NOTICE OF
ADOPTION

ADOPTION NOTICE
15 August 1990 for
AMS 5115G
1 January 1990
SUPERSEDING
AMS 5115E
10 August 1984

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Title of Document: Wire, Carbon Steel
0.60 - 0.75C
Hardened and Tempered

Date of Specific Issue Adopted: 1 January 1990

Releasing Non-Government Standards Body: SAE

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

Military Coordinating Activity
Air Force - 11

(Project No: 9505-0233)

FSC 9505

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G-45-05

SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5115G

Issued 3-1-42
Revised 1-1-90

Superseding AMS 5115F

WIRE, CARBON STEEL
0.60 - 0.75C
Hardened and Tempered

UNS G10700

1. SCOPE:

1.1 Form: This specification covers a carbon steel in the form of wire supplied as coils of wire or as finished springs.

1.2 Application: Primarily for springs, such as valve springs, subject to moderate stresses and requiring good fatigue properties.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

2.1.1 Aerospace Material Specifications:

AMS 2259 - Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2370 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Wrought Products Except Forgings and Forging Stock
AMS 2430 - Shot Peening
AMS 2640 - Magnetic Particle Inspection

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 370 - Mechanical Testing of Steel Products
ASTM E 350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

2.3 U.S. Government Publications: Available from Naval Publications and Forms Center, Attn: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

2.3.1 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage
MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, Ø determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.60	0.75
Manganese	0.50	0.90
Silicon	0.10	0.30
Phosphorus	--	0.025
Sulfur	--	0.030

3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2259.

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Wire: Cold drawn, hardened, and tempered.

3.2.2 Springs: Stress relieved, after coiling, by heating to 725° - 750°F (385° - 399°C), holding at heat for not less than 1 hour, and cooling in air. When permitted by purchaser, other stress relieving treatments may be used.

3.3 Properties: The product shall conform to the following requirements:

3.3.1 Wire:

3.3.1.1 Tensile Properties: Shall be as shown in Table I, determined in accordance with ASTM A 370:

TABLE I

Nominal Diameter Inch	Tensile Strength psi	Reduction of Area %, min
0.093 to 0.120, incl	210,000 - 230,000	45
Over 0.120 to 0.148, incl	205,000 - 225,000	45
Over 0.148 to 0.192, incl	200,000 - 220,000	45
Over 0.192 to 0.250, incl	195,000 - 215,000	45

TABLE I (SI)

Nominal Diameter Millimetres	Tensile Strength MPa	Reduction of Area %, min
2.36 to 3.05, incl	1448 - 1586	45
Over 3.05 to 3.76, incl	1413 - 1551	45
Over 3.76 to 4.88, incl	1379 - 1517	45
Over 4.88 to 6.35, incl	1344 - 1482	45

3.3.1.1.1 Square wire shall have tensile strength within the limits specified in Table I; the reduction of area requirement does not apply.

3.3.1.1.2 Tensile property requirements for wire under 0.093 inch (2.36 mm) or over 0.250 inch (6.35 mm) in nominal diameter shall be as agreed upon by purchaser and vendor.

3.3.1.2 Twist: A sample of wire, approximately 10 inches (254 mm) long, twisted seven turns forward and then reversed until failure shall show a square break normal to the axis of the wire without splits or cracks.

3.3.1.3 Decarburization: The surface of the wire shall exhibit no ferritic area when transverse sections of the wire are mounted, micro-etched, and examined at 100X magnification.

3.3.1.4 Etching: Visual examination, at 7 - 10X magnification, of surfaces of sections of wire, etched in hot hydrochloric acid (1:1) at 160° - 180°F (71° - 82°C) for sufficient time to remove approximately 1% of the nominal diameter or thickness of the wire, shall show no evidence of pits, cracks, laps, injurious die marks, torn surfaces, or other imperfections detrimental to usage in springs. Coils from which defective samples are taken shall be subject to rejection; if 25% or more of the coils from a lot are rejected, the entire lot shall be rejected.

3.3.2 Springs: Shall have properties as agreed upon by purchaser and vendor.

3.3.2.1 Shot Peening: When specified, springs shall be peened in accordance with AMS 2430 to obtain uniform coverage of the entire surface of each spring. Shot size and peening intensity shall be as agreed upon by purchaser and vendor.

3.4 Quality:

3.4.1 Wire: Shall, as received by purchaser, be uniform in quality and condition, sound, smooth, and free from seams, pits, nicks, scratches, and other imperfections detrimental to usage of the wire.

3.4.2 Finished Springs:

3.4.2.1 The surface of finished springs, as received by purchaser, shall be uniform and free from pits, nicks, scratches, and marks due to grinding, drawing, or coiling, and from other imperfections detrimental to performance of the springs.

3.4.2.2 Each spring shall be subjected to magnetic particle inspection in accordance with AMS 2640. The inspection procedure and standards for acceptance shall be as agreed upon by purchaser and vendor.

3.5 Tolerances: Wire shall conform to the following:

3.5.1 Diameter: Shall be as shown in Table II.

TABLE II

Nominal Diameter Inch	Tolerance, Inch plus and minus
0.093 to 0.148, incl	0.001
Over 0.148 to 0.177, incl	0.0015
Over 0.177 to 0.250, incl	0.002

TABLE II (SI)

Nominal Diameter Millimetres	Tolerance, Millimetre plus and minus
2.36 to 3.76, incl	0.025
Over 3.76 to 4.50, incl	0.038
Over 4.50 to 6.35, incl	0.05

3.5.2 Round wire shall not be out-of-round by more than one-half the total tolerance specified for diameter in Table II.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product 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 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests for all technical requirements are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of a spring to a purchaser, on each heat or lot as applicable, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 For direct U.S. Military procurement of springs, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing: Shall be as follows; a lot of wire shall be all wire of the same nominal diameter produced in one continuous run from a single heat of steel, hardened and tempered in the same heat treat batch, and presented for vendor's inspection at one time; a lot of springs shall be all springs of the same part number produced from one lot of wire and presented for vendor's inspection at one time:

4.3.1 Wire: AMS 2370 and the following:

4.3.1.1 Twist and Decarburization: One specimen from each coil.

4.3.1.2 Etching: One specimen from each end of each coil.

4.3.2 Springs: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample springs shall be approved by purchaser before springs for production use are supplied, unless such approval be waived by purchaser. Results of tests on production springs shall be essentially equivalent to those on the approved sample springs.

4.4.2 Vendor of springs shall use materials, manufacturing procedures, processes, and methods of inspection for production springs which are essentially the same as those used on the approved sample springs. If necessary to make any change in materials, manufacturing procedures, or processes, vendor shall submit for reapproval a statement of the proposed changes in material and/or processing and, when requested, sample springs. Production springs incorporating the revised operations shall not be shipped prior to receipt of reapproval.

4.5 Reports:

4.5.1 The vendor of wire shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for tensile properties of each lot and stating that the wire conforms to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 5115G, size, and quantity.

4.5.2 The vendor of finished or semi-finished springs shall furnish with each shipment a report showing the purchase order number, AMS 5115G, contractor or other direct supplier of wire, part number, and quantity. When wire for making springs is produced or purchased by the spring vendor, that vendor shall inspect each lot of wire to determine conformance to the requirements of this specification and shall include in the report either a statement that the wire conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.6 Resampling and Retesting: Shall be in accordance with AMS 2370.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Shall be as follows:

5.1.1 Wire: Coils or reels of wire shall each be identified by a durable tag marked with not less than the purchase order number, AMS 5115G, lot number, nominal size, quantity, and manufacturer's identification. Straight lengths shall be bundled or boxed and shall have attached to each bundle or box a durable tag marked with the same information.

5.1.2 Springs: Each spring shall, when size permits, be marked with the wire coil number and part number on one end. On compression springs, marking shall appear on the chamfer or ground face of the dead coil. If springs are too small to be marked individually, part numbers shall appear on containers.

5.2 Protective Treatment:

5.2.1 Wire: Wire shall be coated with a suitable corrosion-preventive compound prior to shipment.

5.2.2 Finished Springs: Springs shall be protected, during shipment and storage, by coating with a suitable corrosion-preventive compound which is readily removable by washing in hydrocarbon solvents.

5.3 Packaging and Identification:

5.3.1 Wire:

5.3.1.1 Packaging shall be accomplished in such a manner as to ensure that the wire, during shipment and storage, will be protected against mechanical injury and exposure to moisture.