

UNS S45500

STEEL WIRE, CORROSION RESISTANT
11.8Cr - 8.5Ni - 0.30(Cb + Ta) - 1.1Ti - 2.0Cu
Precipitation Hardenable, Spring Temper

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 high strength up to 600°F (315°C).

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

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and 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

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

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

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

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3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Carbon	--	0.05
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	11.00 -	12.50
Nickel	7.50 -	9.50
Columbium + Tantalum	0.10 -	0.50
Titanium	0.80 -	1.40
Copper	1.50 -	2.50
Molybdenum	--	0.50
Nitrogen	--	0.015

- 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 $850^{\circ}\text{F} \pm 10$ ($455^{\circ}\text{C} \pm 5$), holding at heat for 30 min. ± 3 , and cooling in air.

TABLE I

Nominal Diameter Inch	Column A As Cold-Drawn Tensile Strength psi, min	Column B Precipitation-Hardened	
		Tensile Strength, psi	
		min	max
0.010 to 0.040, incl	245,000	310,000	340,000
Over 0.040 to 0.050, incl	235,000	305,000	335,000
Over 0.050 to 0.060, incl	225,000	300,000	330,000
Over 0.060 to 0.075, incl	220,000	295,000	325,000
Over 0.075 to 0.085, incl	215,000	290,000	320,000
Over 0.085 to 0.095, incl	210,000	285,000	315,000
Over 0.095 to 0.110, incl	200,000	278,000	308,000
Over 0.110 to 0.125, incl	195,000	272,000	302,000
Over 0.125 to 0.150, incl	190,000	265,000	295,000
Over 0.150 to 0.500, incl	180,000	260,000	290,000

TABLE I (SI)

Nominal Diameter Millimetres	Column A As Cold-Drawn Tensile Strength MPa, min	Column B Precipitation-Hardened Tensile Strength, MPa	
		min	max
0.25 to 1.02, incl	1689	2137	2344
Over 1.02 to 1.27, incl	1620	2103	2310
Over 1.27 to 1.52, incl	1551	2069	2275
Over 1.52 to 1.90, incl	1517	2034	2241
Over 1.90 to 2.16, incl	1482	2000	2206
Over 2.16 to 2.41, incl	1448	1965	2172
Over 2.41 to 2.79, incl	1379	1917	2124
Over 2.79 to 3.18, incl	1345	1875	2082
Over 3.18 to 3.81, incl	1310	1827	2034
Over 3.81 to 12.70, incl	1241	1793	2000

3.3.2 **Wrapping:** Wire, as cold-drawn, 0.162 in. (4.11 mm) and under in nominal diameter shall withstand, without cracking, wrapping at $77^{\circ}\text{F} \pm 9$ ($25^{\circ}\text{C} \pm 5$) one full turn around a diameter equal to the nominal diameter of the wire. Wire, as cold-drawn, over 0.162 in. (4.11 mm) in nominal diameter shall withstand, without cracking, wrapping at $77^{\circ}\text{F} \pm 9$ ($25^{\circ}\text{C} \pm 5$) one full turn around a diameter equal to twice the nominal diameter of the wire.

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:** Unless otherwise specified, tolerances shall be in accordance with Table II and 3.5.2.

3.5.1 **Diameter:**

TABLE II

Nominal Diameter Inch	Tolerance, Inch Plus and Minus
0.010 to 0.015, incl	0.0003
Over 0.015 to 0.041, incl	0.0005
Over 0.041 to 0.312, incl	0.001
Over 0.312 to 0.500, incl	0.002

TABLE II (SI)

Nominal Diameter Millimetres	Tolerance, Millimetre Plus and Minus
0.25 to 0.38, incl	0.008
Over 0.38 to 1.04, incl	0.013
Over 1.04 to 7.92, incl	0.03
Over 7.92 to 12.70, incl	0.05

3.5.2 Out-of-Roundness: Wire shall not be out-of-round by more than one-half the total permissible tolerance specified for diameter in Table II.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of wire shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling: Shall be in accordance with AMS 2371.

4.4 Reports:

4.4.1 The vendor of wire shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat and the results of tests on each lot to determine conformance to the other technical requirements of this specification. This report shall include the purchase order number, heat number, AMS 5672A, size, and quantity from each heat.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, AMS 5672A, contractor or other direct supplier of wire, part number, and quantity. When wire for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of wire to determine conformance to the requirements of this specification, and shall include in the report a statement that the wire conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

5.1 Wire shall be supplied in coils, on reels, or in straight lengths, as ordered.

5.2 Identification:

5.2.1 Coils or reels of wire shall each be identified by a durable tag marked with the purchase order number, AMS 5672A, heat number, nominal size, quantity, and manufacturer's identification.

5.2.2 Straight lengths shall be bundled or boxed and shall have attached to each bundle or box a tag marked with the information of 5.2.1.