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## MILITARY SPECIFICATION

### WIRE ROPE, FLEXIBLE, FOR AIRCRAFT CONTROL

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

#### 1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the requirements for carbon steel and corrosion-resistant steel wire rope used in aircraft flight controls. The wire rope, bare or nylon-jacketed, shall be capable of operation within a temperature range of  $-65^{\circ}\text{F}$  to  $250^{\circ}\text{F}$ , in wind, in dust, in fuel and oil spills, in wash-down and other environmental stresses an aircraft experiences.

1.2 Classification. The wire rope covered in this specification shall be of the following types:

- a. Type I - Nonjacketed wire rope
  - Composition A - Carbon steel, tin or zinc coated
  - Composition B - Corrosion resistant steel
- b. Type II - Jacketed wire rope
  - Composition A - Carbon steel, tin or zinc coated
  - Composition B - Corrosion resistant steel

#### 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.

#### SPECIFICATIONS

##### Federal

MM-L-736	Lumber and Timber; Hardwood
MM-L-751	Lumber; Softwood
QQ-S-781	Strapping, Steel, Flat and Seals
PPP-B-636	Box, Fiberboard

FSC 4010

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Military

MIL-P-116	Preservation, Methods of
MIL-B-121	Barrier Material, Greaseproof, Waterproof, Flexible
MIL-T-781	Terminal; Wire Rope, Swaging
MIL-G-5572	Gasoline Aviation; Grades 80/87, 100/130, 115/145
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft and Ordnance
MIL-T-5624	Turbine Fuel Aviation, Grades JP-4 and JP-5
MIL-L-7808	Lubricating Oil, Aircraft and Turbine Engine, Synthetic Base
MIL-A-8243	Anti-icing and De-icing, De-frosting Fluid
MIL-H-19457	Hydraulic Fluid, Fire Resistant
MIL-F-22191	Films, Transparent, Flexible, Heat Sealable, For Packaging Applications
MIL-C-25769	Cleaning Compounds, Aircraft Surface, Alkaline Waterbase

STANDARDSMilitary

MIL-STD-129	Marking For Shipment and Storage
MIL-STD-794	Parts and Equipment Procedures for Packaging and Packing

(Copies of specifications, standards, drawings, and publications required by the 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 documents form 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 Society for Testing and Materials

ASTM E8	Tension Test Procedures
ASTM A90	Weight Testing of Zinc Coating
ASTM A309	Weight Testing of Tin Coating
ASTM D510	Moisture Absorption Test
ASTM D635	Burn Resistance of Plastics
ASTM D638	Tensile Properties of Plastics
ASTM D648	Heat Deflection of Plastics
ASTM D746	Brittleness Temperature of Plastic and Elastomers by Impact
ASTM D747	Stiffness of Plastic by Means of a Cantilever
ASTM D789	Melting Range of Plastics
ASTM D792	Specific Gravity and Density of Plastic Displacement, Test for

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

### 3. REQUIREMENTS

3.1 Detailed specifications. The individual item requirements shall be as specified herein.

3.2 Classification of requirements. The requirements for the wire rope are classified as follows:

<u>Requirements</u>	<u>Paragraph No.</u>
Qualification	3.3
Materials	3.4
Construction	3.5
Performance	3.6
Identification	3.7
Appearance	3.8

3.3 Qualification. Every wire rope, type, size, and construction furnished under this specification shall be products that are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.2.1 and 6.5).

3.3.1 Wire rope for type II. The wire rope that is to be covered with nylon jacketing shall first be qualified as a type I, composition A or B, wire rope in accordance with this specification.

#### 3.4 Materials

3.4.1 Steel for composition B. Steel for types I and II shall conform to the following composition limits:

Carbon	0.15 max	Sulfur	0.030 max
Manganese	2.00 max	Chromium	17.0 - 20.0
Silicon	1.00 max	Nickel	8.0 - 12.0
Phosphorous	0.045 max		

3.4.2 Steel for composition A. The steel used in carbon steel shall be capable of meeting the requirements of this specification.

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**3.4.3 Protective coating**

**3.4.3.1 Zinc coating for composition A.** Wires shall be zinc coated by the hot-dipped or electroplated process and shall conform to the following:

<u>Wire Diameter</u>	<u>Min Weight of Zinc Coating</u>	
	<u>Oz/Sq Ft</u>	<u>Grams/Sq cm</u>
.005 inch to .010 inch (.013 mm to .0250 mm)	0.03	18.98
Over .010 inch to .015 inch (.025 mm - .038 mm)	0.05	31.64
Over .015 inch to .028 inch (.038 mm - .071 mm)	0.10	63.28
Over .028 inch to .060 inch (.071 mm - .152 mm)	0.20	126.55

**3.4.3.2 Tin coating for composition A.** Tin coating of wires shall be by the hot-dipped or electroplated process and shall conform to the following:

<u>Wire Diameter</u>	<u>Min Weight of Zinc Coating</u>	
	<u>Oz/Sq Ft</u>	<u>Grams/Sq cm</u>
.005 inch to .101 inch (.013 mm - .025 mm)	0.003	1.898
Over .010 inch to .028 inch (.025 mm - .038 mm)	0.005	3.164
Over .015 inch to .028 inch (.038 mm - .071 mm)	0.010	6.328
Over .028 inch to .0625 inch (.071 mm - .158 mm)	0.015	9.492

**3.4.3.3 Nylon-jacketed coating for type II.** The nylon jacketing material shall meet the requirements of this specification as specified in 3.4.3.3.1 and shall be extruded over the rope. Only virgin nylon material shall be used in coating on the type II wire ropes.

**3.4.3.3.1 Physical and mechanical properties, nylon.** The nylon used on the wire rope shall be capable of meeting the requirements listed below when tested in accordance with 4.4.8 through 4.4.8.8.

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<u>Property</u>	<u>Test Method</u>
Ultimate tensile strength	5000 psi min <sub>2</sub> (4.4.8.1) (315.5 kg/cm <sup>2</sup> min)
Elongation	250 percent min (4.4.8.1)
Specific gravity	1.02 to 1.09 psi min (4.4.8.2)
Stiffness	35,000 psi min (4.4.8.5) (2460.7 kf/cm <sup>2</sup> min)
Water absorption	1.5 percent max (4.4.8.3)
Brittleness	-65°F (-54°C) max (4.4.8.4)
Resistance to fluids	(4.4.13)
Heat deflection	110/45°C at 66/264 psi min (4.4.8.6)
Melting range	320° to 374°F (160° to 190°C) (4.4.8.7)
Burn resistance	4 inch/min (10.2 cm/min) (4.4.8.8)

3.4.4 Lubricant. A suitable type of friction-preventive compound having noncorrosive properties shall be applied during the wire rope fabrication.

### 3.5 Construction

3.5.1 Wire. The wire used in steel cable shall be cylindrical and smooth and of uniformly high quality. It shall be free from splits, cold shuts, and other defects. Composition A wire shall be thoroughly and uniformly coated with either tin and zinc, or tin and zinc.

3.5.1.1 Wire properties. Tensile strengths of wire and wire sizes shall be such that wire rope will be capable of meeting the requirements of this specification.

3.5.1.2 Preforming of wires and strands. The individual wires and strands composing the wire rope shall be shaped into the exact helical position they will have in the finished wire rope, so that if the wire rope is cut or severed there is no tendency for the measured diameter of the wire rope at the unseized cut ends to increase by more than the amount specified in tables IA and IB.

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TABLE IA. Construction, Physical Properties of Type I, Carbon Steel and Corrosion Resistant Steel Wire Rope

Nominal Diameter of Wire Rope	Construction		Tolerance on Diameter (Plus Only)		Allowable Increase of Diameter		Minimum Breaking Strength Composition A		Minimum Breaking Strength Composition B		Approximate Weight per 100 Ft	
	In	mm	In	mm	In	mm	lbs	kg	lbs	kg	lbs	kg
1/32		.794	.006	.152	.006	.152	110	49.89	110	49.89	0.16	0.07
3/64		1.19	.008	.203	.008	.203	230	104.3	230	104.3	0.33	0.15
3/64		1.19	.008	.203	.008	.203	270	122.4	270	122.4	0.42	0.19
1/16		1.59	.010	.254	.009	.229	480	217.7	480	217.7	0.75	0.34
1/16		1.59	.010	.254	.009	.229	480	217.7	480	217.7	0.75	0.34
3/32		2.38	.012	.305	.010	.254	920	417.3	920	417.3	1.60	0.72
3/32		2.38	.012	.305	.010	.254	1,000	453.6	920	417.3	1.74	0.79
1/8		3.18	.014	.356	.011	.279	2,000	907.2	1,760	798.3	2.90	1.31
5/32		3.97	.016	.406	.017	.432	2,800	1270.	2,400	1089.	4.50	2.04
3/16		4.76	.018	.457	.019	.483	4,200	1905.	3,700	1678.	6.50	2.95
7/32		5.56	.018	.457	.020	.508	5,600	2540.	5,000	2268.	8.60	3.90
1/4		6.35	.018	.457	.021	.533	7,000	3175.	6,400	2903.	11.00	4.99
9/32		7.14	.020	.508	.023	.584	8,000	3629.	7,800	3538.	13.90	6.30
5/16		7.94	.022	.559	.024	.610	9,800	4445.	9,000	4082.	17.30	7.85
11/32		8.87	.024	.610	.025	.635	12,500	5670.			20.70	9.39
3/8		9.52	.026	.660	.027	.686	14,000	6332.	12,000	5443.	24.30	11.00

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Table IB. Construction and Dimensional Properties of Type II Wire Rope Jacket Tolerances

Nominal Diameter of Wire Rope	Construction		Tolerance on Jacket O.D. (Plus Only)		Outside Diameter of Jacket		Jacket Wall Thickness (Reference)		Approximate Weight per 100 Ft.	
In	mm		In	mm	In	mm	In	mm	lbs	kg
1/32	.794	3 x 7	.008	.203	3/64	1.19	.008	.203	0.22	0.10
3/64	1.19	3 x 7	.010	.254	1/16	1.59	.008	.203	—	—
3/64	1.19	7 x 7	.010	.254	1/16	1.59	.008	.203	0.49	0.22
3/64	1.19	7 x 7	.012	.305	5/64	2.00	.016	.406	0.76	0.34
1/16	1.59	7 x 7	.012	.305	3/32	2.38	.016	.406	0.93	0.42
1/16	1.59	7 x 7	.014	.356	1/8	3.18	.031	.787	1.18	0.53
1/16	1.59	7 x 19	.012	.305	3/32	2.38	.016	.406	0.93	0.42
1/16	1.59	7 x 19	.014	.356	1/8	3.18	.031	.787	1.18	0.53
2/32	2.38	7 x 7	.014	.356	1/8	3.18	.016	.406	1.85	0.84
3/32	2.38	7 x 7	.016	.406	5/32	3.97	.031	.787	2.18	0.99
3/32	2.38	7 x 19	.014	.356	1/8	3.18	.016	.406	1.99	0.90
3/32	2.38	7 x 19	.016	.406	5/32	3.97	.031	.787	2.32	1.05
1/8	3.18	7 x 19	.018	.457	3/16	4.76	.031	.787	3.62	1.64
5/32	3.97	7 x 19	.018	.457	7/32	5.56	.031	.787	6.10	2.77
5/32	3.97	7 x 19	.022	.559	9/32	7.14	.063	1.60	7.51	3.41
3/16	4.76	7 x 19	.018	.457	1/4	6.35	.031	.787	7.75	3.51
3/16	4.76	7 x 19	.022	.559	5/16	7.94	.063	1.60	9.20	4.17
7/32	5.56	7 x 19	.020	.508	9/32	7.14	.031	.787	9.76	4.43
7/32	5.56	7 x 19	.024	.610	11/32	8.87	.063	1.60	—	—
1/4	6.35	7 x 19	.020	.508	5/16	7.94	.031	.787	12.30	5.58
1/4	6.35	7 x 19	.024	.610	3/8	9.52	.063	1.60	—	—
9/32	7.14	7 x 19	.024	.610	13/32	10.3	.063	1.60	16.18	7.34
5/16	7.94	7 x 19	.024	.610	7/16	11.11	.063	1.60	19.80	8.98
11/32	8.87	7 x 19	.027	.686	15/32	11.9	.063	1.60	—	—
3/8	9.52	7 x 19	.027	.686	1/2	12.7	.063	1.60	27.20	12.34

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**3.5.1.3 Splicing and joining.** All wire splices or joints shall be brazed or welded. Any joints in individual wires in any layer of a strand shall not be closer than 20 feet (6.09 m) except as specified in 3.5.1.3.1.

**3.5.1.3.1 Twist-off.** When a twist-off occurs during fabrication of the 7-wire layer of a 19-wire strand (see 3.5.1.3), splices and joints in individual wires may be as close as 18 inches (46 cm).

**3.5.2 Wire rope lengths.** The wire rope shall be furnished on reels. There shall be no more than two pieces of wire rope on the reel. The shortest piece shall be a minimum of 20 percent of the reel length. The distance to the break point on the reel shall be marked on the reel and package.

**3.5.3 Types of construction.** Flexible steel wire rope covered by this specification shall be of 3 by 7, 7 by 7, or 7 by 19 construction. The type of construction for the respective diameters, the dimensional tolerances, and the physical properties shall be as specified in tables IA and IB.

**3.5.3.1 3 by 7 construction.** Wire rope of this construction shall consist of 3 strands of 7 wires each laid together without a core. Each strand shall consist of a layer of 6 wires laid around a center wire in a left-hand direction. The 3 strands shall be laid together in a right-hand direction. The length of lay of the 6 outer wires in each strand shall not exceed 70 percent of the lay of the finished wire rope. The length of lay of the finished wire rope shall be not more than 7 times nor less than 5 times the nominal wire rope diameter.

**3.5.3.2 7 by 7 construction.** Wire rope of this construction shall consist of 6 outer strands of 7 wires each laid around a core strand of 7 wires. The 6 outer strands shall consist of a layer of 6 wires laid around a center wire in a left-hand direction. The core strand shall consist of a layer of 6 wires laid around a center wire in a right-hand direction. The length of lay of the outside 6 wire in each of the 6 outside strands and the outside 6 wires of the core strand shall not exceed 60 percent of the lay of the finished wire rope. The length of the lay of the finished wire rope shall not be more than 8 nor less than 6 times of the nominal rope diameter.

**3.5.3.3 7 by 19 construction.** Wire rope of this construction shall consist of 6 outer strands of 19 wires each laid around a core strand of 19 wires. The 6 outer strands shall each consist of a layer of 6 wires laid around a center wire in a left-hand direction and a layer of 12 wires laid over the 7-wire strand in a left-hand direction. The core strand shall consist of a layer of 6 wires laid around a center wire in a right-hand direction and a layer of 12 wires laid around the 7-wire strand in the right-hand direction. The 6 outer strands shall be laid around the core in a right-hand direction. The length of lay of the inside layer of 6 wires in each of the 6 outer strands and the one core strand shall not exceed 60 percent of the lay of the outside layer of 12 wires in each strand. The length of lay of the outside layer of



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12 wires in each of the 6 outside strands and the core strand shall not exceed 50 percent of the lay of the finished wire rope. The length of lay of the finished wire rope shall be not more than 8 times nor less than 6 times the nominal wire rope diameter.

### 3.6 PERFORMANCE

3.6.1 Breaking strength. When tested in accordance with 4.4.2, the wire rope shall have the minimum breaking strength as shown in table IA.

3.6.2 Endurance, type I, composition A wire rope. When tested in accordance with 4.4.3 at -65°F, wire rope sizes 3/64 inch (1.19 mm) 7 by 7 construction to 3/8 inch (9.525 mm) 7 by 19 construction, shall be subjected to the endurance test at the specified loads and for the specified number of reversals shown in table IIA. There shall be no failures and the breaking strength of the wire rope after the endurance test shall not be less than the specified minimum values of table IIA. A diagram of an endurance testing machine is shown on figure 1.

3.6.2.1 Endurance, type I, composition A and B wire rope. When tested as specified in 4.4.4, wire rope 3/64 inch (1.19 mm) 7 by 7 construction to 3/8 inch (9.525 mm) 7 by 19 construction, shall be subject to the endurance test at the specified loads and for the specified number of reversals shown in table IIA. The breaking strength of the wire rope after the endurance test shall not be less than the specified values of table IIA for each composition.

3.6.3 Endurance, type II, composition A and B wire rope. When tested as specified in 4.4.5, wire rope 3/64 inch (1.19 mm) 7 by 7 construction to 3/8 inch (9.525 mm) 7 by 19 construction, shall be subject to the endurance test at the specified loads and for the specified number of reversals shown in table IIB. The breaking strength of the wire rope after the endurance test shall not be less than the specified values of table IIB for each composition.

3.6.3.1 Endurance, type II, sizes 1/16 inch (0.59 mm) and 3/32 inch (2.38 mm). Wire rope sizes 1/16 inch (0.59 mm) coated to 3/32 inch (2.38 mm) coated to 1/8 inch (3.18 mm), 7 by 7 and 7 by 19 construction shall be endurance tested as specified in 4.4.5, with the exception that the endurance test shall be conducted at -65°F for the above sizes and construction. The breaking strength of the wire rope after the endurance test shall not be less than the specified values of table IIB for each composition, nor shall there be cracking of nylon.

3.6.4 Stretch limits. When tested in accordance with 4.4.6, the stretch in the wire rope, types I and II, sizes 3/64 inch (1.19 mm) 7 by 7 construction to 3/8 inch (9.525 mm) 7 by 19 construction, shall not exceed 1.5 percent when it is loaded to 60 percent of the minimum breaking strength.

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Table IIA. Breaking Strength of Type I After Endurance Testing

COMPOSITION		A 4/				B			
Nominal Diameter of Bare Wire Rope	Con-struct-ion	TENSION 1/		MINIMUM BREAKING STRENGTH 2/		TENSION 1/		MINIMUM BREAKING STRENGTH 3/	
In	mm	lbs	kg	Reversal	lbs	kg	Reversal	lbs	kg
1/32	.794								
3/64	1.19								
3/64	1.19	3.0	1.36	70,000	135	61.23	70,000	162	73.5
1/16	1.59	5.0	2.27	70,000	240	108.9	70,000	288	130.6
1/16	1.59	5.0	2.27	70,000	240	108.9	70,000	288	130.6
3/32	2.38	9.0	4.08	70,000	460	208.6	70,000	552	250.4
3/32	2.38	9.0	4.08	70,000	500	226.8	70,000	552	250.4
1/8	3.18	18.0	8.16	70,000	1,000	453.6	70,000	1,056	479.0
5/32	3.97	24.0	10.89	130,000	1,400	635.0	130,000	1,440	653.2
3/16	4.76	37.0	16.78	130,000	2,100	952.5	130,000	2,220	1007.
7/32	5.56	50.0	22.68	130,000	2,800	1270.	130,000	3,000	1361.
1/4	6.35	64.0	29.03	130,000	3,500	1588.	130,000	3,840	1742.
9/32	7.14	78.0	35.38	130,000	4,000	1814.	130,000	4,680	2123.
5/16	7.94	90.0	40.82	130,000	4,900	2222.	130,000	5,400	2449.
11/32	8.87	110.0		130,000	6,250	2835.			
3/8	9.52	120.0		130,000	7,200	3266.	130,000	7,200	3266.

\* - 1 CYCLE = 2 REVERSALS

1/ - TENSION IS EQUAL TO HALF OF THE WEIGHT (W) WHICH INCLUDES THE IDLER SHEAVE AND THE HANGER

2/ - EQUAL TO 50 PERCENT OF THE ORIGINAL BREAKING STRENGTH

3/ - EQUAL TO 60 PERCENT OF THE ORIGINAL BREAKING STRENGTH

4/ - THIS ENDURANCE TEST IS CONDUCTED AT -65°F FOR OPL TESTING

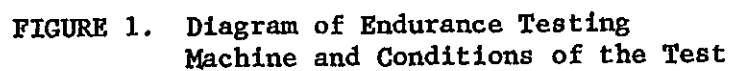
Table IIB. Breaking Strength of Type II after Endurance Testing

COMPOSITION			A				B			
Nominal Diameter of Bare Wire Rope	Con-struction		TENSION 1/		MINIMUM BREAKING STRENGTH 3/		TENSION 1/		MINIMUM BREAKING STRENGTH 2/	
In	mm		lbs	kg	Reversal	lbs	kg	Reversal	lbs	kg
1/32	.794	3 x 7			200,000	162	73.5		162	73.5
3/64	1.19	3 x 7	3.0	1.36	200,000	288	130.6	200,000	288	130.6
3/64	1.19	7 x 7	5.0	2.27	200,000	288	130.6	200,000	288	130.6
1/16	1.59	7 x 7	5.0	2.27	200,000	552	250.4	200,000	552	250.4
1/16	1.59	7 x 19	9.0	4.08	200,000	600	272.1	200,000	552	250.4
3/32	2.38	7 x 7	18.0		200,000	1,200	544.3	200,000	1,056	479.0
3/32	2.38	7 x 19	24.0		200,000	1,680	762.0	200,000	1,440	653.2
1/8	3.18	7 x 19	37.0		500,000	2,520	1143.	200,000	2,220	1007.
5/32	3.97	7 x 19	50.0		500,000	3,360	1524.	200,000	3,000	1361.
3/16	4.76	7 x 19	64.0		500,000	4,200	1905.	500,000	3,840	1742.
7/32	5.56	7 x 19	78.0		500,000	4,800	2177.	500,000	4,680	2123.
1/4	6.35	7 x 19	90.0		500,000	5,880	2667.	500,000	5,400	2449.
9/32	7.14	7 x 19	100.0		500,000	7,530	3416.	500,000		
5/16	7.94	7 x 19	110.0		500,000	8,640	3919.	500,000		
11/32	8.87	7 x 19	120.0		500,000			500,000		
3/8	9.52	7 x 19	120.0		500,000			500,000	7,200	3226.

\* - 1 CYCLE = 2 REVERSALS

1/ - TENSION IS EQUAL TO HALF OF THE WEIGHT (W) WHICH INCLUDES THE IDLER SHEAVE AND THE HANGER

2/ - EQUAL TO 60 PERCENT OF THE ORIGINAL BREAKING STRENGTH



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3.6.5 Proof loading. When tested in accordance with 4.4.7, the wire rope, types I and II, sizes 3/64 inch (1.19 mm) 7 by 7 construction to 3/8 inch (9.525 mm) 7 by 19 construction, shall carry 80 percent of its minimum breaking strength load without any failures of the individual wires in the rope.

3.6.6 Jacket characteristics, type II. The nylon jacketed wire rope shall have the characteristics in accordance with the requirements of table IB.

3.6.7 Low temperature flexibility, type II. When tested in accordance with 4.4.10, type II jacketed rope shall qualify to the requirements of low temperature flexibility (see 6.3.15).

3.6.8 Resistance to fluids. When tested in accordance with 4.4.13, type II wire rope shall show no deleterious effects when immersed in the fluids.

3.7 Identification of product. In addition to the requirements of section 5, the product shall be identified in accordance with the following:

3.7.1 Each manufacturer shall assign a significant identification number on each manufacturing reel of wire rope. When the wire rope on the manufacturing reel is cut to specified lengths for transfer to the shipping reel, each shipping reel shall be marked with the identification number of the manufacturing reel, and a sequential transfer number.

3.7.2 Each manufacturer shall identify every wire rope made to this specification by the use of color tracer filaments manufactured into the rope. The procuring activity shall assign a combination of two colors to each manufacturer desiring qualification.

3.7.2.1 When the manufacturer for type II wire rope is solely the extruder and not the wire rope manufacturer, the manufacturer must satisfy the following requirements:

a. Use wire rope from manufacturers qualified to the QPL, and the wire rope shall have the rope manufacturer's color-coding.

b. The jacketing shall have identifying markings or color-coding, which will be assigned by the preparing activity. The identifying marking shall not cause any indentation in the jacket.

3.8 Workmanship. All details or workmanship and finish shall be in accordance with the best practice for high quality aircraft wire rope consistent with the requirements of this specification. The finished cable shall be uniform in construction and securely laid, free from kinks, loose wires, loose strands, or other defects.

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3.8.1 Physical appearance, type II. The nylon coating shall be uniform thickness as specified in table IB and shall be uniform in appearance. The nylon coating shall be transparent and shall be homogeneous and uniform in consistency. Three areas on each sample shall be checked under 10 x magnification to determine if there is any foreign material in the area. Periodic foreign particles shall be allowed, provided they do not exceed 20 percent of the nominal nylon thickness in diameter and do not exceed the concentration of two in any lineal foot of jacketed wire rope. The jacketed wire rope shall have no crack or seams, or extrusion die marks on the surface which effect wire rope performance. Any deleterious effects, such as cracking or separating from the wire rope shall be cause for rejection.

3.8.1.1 Concentricity. Test for concentricity as specified in 4.4.1.1 and if the differences in wall thickness is greater than 20 percent, this shall be cause for rejection.

3.8.2 Physical appearance of type I. All details of construction shall be in accordance with the requirements of this specification and shall comply with 3.8.

#### 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 in the contract or order, the supplier may use his own or any other suitable facilities for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection and testing of the wire rope shall be classified as follows:

- a. Qualification inspection (see 4.2.1 and table III)
- b. Quality conformance inspection (see 4.2.2 and table III).

4.2.1 Qualification testing. The qualification tests shall include all of the examinations and tests specified in 4.4.

4.2.1.1 Test report for nylon certification. A certified test report from the nylon manufacturer showing and stating that the nylon meets the requirements of this specification will be required. The test report shall include, as a minimum, actual results of the tests specified (see 4.4.8 to 4.4.8.8). Qualification for type II will be finalized upon the receipt of this report and completion of other qualification tests (see 6.2.1).

TABLE III. Qualification Tests and Quality Conformance Tests and Inspection

TESTS	REQUIREMENT PARA	QUALIFICATION PARA	QUALITY CON- FORMANCE REQUIREMENT PARA	QUALITY CON- FORMANCE TEST PARA
Examination of product				
Breaking strength	3.6.1	4.4.2	3.8 to 3.8.2	4.4.1
Endurance test for type I, Composition A at -65°	3.6.2	4.4.3	3.6.1	4.4.2
Endurance test for type I	3.6.2.1	4.4.4	3.6.2.1	4.4.4
Endurance test for type II	3.6.3	4.4.5	3.6.3	4.4.5
Endurance test for type II, thin- walled jacket	3.6.3.1	4.4.5.1		
Stretch test	3.6.4	4.4.6	3.6.4	4.4.6
Proof loading	3.6.5	4.4.7 to 4.4.7.1	3.6.5	4.4.7 to 4.4.7.1
Nylon testing	3.4.3.3.1	4.4.8 to 4.4.8.8		
Tin and zinc coating test	3.4.3.1 - 3.4.3.2	4.4.9 to 4.4.9.3		
Low temperature flexible test	3.6.7	4.4.10		
Concentricity testing	3.8.1.1	4.4.1.1	3.8.1.1	4.4.1.1
Jacket requirements	3.6.6 - 3.6.8	4.4.11		4.5
Rejection and retest	Sec 5	4.6		
Identification of product	3.7 to 3.7.2	4.4.12	3.7 to 3.7.2.1	4.4.13
Responsibility for inspection	3.7 to 3.7.2.1			4.1
Qualification		4.2.1 to 4.2.12		4.2.2
Quality conformance	3.3 - 3.3.1	4.2.2.1, 4.2.2.2, 4.2.2.3		4.2.2.1
Sampling, lot, specimen				4.2.2.2, 4.2.2.3

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4.2.1.2 Duplication nylon certification. If two or more type II wire rope sizes are submitted for qualification, and the nylon coating is of the same type and grade, copies of the original test certification on the particular type and grade of nylon will satisfy the requirement as specified in 4.2.1.1.

4.2.2 Quality conformance testing. Quality conformance testing shall consist of all the inspections such as workmanship, physical appearance, and identification specified in the specification. The sample wire rope shall pass the breaking strength test as specified in 4.4.2, and type I shall pass the endurance test as specified in 4.4.4. Type II shall pass the endurance test as specified in 4.4.5. Both types shall be subjected to the proof and stretch tests as specified in 4.4.6 and 4.4.7, and the concentricity test as specified in 4.4.1.1.

4.2.2.1 Sampling. When conducting the tests specified herein, with the exception of examinations of product, one sample not less than 50 feet (12.7 m) in length for sizes listed in table II, shall be taken after any discard has been removed from the head or starting end of the first manufacturing reel for each lot of wire rope.

4.2.2.2 Lot. A lot shall consist of not more than 20,000 feet (6,100 m) of wire rope of the same construction and diameter produced continuously by one machine or by one series of progressive processing machines.

4.2.2.3 Specimen. A specimen is a wire rope cut from a sample of which 6 are required for the performance of a testing method. All specimens per contract order shall only be taken from the sample taken from the lot applied to that particular order.

#### 4.3 Test report and certification

4.3.1 Certification. Upon request, the wire rope manufacture shall furnish a certified test report showing that the wire rope manufacturer's product satisfactorily conforms to this specification. The test report shall include as a minimum, actual results of the test specified herein (see

4.3.2 Nylon certification and test report. The nylon certification and test report shall be available upon request.

#### 4.4 Test methods

4.4.1 Examination of product. All wire rope shall be examined for workmanship and finish to determine compliance with 3.8. For this purpose, the wire rope shall travel no faster than 100 feet per minute and shall be stopped for closer inspection when deemed necessary. This inspection shall take place at the time the wire rope is wound on shipping reels. Any discard from the head or starting end of the manufacturing reel shall be removed prior to winding of the shipping reels.



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4.4.1.1 Concentricity test for type II wire rope. All type II wire rope shall be examined for concentricity as specified in 3.8.1.1. The wire rope specimen shall have its diameter measure at 2 locations 90° apart, the average of those two measurements is the nominal O.D. (M1). The wall thickness will be measured at points 180 degrees apart (M2 and M3). The percent variation of these two measurements shall be less than 20 percent, to be calculated as follows:

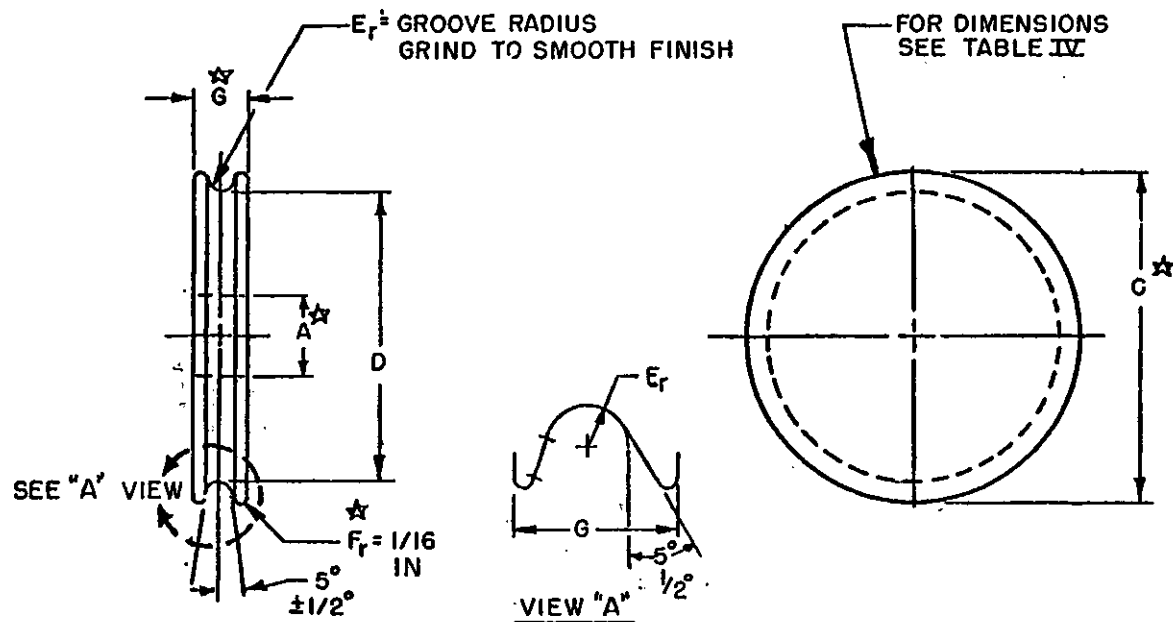
$$\frac{M2}{M1} = V1 \quad \frac{M3}{M1} = V2 \quad .20 \quad \frac{V1 - V2}{V1 \text{ or } V2} \text{ (use the smallest value)}$$

4.4.2 Breaking strength. The wire rope specimen shall be selected from the sample from each lot. The specimen shall be no less than 24 inches (60 cm) in length, and where necessary, swaged terminals conforming to MIL-T-781 (do not use ball and fittings) and accompanying hardware may be used to facilitate installation of the specimen in the jaws of the testing machine. The distance between the jaws of the testing machine with the sample shall be no less than 10 inches (25 cm). The breaking strength shall be determined by use of a tensile testing machine in accordance with applicable requirements of ASTM E8. The breaking strength shall conform to the requirements of table IA for qualification.

4.4.3 Endurance test at -65° for type I, composition A. One endurance test shall be conducted on one specimen from the sample lot for each wire rope diameter to be qualified from type I, composition A. The number of reversal and tension in wire rope for the test shall be as indicated in table IIA. The test machinery shall conform to figure 1 and be capable of conducting the test at -65°F. The total travel of the cable in one direction shall be 13-1/2 inches (34.3 cm). The test pulleys shall be made of steel and shall conform to the dimensions of figure 2 and table IVA. The application of lubricant to the endurance test sample, in addition to the lubricant applied during the manufacture of wire rope, shall not be permitted either before or during the endurance test. The breaking strength after the endurance test shall be determined by the method specified for determining the breaking strength of wire rope (see 4.4.2). The test specimen shall be that portion of the wire rope that passes over the test pulley during the endurance test. The breaking strength shall be equal to or greater than the values specified in table IIA for qualification.

4.4.4 Endurance test at room temperature for type I, composition A and B. The endurance test for type I shall be as specified in 4.4.3, with the exception that the test shall be conducted at room temperature.

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$\star$  Note: These dimensions are only reference numbers; these may be varied by the manufacturers.

Material: Tool steel.

Heat Treat: Harden to rockwell C60 minimum.

Note: "A" support pulleys on suitable ball or roller bearings or shaft extensions supported on suitable ball or roller bearings.

FIGURE 2. Test Pulleys used in Standard Endurance Test

TABLE IVA. Dimensions of Steel Pulley  
Used in Type I Endurance Test

Nominal Diameter of Wire Rope		Construction	Pulley Ratio	C		G		D		Er	
In	mm			In	mm	In	mm	In	mm	In	mm
1/32	.974	3 x 7	to 1	1.00	25.40	3/8	9.52	0.562	14.28	.025	.635
3/64	1.19										
3/64	1.19										
1/16	1.59										
1/16	1.59			1.00	25.40	3/8	9.52	0.438	11.11	.036	.914
3/32	2.38										
3/32	2.38										
1/8	3.18										
5/32	3.97			1.250	31.75	3/8	9.52	0.875	22.22	.069	1.75
3/16	4.76										
7/32	5.56										
1/4	6.35										
9/32	7.14			3.500	88.90	1/2	12.70	2.671	67.86	.150	3.81
5/16	7.94										
11/32	8.87										
3/8	9.5										
		4.625	117.5	9/16	14.30	3.265	84.26	.184	4.67		
		4.625	117.5	9/16	14.30	3.562	90.49	.200	5.08		

1/ Reference numbers not a mandatory dimension. Left to manufacturer's discretion.

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4.4.5 Endurance test for type II, composition A and B. The nylon coated wire rope shall be endurance tested in accordance with the procedures in this specification using pulley sizes as specified in table IVB and figure 2, which conform to the OD size of the nylon coating and test loads which conform to the wire rope size. The endurance test shall be conducted at room temperature for the number of reversals as specified in table IIB. There shall be no cracking or deterioration of the nylon coating after completion of the tests. The wire rope shall then be prepared for the breaking strength test in accordance with 4.4.2. The breaking strength shall be as specified in table IIB for the wire rope size (not over all jacketed diameter).

4.4.5.1 Endurance test on thin-wall jacket at -65°F. Nylon-jacketed wire rope shall be endurance tested when the jacketed thickness is 17 percent or less than the overall diameter in accordance with 4.4.5, except that the test shall be conducted at -65°F.

4.4.6 Stretch test. For sizes 3/64 inch (1.19 mm) through 3/8 inch (9.52 mm) diameter (7 x 7 and 7 x 19), one specimen from each sample of wire rope selected as specified in 4.2.1 shall be tested to determine the percent stretch. The total length of the wire rope specimen to be tested shall not be less than 24 inches (60.8 cm). Where necessary, swaged terminals and accompanying hardware may be used to facilitate installation of the specimen in the jaws of the test machine. The amount of stretch shall be determined on a tension testing machine in accordance with ASTM E8. The specimen shall be loaded to 1 percent minimum breaking strength shown in table IA to straighten the wire rope. While the specimen is under tension, an adequate gauge length shall be marked off the wire rope between the jaws of the testing machine. The specimen shall then be loaded to 60 percent of minimum breaking strength and measured for elongation under load. From this data, the percent stretch can be read directly or calculated using the formula below:

$$\text{Percent stretch} = (100) \frac{\text{Elongation under load}}{\text{original length}}$$

Results of the stretch test shall not exceed 1.5 percent

4.4.7 -Proof test. For sizes 3/64 inch (1.19 mm) through 3/8 inch (9.52 mm) in diameter (7 x 7 and 7 x 19), the following proof test shall be made using the same wire rope specimen used in the stretch test, or a similarly prepared specimen; load the specimen to 1 percent of breaking strength then increase the loading to 80 percent of the minimum required breaking strength of the wire rope specified in table IA. The load shall be applied for 5 seconds. At the end of the test, the wire rope fitting shall be removed and the entire wire rope shall be completely unwound and every wire inspected. A suitable electronic device capable of detecting the breaking of individual wires during proof testing may be used instead of unwinding the wire rope. The failure of any wire shall be cause for rejection.

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Table IVB. Dimensions of Steel Pulleys Used in Type II Endurance Test

Nominal Diameter of wire rope	Construct- ion	Pulley Ratio	C $\frac{1}{16}$		G $\frac{1}{16}$		D		E <sub>r</sub>	
			+1/64 -1/64 In	mm + .397 - .397	+1/64 -1/64 In	mm + .397 - .397	+ .005 - .000 In	mm + .127 - .000	+ .002 - .002 In	+ .051 - .051 mm
1/32	3 x 7									
3/64	3 x 7									
3/64	7 x 7	12.0	1.00	25.40	3/8	9.52	.750	19.05	.036	.914
3/64	7 x 7	12.0	1.00	25.40	3/8	9.52	.656	16.67	.052	1.33
1/16	7 x 7	12.0	1.00	25.40	3/8	9.52	.656	16.67	.052	1.33
1/16	7 x 7	12.0	1.00	25.40	3/8	9.52	.875	22.22	.069	1.75
1/16	7 x 19	7.0	.6875	17.46	3/8	9.52	.656	16.67	.052	1.33
1/16	7 x 19	7.0	.6875	17.46	3/8	9.52	.875	22.22	.069	1.75
3/32	7 x 7	12.0	1.4375	36.51	3/8	9.52	.875	22.22	.069	1.75
3/32	7 x 7	12.0	1.4375	36.51	3/8	9.52	1.484	37.69	.086	2.18
3/32	7 x 19	7.0	.96875	24.60	3/8	9.52	.875	22.22	.069	1.75
3/32	7 x 19	7.0	.96875	24.60	3/8	9.52	1.484	37.69	.086	2.18
1/8	7 x 19	9.5	1.250	31.75	3/8	9.52	1.781	45.24	.102	2.59
5/32	7 x 19	9.5	2.000	50.80	3/8	9.52	2.078	53.78	.118	3.00
5/32	7 x 19	9.5	2.000	50.80	3/8	9.52	2.671	68.86	.150	3.81
3/16	7 x 19	9.5	2.375	60.32	1/2	12.70	2.375	60.32	.134	3.11
3/16	7 x 19	9.5	2.375	60.32	1/2	12.70	2.969	75.40	.167	3.95
7/32	7 x 19	9.5	2.750	69.85	1/2	12.70	2.671	67.86	.150	3.81
7/32	7 x 19	9.5	2.750	69.85	1/2	12.70	3.265	82.93	.184	4.67
1/4	7 x 19	9.5	3.125	85.72	1/2	12.70	2.969	75.40	.167	3.85
1/4	7 x 19	9.5	3.125	85.72	1/2	12.70	3.562	90.49	.200	5.08
9/32	7 x 19	9.5	3.500	88.90	1/2	12.70	2.546	64.66	.217	5.51
5/16	7 x 19	9.5	3.875	98.42	9/16	14.30	2.842	72.20	.217	5.51
11/32	7 x 19	9.5	4.250	107.9	9/16	14.30	3.191	81.06	.225	5.71
3/8	7 x 19	9.5	4.625	117.5	9/16	14.30	3.436	87.29	.225	5.71

$\frac{1}{16}$  Reference numbers not a mandatory dimension. Left to manufacturer's discretion.

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4.4.7.1 Use of electronic device for proof test. The load shall be increased to 80 percent on the test specimen, whether or not a ping is heard (see 6.3.15). If no ping is heard, the specimen has passed the test. If one or more pings are heard, the wire rope specimen shall be unraveled and the broken wires shall confirm failure of the specimen. If no broken wires are found, the specimen has passed the test.

4.4.8 Nylon testing for type II. The test specimen shall be molded into a shape needed to perform the following tests. The jacket extrusion lot number shall be identified with the molding in the test report. The nylon manufacturer shall perform all nylon tests in section 4.4.8.

4.4.8.1 Tensile strength, percent elongation. Mold specimens into type 4 test bar and conduct test in accordance with ASTM D638.

4.4.8.2 Specific gravity. Mold specimens and conduct test in accordance with ASTM D792.

4.4.8.3 Water absorption. Mold specimens and conduct test in accordance with ASTM D570.

4.4.8.4 Brittleness. Mold specimens and conduct test in accordance with ASTM D746.

4.4.8.5 Stiffness. Mold specimens and conduct test in accordance with ASTM D747.

4.4.8.6 Heat deflection. Mold specimens and conduct test in accordance with ASTM D648.

4.4.8.7 Melting range. Mold specimens and conduct test in accordance with ASTM D789.

4.4.8.8 Burn resistance. Mold specimens and conduct test in accordance with ASTM D635.

4.4.9 Weight of tin or zinc coating, composition A

4.4.9.1 Preparation of specimens. Three specimens not less than 12 inches (305 mm) long shall be cut from the wire before the wire rope is fabricated. These specimens shall be cut from each size of wire to be used in making each lot of wire rope.

4.4.9.2 Tin-coated wire. The weight of coating on samples of zinc-coated wire shall be determined in accordance with ASTM A309.

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4.4.9.3 Zinc-coated wire. The weight of coating on samples of zinc-coated wire shall be determined in accordance with ASTM A90.

4.4.10 Low temperature flexibility for type II. The jacketed wire rope shall be subjected to  $-65^{\circ}\text{F}$  for a period of 24 hours in a straight position. After this time and while still at the specified temperature, the sample shall be evenly and uniformly bent over a test pulley with the same dimensions as the endurance pulley for the particular size wire rope. Bending shall be accomplished in a period of not less than 8 seconds and not more than 12 seconds, and the wire rope shall be bent at least  $180^{\circ}$  in the groove of the pulley. After flexing, straighten the wire rope out and allow to warm to room temperature in 4 to 6 hours, then examine the flexed area under a magnification of 20x power. There shall be no evidence of cracks or separation of the nylon jacketing from the wire rope.

4.4.11 Resistance to fluids on type II. Totally immerse a 3-inch (76 mm) unsealed length of nylon-jacketed wire rope in each of the fluids listed below for 4 hours. Remove, wipe dry, and record appearance of each one of the specimens. Deleterious effects such as softening, cracking, or separation shall be cause for rejection.

- |    |             |   |
|----|-------------|---|
| a. | MIL-G-5572  | Aviation Gasoline                             |
| b. | MIL-H-5606  | Hydraulic Oil                                 |
| c. | MIL-P-5624  | Jet Fuel JP-5                                 |
| d. | MIL-L-7803  | Lubrication Oil                               |
| e. | MIL-A-8243  | Anti-icing Fluid                              |
| f. | MIL-H-19457 | Hydraulic Fluid (Skydrol 500A, or equivalent) |
| g. | MIL-C-25769 | Cleaning Compound                             |

4.4.12 Color-coding identification. Each wire rope shall be inspected for proper identification as specified in 3.7.2.

4.5 Rejection and retest. The failure of any specimen shall be cause for rejection of the lot represented. The manufacturer may, at his own expense, in the presence of the Government inspector, sample each length of wire rope comprising a rejected lot and subject specimens from these samples to retest. The inspector may accept lengths of wire rope shown to conform to all of the requirements of this specification by this retest.

4.6 Examination of preparation for delivery. The preservation, packaging, packaging, packing and marking shall be examined for conformance to section 5.

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## 5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A. Wire rope of one type, size, composition and length shall be wound on reels constructed to the dimensions specified in table V, as applicable. Reels shall be fabricated in a manner similar to that shown in figure 3. Before starting to wind the wire rope on the reel, barrier material conforming to type I, grade A, class 1 or 2 of MIL-B-121 shall be applied to the drum of the reel and the inside of its heads against which the wire rope will rest. After the wire rope is wound on the reel and secured, a layer of the above referenced barrier material shall be applied over the wire rope the full width of the drum and overlap itself not less than 8 inches. The barrier will be secured by the use of metal straps or nonmetallic straps. When the distance between heads is 7 inches or less 1 strap shall be used; when over 7 inches 2 straps shall be used. Metal strapping shall conform to either QQ-S-781 or QQ-S-790. Non-metallic strapping shall conform to PPP-S-760. Alternatively, wire rope 1/8 inch or less in diameter may be wound on metal or fiberboard reels and packaged in fiberboard containers in accordance with commercial practice. The wire rope in fiberboard containers shall be preserved in accordance with the requirements of method 1C-2 of MIL-P-116.

5.1.2 Level C. Each wire rope wound on a reel as outlined in 5.1.1 shall be preserved and packaged to afford adequate protection against corrosion, deterioration and physical damage during shipment from supply source to the first receiving activity. This level may conform to the suppliers' commercial practice when it meets the requirements of this level.

5.2 Packing. Packing shall be level A, B, or C as specified.

5.2.1 Level A. Wire rope on reels preserved and packaged as specified in 5.1.1 shall be packed in appropriate weather-resistant shipping containers selected from MIL-STD-794. The grade of each shipping container, determined by the gross weight and size, shall be limited to the applicable special requirements table of the specification. Where practicable, the exterior shipping container shall be of the uniform shape and size and of minimum cube and tare. Closure and strapping shall be as specified in the applicable container specification.

5.2.2 Level B. Level B packing shall be the same as that specified in 5.2.1.

5.2.3 Level C. Packages that require overpacking for acceptance by the carrier shall be placed in exterior shipping containers in a manner that will insure safe transportation at the lower rate to the point of delivery. Containers shall comply with Uniform Freight Classification Rules or regulations of other carriers as applicable to the mode of transportation and as otherwise specified in MIL-STD-794.



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Table V. Dimensions for Reels Per Wire Rope Size

1000 Ft (304.8 M)						3000 Ft (914.4 M)			
Overall 1/ Diameter of Wire Rope		Minimum Diameter of Drum		Diameter of Arbor Hole		Minimum Diameter of Drum		Diameter of Arbor Hole	
In	mm	In	mm	In	mm	In	mm	In	mm
1/32	.794	4	102	1-1/8	28.6	6	102	1-1/8	28.6
3/64	1.19	4	102	1-1/8	28.6	6	102	1-1/8	28.6
1/16	1.59	6	152	1-1/8	28.6	8	203	1-1/8	28.6
3/32	2.38	6	152	1-1/8	28.6	10	254	1-1/8	28.6
1/8	3.18	8	203	101/8	28.6	10	254	2-1/8	54.0
5/32	3.97	8	203	1-1/8	28.6	10	254	2-1/8	54.0
3/16	4.76	8	203	2-1/8	54.0	10	254	2-1/8	54.0
7/32	5.56	8	203	2-1/8	54.0	10	254	2-1/8	54.0
1/4	6.35	10	254	2-1/8	54.0	12	305	2-1/8	54.0
9/32	7.14	10	254	2-1/8	54.0	12	305	2-1/8	54.0
5/16	7.94	12	305	2-1/8	54.0	12	305	2-1/8	54.0
11/32	8.87	12	305	2-1/8	54.0	12	305	2-1/8	54.0
3/8	9.52	12	305	2-1/8	54.0	12	406	2-1/8	54.0
13/32	10.3	12	305	2-1/2	63.5	26	660	5	127.0
7/16	11.1	12	305	2-1/2	63.5	26	660	5	127.0
15/32	11.9	12	305	2-1/2	63.5	26	660	5	127.0
1/2	12.7	12	305	2-1/2	63.5	26	660	5	127.0
5000 Ft (1524 M)						10,000 Ft (3048 M)			
1/32	.794	8	203	1-1/8	28.6	10	254	1-1/8	28.6
3/64	1.19	8	203	1-1/8	28.6	10	254	1-1/8	28.6
1/16	1.59	10	254	1-1/8	28.6	12	305	2-1/8	54.0
3/32	2.38	10	254	2-1/8	54.0	12	305	2-1/8	28.6
1/8	3.18	10	254	1-1/8	54.0	12	305	2-1/8	54.0
5/32	3.97	12	305	2-1/8	54.0	12	305	2-1/8	54.0
3/16	4.76	12	305	2-1/8	54.0	12	305	2-1/8	54.0
7/32	5.56	12	305	2-1/8	54.0	12	406	3-1/8	85.7
1/4	6.35	12	305	2-1/8	54.0	18	457	3-1/8	85.7
9/32	7.14	12	305	2-1/8	54.0	18	457	3-1/8	85.7
5/16	7.94	12	305	2-1/8	54.0	18	457	3-1/8	85.7
11/32	8.87	16	405	2-1/8	54.0	18	457	3-1/8	85.7
3/8	9.52	16	405	2-1/8	54.0	18	457	3-1/8	85.7
13/32	18.3	26	660	5	127.0	26	660	5	127.0
7/16	11.1	26	660	5	127.0	26	660	5	127.0
15/32	11.9	26	660	5	127.0	26	660	5	127.0
1/2	12.7	26	660	5	127.0	26	5	127.0	

1/ For type II the wire rope size is the diameter of the wire rope with the nylon jacket.

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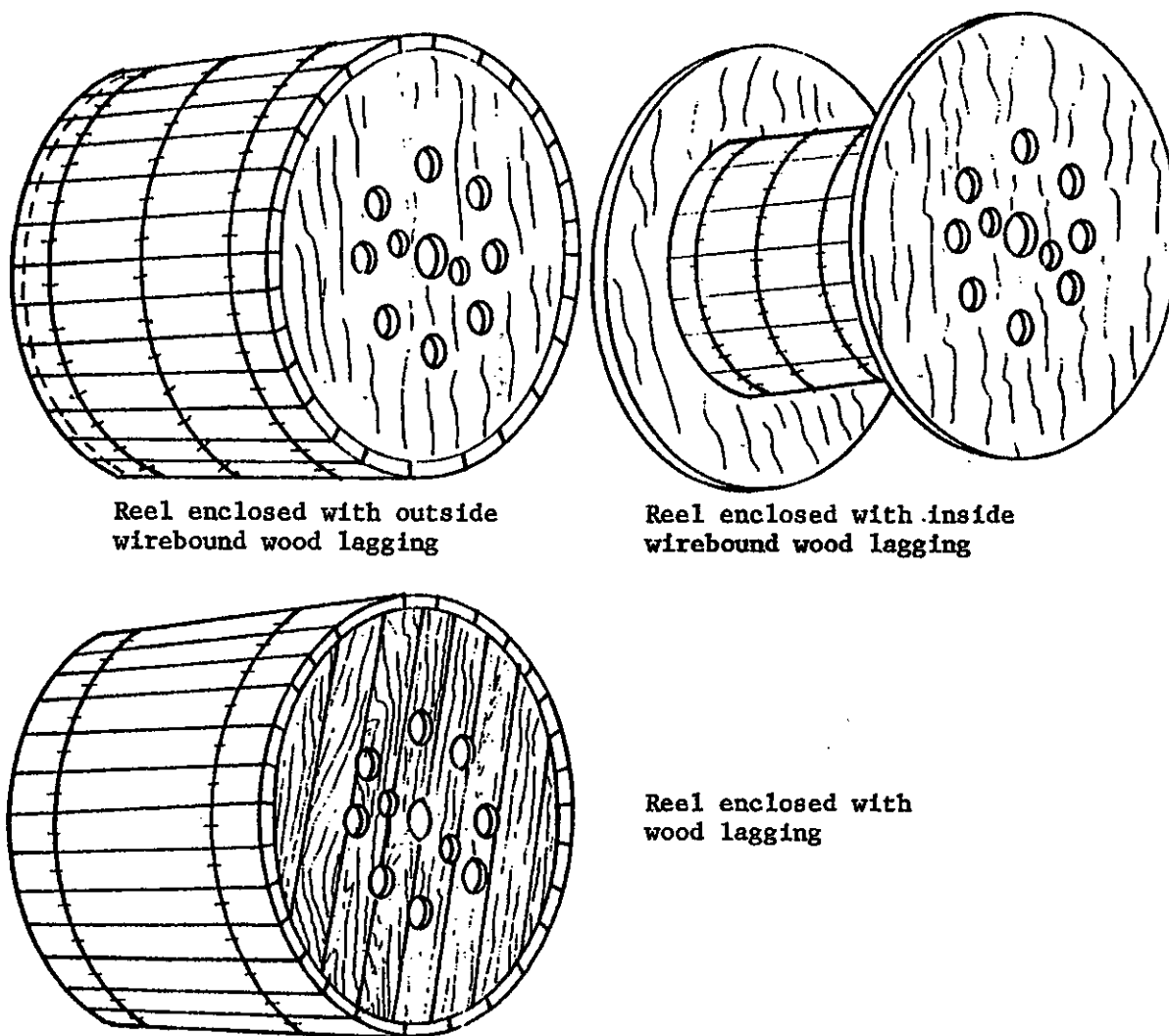


FIGURE 3. Typical Reel of Wire Rope Enclosed with Wood Lagging or Wirebound Wood Lagging.

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### 5.3 Marking for shipment

5.3.1 Marking of reels. Each shipping reel shall be marked in accordance with the requirements of MIL-STD-129. The following information shall be included:

- a. Stock No. or identification as specified in the purchase order document 1/
- b. Size (include diameter of wire rope, outside diameter of nylon-jacket for type II and construction rope)
- c. Name of manufacturer
- d. Name of contractor
- e. Contract order number
- f. Type of wire rope and composition
- g. Date of coating for type II (quarter, year)
- h. For reels with 2 sections of wire rope, record distance from beginning to separation point and length of wire rope on the reel.

1/ The contractor shall enter the Federal Stock No. specified in the purchase document or as furnished by the procuring activity. When the Federal Stock No. is not provided or available from the procuring activity, leave space therefore and enter the Stock No. or other identification when provided by the procuring activity.

5.3.2 Marking of shipping containers. The shipping containers shall have all the information as required in 5.3.1.

### 6. NOTES

6.1 Intended use. The wire rope covered by this specification is intended for use in aircraft control systems applications where high resistance is needed against corrosion, abrasion, and fatigue wear.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification
- b. Type, size, construction, and quantity of wire rope to be furnished
- c. Lengths of wire rope
- d. Tin and zinc or zinc-coated for carbon steel, bare or rejected.
- e. Selection of applicable levels of packaging and packing required, (see section 5).

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6.2.1 Contract data requirements. Data specified in 4.2.1.1, 4.2.1.2, 4.3.1, and 4.3.2 will be listed directly on a DD Form 1423 incorporated into the contract.

### 6.3 Definitions

6.3.1 Wire. Each individual cylindrical steel rod is designated as wire.

6.3.2 Strand. Each group of wires helically twisted is designated as a strand.

6.3.3 Wire rope. A group of strands helically twisted or laid about a central core is designated as a wire rope. The strands and the core act as a unit.

6.3.4 Preformed. Wire rope consisting of wires and strands shaped, during fabrication of the wire rope, to conform to the form or curvature which they take in the finished wire rope, is designated as preformed rope.

6.3.5 Diameter. The diameter of wire rope is the diameter of the circumscribing circle, or the distance across opposite strands.

6.3.6 Lay (or twist). The helical form taken by the wires in the strand and by the strand in the wire rope is characterized as the lay (or twist) of the strands or wire rope, respectively. In a right-hand lay, the wires or strands are the same direction as the thread on a right-hand screw, and for a left-hand lay, the strands or wires lay in an opposite direction.

6.3.7 Regular lay. Wire rope in which the direction of the lay of the wires in the strand is in an opposite direction to the lay of the strand in the wire rope.

6.3.8 Length of lay (or pitch). The distance parallel to the axis of the strand of cable, in which a wire or strand makes one complete turn about the axis, is designated as the length of lay (or pitch) of the strand or wire rope.

6.3.9 Center wire. The center of all strands is an individual wire and is designated as a wire center.

6.3.10 Strand core. A strand core consists of a single straight strand made of preformed wires similar to the other strands comprising the cable in arrangement and number of wires.

6.3.11 Master reel. The master reel is the large manufacturing reel that is used to hold the wire rope as it is continuously manufactured. The shipping reels are taken off the master reel as needed.

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6.3.12 Jacketing. Jacketing is the sheet or shielding coating around the wire rope and is extruded over the wire rope to completely enclose the wire rope with a protective coating.

6.3.13 Low temperature flexibility. The capability of jacketed wire rope to be bent or flexed into any reasonable shape at a temperature of -65°F without any deleterious effects such as cracking of the nylon from the wire rope.

6.3.14 Ping. Ping is an audible sound given off as a result of an individual wire breaking in the wire rope. The sound is amplified and fed into a speaker system to a level distinctly detectable by the human ear.

6.3.15 Twist-off. Twist-off is a twisting severance of the strand or wire due to a malfunctioning of the stranding equipment.

6.4 Wire rope lubricant. A satisfactory aircraft control wire rope lubricant will reduce the internal friction and prevent corrosion. It will remain plastic at -67°F and will not flow out of the cable at temperatures below 160°F. To insure a satisfactory service life, the lubricant should be resistant to oxidation.

6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Product List whether or not such products have actually been so listed by that date. The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have 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 the Aeronautical Systems Division, Attn: ENFL, Wright-Patterson Air Force Base, Ohio 45433, and information pertaining to qualification of products may be obtained from that activity.

Custodians:  
 Army - AV  
 Navy - AS  
 Air Force - 11

Preparing activity:  
 Air Force - 11  
 Project No. 4010-0089

Review activities:  
 Air Force - 82  
 DSA - IS