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# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5678B

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Superseding AMS 5678A

STEEL WIRE, CORROSION RESISTANT  
17Cr - 7.1Ni - 1.1Al  
Precipitation-Hardenable, Spring Temper

UNS S17700

## 1. SCOPE:

1.1 Form: This specification covers a corrosion-resistant steel in the form of wire.

1.2 Application: Primarily for springs requiring corrosion resistance and resistance to permanent set up to 600°F (315°C) (See 8.3). Where parts require welding during fabrication, strength of this cold-drawn wire will be impaired.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

### 2.1.1 Aerospace Material Specifications:

AMS 2248 - Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys

AMS 2350 - Standards and Test Methods

AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM A370 - Mechanical Testing of Steel Products

ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

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2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353 or by spectrochemical or other analytical methods approved by purchaser:

	min	max
Carbon	--	0.09
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	16.00 -	18.00
Nickel	6.50 -	7.75
Aluminum	0.75 -	1.50
Molybdenum	--	0.75
Copper	--	0.50

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.2 Condition: Spring temper, cold drawn to required size.

3.2.1 Wire ordered for coiling on automatic spring-winding machines shall be coated with a suitable lubricant.

3.3 Properties: Wire shall conform to the following requirements; tensile and wrapping tests shall be performed in accordance with ASTM A370:

3.3.1 Tensile Properties: Wire, as cold-drawn, shall have the tensile strength specified in Table I, Column A. Wire shall have the tensile strength specified in Table I, Column B, after being precipitation heat treated by heating to  $900^{\circ}\text{F} \pm 10$  ( $480^{\circ}\text{C} \pm 5$ ), holding at heat for  $60 \text{ min.} \pm 5$ , and cooling in air.

TABLE I

Nominal Diameter Inch	Column A As Cold-Drawn		Column B Precipitation-Hardened	
	Tensile Strength, psi min	Tensile Strength, psi max	Tensile Strength, psi min	Tensile Strength, psi max
0.016 to 0.020, incl	248,000	305,000	335,000	365,000
Over 0.020 to 0.025, incl	243,000	300,000	330,000	360,000
Over 0.025 to 0.029, incl	239,000	295,000	325,000	355,000
Over 0.029 to 0.041, incl	234,000	290,000	320,000	350,000
Over 0.041 to 0.051, incl	230,000	285,000	310,000	340,000
Over 0.051 to 0.061, incl	225,000	280,000	305,000	335,000
Over 0.061 to 0.071, incl	218,000	272,000	297,000	327,000
Over 0.071 to 0.086, incl	216,000	270,000	292,000	322,000
Over 0.086 to 0.090, incl	207,000	260,000	282,000	312,000
Over 0.090 to 0.100, incl	204,000	257,000	279,000	309,000
Over 0.100 to 0.106, incl	201,000	253,000	274,000	304,000
Over 0.106 to 0.130, incl	199,000	251,000	272,000	302,000
Over 0.130 to 0.138, incl	194,000	245,000	260,000	290,000
Over 0.138 to 0.146, incl	192,000	243,000	258,000	288,000
Over 0.146 to 0.162, incl	190,000	241,000	256,000	286,000
Over 0.162 to 0.180, incl	188,000	239,000	254,000	284,000
Over 0.180 to 0.207, incl	186,000	237,000	252,000	282,000
Over 0.207 to 0.225, incl	183,000	233,000	248,000	278,000
Over 0.225 to 0.306, incl	178,000	228,000	242,000	272,000
Over 0.306 to 0.440, incl	173,000	222,000	235,000	265,000

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TABLE I (SI)

Nominal Diameter Millimetres	Column A As Cold-Drawn		Column B Precipitation-Hardened	
	Tensile Strength, MPa min	Tensile Strength, MPa max	Tensile Strength, MPa min	Tensile Strength, MPa max
0.40 to 0.50, incl	1710	2105	2310	2515
Over 0.50 to 0.62, incl	1675	2070	2275	2480
Over 0.62 to 0.72, incl	1650	2035	2240	2450
Over 0.72 to 1.02, incl	1615	2000	2205	2415
Over 1.02 to 1.28, incl	1585	1965	2135	2345
Over 1.28 to 1.52, incl	1550	1930	2105	2310
Over 1.52 to 1.78, incl	1505	1875	2050	2255
Over 1.78 to 2.15, incl	1490	1860	2015	2220
Over 2.15 to 2.25, incl	1425	1795	1945	2150
Over 2.25 to 2.50, incl	1405	1770	1925	2130
Over 2.50 to 2.65, incl	1385	1745	1890	2095
Over 2.65 to 3.25, incl	1370	1730	1875	2080
Over 3.25 to 3.45, incl	1340	1690	1795	2000
Over 3.45 to 3.65, incl	1325	1675	1780	1985
Over 3.65 to 4.05, incl	1310	1660	1765	1970
Over 4.05 to 4.50, incl	1295	1650	1750	1960
Over 4.50 to 5.18, incl	1280	1635	1740	1945
Over 5.18 to 5.62, incl	1260	1605	1710	1915
Over 5.62 to 7.65, incl	1225	1570	1670	1875
Over 7.65 to 11.00, incl	1195	1530	1620	1825

- 3.3.2 Wrapping: As-cold-drawn wire shall withstand, without cracking, wrapping at 77°F + 9 (25°C + 5) one full turn around a diameter equal to the nominal diameter of the wire.
- 3.3.3 Coiling: The as-cold-drawn wire shall show a uniform pitch with no splits or fractures when wound in a tightly closed coil on an arbor of size shown in Table II and the resultant coil stretched to a permanent set of 4 times its as-wound length. This requirement shall apply only to wire having a nominal diameter of 0.125 in. (3.00 mm) and under.

TABLE II

Nominal Diameter Inch	Arbor Diameter Inch
0.016 to 0.024, incl	0.067
Over 0.024 to 0.034, incl	0.102
Over 0.034 to 0.045, incl	0.145
Over 0.045 to 0.055, incl	0.212
Over 0.055 to 0.078, incl	0.250
Over 0.078 to 0.125, incl	0.328

TABLE II (SI)

Nominal Diameter Millimetres	Arbor Diameter Millimetres
0.40 to 0.60, incl	1.68
Over 0.60 to 0.85, incl	2.55
Over 0.85 to 1.12, incl	3.62
Over 1.12 to 1.38, incl	5.30
Over 1.38 to 1.95, incl	6.25
Over 1.95 to 3.00, incl	8.20

3.4 Quality:

- 3.4.1 Wire, as received by purchaser, shall be uniform in quality and condition, cylindrical, clean, and free from kinks, twists, scrapes, splits, and other imperfections detrimental to usage of the wire.
- 3.4.2 The surface of the wire shall have a smooth, cold-drawn finish free from pits, abrasions, and other surface imperfections.

3.5 Tolerances: Shall be in accordance with Table III.

TABLE III

Nominal Diameter Inch	Tolerance, Inch Minus Only
0.016 to 0.024, incl	0.0008
Over 0.024 to 0.032, incl	0.0010
Over 0.032 to 0.042, incl	0.0015
Over 0.042 to 0.312, incl	0.0020
Over 0.312 to 0.440, incl	0.0030

TABLE III (SI)

Nominal Diameter Millimetres	Tolerance, Millimetre Minus Only
0.40 to 0.60, incl	0.020
Over 0.60 to 0.80, incl	0.025
Over 0.80 to 1.05, incl	0.038
Over 1.05 to 7.80, incl	0.050
Over 7.80 to 11.00, incl	0.075