ADOPTION NOTICE

SAE-AMS6457, "STEEL, WELDING WIRE 0.9CR - 0.20MO - (0.28 - 0.33C) (SAE 4130) VACUUM MELTED, ENVIRONMENT CONTROLLED PACKAGING", was adopted on 31-AUG-94 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: ASC/ENOI, Building 560, 2530 Loop Road West, Wright-Patterson AFB, OH 45433-7101. Copies of this document may be purchased from the Society of Automotive Engineers 400 Commonwealth Drive Warrendale, Pennsylvania, United States, 15096-0001. http://www.sae.org/

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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 6457B

Issued OCT 1979
Revised AUG 1994
Reaffirmed AUG 2000

Superseding AMS 6457A

Steel, Welding Wire
0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
Vacuum Melted, Environment Controlled Packaging

UNS K13147

1. SCOPE:

1.1 Form:

This specification covers a low-alloy steel in the form of welding wire.

1.2 Application:

This wire has been used typically as filler metal for gas-tungsten-arc and gas-metal-arc welding of low-alloy steels where the joint is capable of being heat treated to a minimum tensile strength up to 180 ksi (1241 MPa), but usage is not limited to such applications.

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.

AMS 2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2370	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock
AMS 2635	Radiographic Inspection
AMS 2813	Packaging and Marking of Packages of Welding Wire, Standard Method
AMS 2814	Packaging and Marking of Packages of Welding Wire, Premium Quality
AMS 2816	Identification, Welding Wire, Tab Marking Method
AMS 2819	Identification, Welding Wire, Direct Color Code System
AMS 6350	Steel Sheet, Strip, and Plate, 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
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2.1 (Continued):

ARP1876 Weldability Test for Weld Filler Metal Wire

2.2 ASTM Publications:

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

ASTM E 8 Tension Testing of Metallic Materials
ASTM E 8M Tension Testing of Metallic Materials (Metric)
ASTM E 350 Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	0.28	0.33
Manganese	0.40	0.60
Silicon	0.15	0.35
Phosphorus	--	0.008
Sulfur	--	0.008
Phosphorus + Sulfur	--	0.012
Chromium	0.80	1.10
Molybdenum	0.15	0.25
Nickel	--	0.25
Copper	--	0.10
Vanadium	--	0.06
Oxygen	--	0.0025 (25 ppm)
Nitrogen	--	0.005 (50 ppm)
Hydrogen	--	0.0010 (10 ppm)

3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2259; the limit for phosphorus plus sulfur shall be 0.005 over maximum. No variation is permitted for oxygen, nitrogen, and hydrogen.

3.2 Melting Practice:

Steel shall be vacuum induction melted.

3.3 Condition:

Cold worked, bright finish, in a temper and with a surface finish which will provide proper feeding of the wire in machine welding equipment.

3.3.1 Wire shall be furnished on disposable spools for machine welding or in cut lengths for manual welding, as ordered.

3.3.2 Drawing compounds, oxides, dirt, oil, and other foreign materials shall be removed by cleaning processes which will neither result in pitting nor cause gas absorption by the wire or deposition of substances harmful to welding operations.

3.3.3 Residual elements and dissolved gases deposited on, or absorbed by, the welding wire as a result of cleaning or drawing operations shall be removed by vacuum degassing. Annealing, if required, shall be performed in vacuum or in an inert gas atmosphere.

3.4 Properties:

Wire shall conform to the following requirements:

3.4.1 Weldability: Melted wire shall flow smoothly and evenly during welding and shall produce acceptable welds. ARP1876 may be used to resolve disputes.

3.4.2 Spooled Wire: Shall conform to 3.4.2.1 and 3.4.2.2.

3.4.2.1 Cast: Wire, wound on standard 12-inch (305-mm) diameter spools, shall have imparted to it a curvature such that a specimen sufficient in length to form one loop with a 1-inch (25-mm) overlap, when cut from the spool and laid on a flat surface, shall form a circle 15 to 50 inches (381 to 1270 mm) in diameter.

3.4.2.2 Helix: The specimen on which cast was determined, when laid on a flat surface and measured between adjacent turns, shall show a vertical separation not greater than 1 inch (25 mm).

3.4.3 Tensile Properties: Specimens, prepared in accordance with 4.3.1 and tested in accordance with ASTM E 8 or ASTM E 8M, shall have average tensile strength not lower than 90% of the average of the control specimens of 4.3.1; elongation of the welded specimens shall be not less than 6% in 2 inches (50.8 mm).

3.5 Quality:

Wire, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to welding operations, operation of welding equipment, or properties of the deposited weld metal.

3.6 Sizes and Tolerances:

Wire shall be supplied in the standard sizes and to the tolerances shown in 3.6.1 and 3.6.2.

3.6.1 Diameter: Shall be as shown in Table 2.

TABLE 2A - Sizes and Diameter Tolerances, Inch/Pound Units

Form	Nominal Diameter Inch	Tolerance Inch Plus	Tolerance Inch Minus
Cut Lengths	0.030, 0.045, 0.062, 0.078, 0.094, 0.125	0.003	0.003
Spools	0.007, 0.010, 0.015, 0.020	0.0005	0.0005
Spools	0.030, 0.035, 0.045	0.001	0.002
Spools	0.062, 0.078, 0.094	0.002	0.002

TABLE 2B - Sizes and Diameter Tolerances, SI Units

Form	Nominal Diameter Millimeters	Tolerance Millimeter Plus	Tolerance Millimeter Minus
Cut Lengths	0.76, 1.14, 1.57, 1.98, 2.39, 3.18	0.08	0.08
Spools	0.18, 0.25, 0.38, 0.51	0.013	0.013
Spools	0.76, 0.89, 1.14	0.025	0.05
Spools	1.57, 1.98, 2.39	0.05	0.05

3.6.2 Length: Cut lengths shall be furnished in 18, 27, or 36 inch (457, 686, or 914 mm) lengths, as ordered, and shall not vary more than +0, -0.5 inch (-13 mm) from the length ordered.

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. 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:

4.2.1 Acceptance Tests: Tests for composition (3.1), sizes and tolerances (3.6), and alloy verification (5.2.1) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Tests for weldability (3.4.1), cast (3.4.2.1), helix (3.4.2.2), and tensile properties (3.4.3) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2370 and as specified herein.

4.3.1 Specimens for Tensile Property Testing: A single-vee-groove, butt-joint weld shall be made between two pieces of AMS 6350 plate, 0.250 inch (6.35 mm) in nominal thickness, which have been chamfered full depth to a 60-degree included angle; the weld shall be perpendicular to the longitudinal grain direction of the test pieces. Test pieces, prior to machining the test specimens, shall be heat treated to a tensile strength not lower than 180 ksi (1241 MPa). After heat treatment, the weld metal shall be finished flush with the parent metal on both faces and standard sheet-type, rectangular tensile specimens shall be prepared in accordance with ASTM E 8 or ASTM E 8M, with the weld in the approximate center of the gage length. The weld in the specimens, prior to tensile testing, shall be free from defects detrimental to tensile properties of the weld, determined by radiographic inspection in accordance with AMS 2635. Three control standard sheet-type, rectangular tensile specimens shall be machined from 0.250 inch (6.35 mm) AMS 6350 plate of the same heat as that used for the welded specimens, heat treated with the welded specimens, and tested for comparative tensile properties in accordance with ASTM E 8 or ASTM E 8M.

4.4 Reports:

The vendor of wire shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and stating that the wire conforms to the other technical requirements. This report shall include the purchase order, heat and lot numbers, AMS 6457B, nominal size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2370.

5. PREPARATION FOR DELIVERY:

5.1 Heat:

Wire on each spool shall be of one continuous length from the same heat of steel.