample shall be subjected to the salt spray test for 100 hours in accordance with ASTM B117.

4.5.3.3 Abrasion Resistance Test

Samples for this test shall be 4 inches by 12 inches and shall be of the material representative of the outside surface of the hoses. Type I material shall be subjected to a minimum of 2500 cycles on a Tabor Abrader using a H-22 Calibrase Wheel under a load of one kilogram. (An alternate of 20,000 cycles using a CS-17 Calibrase Wheel with a one kilogram load may be used.) Type II material shall be tested for 1,000 cycles minimum under a one kilogram load using a CS-17 Calibrase Wheel.

4.6 TEST METHODS

The following notes are applicable as indicated to the qualification tests contained in this paragraph of the specification:

Note 1: Specimen shall be mounted in a straight line position on test mounts similar to the mount shown in Figure 2 except that both ends shall be rigidly fixed in respect to each other so hose can neither lengthen nor shorten during test. This note is applicable to tests, Para. 4.6.2, 4.6.4, 4.6.5, and 4.6.6.

Note 2: Temperatures, pressures, and other test specifications shall be within +10, -0 percent of specified values.

Note 3: Specimens must be conditioned to 70°F (21°C) ± 5°F (±3°C) and at 50 percent plus or minus 5 percent relative humidity until moisture equilibrium is reached or for 24 hours. Only one specimen at a time may be removed from the conditioning environment immediately before subjecting to tests, Para. 4.6.8.

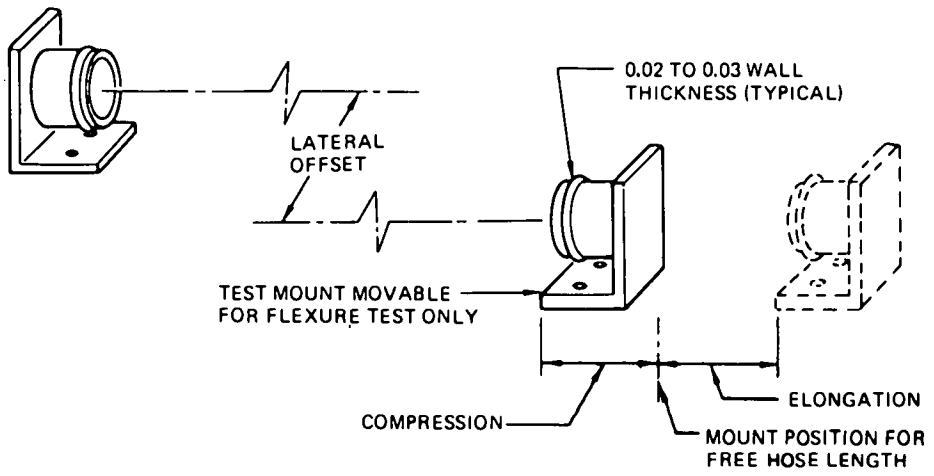


FIGURE 2
TEST MOUNTS FOR FLEXURE AND OTHER TEST