Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 5031B
Superseding AMS 5031A

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WELDING ELECTRODES, COVERED, STEEL
0.07 - 0.15C

1. SCOPE:

1.1 Form: This specification covers a low-carbon steel in the form of covered welding electrodes.

1.2 Application: Primarily for use as filler metal for metal arc welding of low-carbon steels.

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., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

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

ASTM E8 - Tension Testing of Metallic Materials
ASTM E350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

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

2.3.1 Federal Standards:

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

2.4 AWS Publications: Available from American Welding Society, 2501 North West 7th Street, Miami, Florida 33125.

AWS A5.1 - Mild Steel Covered Arc Welding Electrodes

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Weld metal deposited from electrodes shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E350, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Carbon	0.07	0.15
Manganese	0.25	0.60
Silicon	0.15	0.50
Phosphorus	--	0.04
Sulfur	--	0.04
Copper	--	0.15

3.1.1 Weld Pads for Chemical Analysis: The referee procedure for making pads of weld metal and removing samples for chemical analysis shall be in accordance with AWS A5.1.

3.2 Type: Electrodes shall be suitable for welding in all positions using AC or using DC straight polarity (electrode negative).

3.3 Properties:

3.3.1 Tensile Properties: All-weld-metal tensile specimens, prepared in accordance with AWS A5.1 and tested in accordance with ASTM E8 in the as-welded condition, shall conform to the following requirements:

Tensile Strength, min	67,000 psi (462 MPa)
Yield Strength at 0.2% Offset, min	55,000 psi (379 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	17%

3.3.2 Weldability: Electrodes shall demonstrate good weldability and shall flow smoothly and evenly under the conditions specified in 3.2.

3.3.3 Burn-Off: The covering shall be consumed uniformly on all sides and shall not burn back from the core wire under proper welding conditions. Heating of the electrode during welding shall not cause injurious blistering of the covering within the range of current values recommended by the manufacturer.

3.3.4 Grip Portion and Arc Ends: A portion of the electrode 0.75 - 1.25 in. (19.0 - 31.8 mm) long at one end shall be bare to permit good electrical contact with the electrode holder. The opposite, or arc, end of the electrode shall be sufficiently bare to permit easy striking of the arc but the length of this bare section, as measured from the end of the electrode to the point where the full cross-section of the covering begins, shall not exceed the diameter of the bare wire and in no case shall it exceed 1/8 in. (3.2 mm).

3.3.5 Cleaning: Slag produced during welding shall be readily removable with hand tools.

3.4 Quality:

3.4.1 Core Wire: Shall be uniform in quality and condition, cylindrical, clean, sound, and free from foreign materials and from imperfections detrimental to weld quality.

3.4.2 Covering: Shall be uniform in quality, tightly adherent, and free from abnormal scabs, blisters, pockmarks, bruises, and other surface defects and shall withstand normal handling without damage. It shall not be harmfully hygroscopic and shall not adversely affect weld quality.

3.5 Standard Sizes and Lengths: The sizes and lengths in Table I are standard:

TABLE I

Nominal Diameter of Core Wire Inch	Length Inches
1/16	9
5/64	9 or 12
3/32	12
1/8, 5/32, 3/16	14
7/32	14 or 18
1/4, 5/16	18

TABLE I (SI)

Nominal Diameter of Core Wire Millimeters	Length Millimeters
1.6	229
2.0	229 or 305
2.4	305
3.2,4.0,4.8	356
5.6	356 or 457
6.4,7.9	457

3.5.1 Unless otherwise specified, end grip electrodes shall be supplied.

3.6 Tolerances: Unless otherwise specified, tolerances shall be as follows:

3.6.1 Length: Shall vary not more than ± 1/8 in. (± 3.2 mm) from the length ordered.

3.6.2 Diameter:

3.6.2.1 Core Wire: Shall vary not more than ± 0.002 in. (± 0.05 mm) from the size ordered.

3.6.2.2 Covered Electrodes: Shall vary not more than 4% from that of the approved sample.

3.6.3 Covering: Shall be concentric with the core wire to the extent that the maximum core-plus-one-covering dimension shall not exceed the minimum core-plus-one-covering dimension by more than 3% of the minimum core-plus-one-covering dimension.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of electrodes shall supply all samples 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 perform such confirmatory testing as he deems necessary to assure that the electrodes conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to composition (3.1), tensile properties (3.3.1), grip portion and arc ends (3.3.4), size (3.5), and tolerance (3.6) requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to weldability (3.3.2), burn-off (3.3.3), and cleaning (3.3.5) requirements are classified as qualification or periodic control tests.

4.3 Sampling: Shall be as agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample electrodes shall be approved by purchaser before electrodes for production use are supplied, unless such approval be waived.

4.4.2 Vendor shall use materials, manufacturing procedures, processes, and methods of inspection on production electrodes which are essentially the same as those used on the approved sample electrodes. If necessary to make any change in covering formulation or in manufacturing procedures, processes, or methods of inspection which could affect quality or properties of the electrodes, vendor shall submit for reapproval a statement of the revised procedures and, when requested, sample electrodes. No production electrodes incorporating the revised procedures shall be shipped prior to receipt of reapproval.

4.5 Reports:

4.5.1 The vendor of electrodes shall furnish with each shipment three copies of a report stating that the electrodes conform to the requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, control number, size, and quantity. Control number shall be a designation indicating batch processing and core wire heat number. When requested by the purchaser, the vendor shall also include in the report the composition of the deposited weld metal for each heat in the shipment.

4.5.2 When assemblies requiring use of these electrodes are supplied, the assembly manufacturer shall inspect each lot of electrodes to determine conformance to this specification and shall furnish with each shipment three copies of a report stating that the electrodes conform. This report shall include the purchase order number, this specification number and its revision letter, part number, and quantity.

4.6 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the electrodes may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the electrodes represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Marking:

5.1.1 Packaging shall be accomplished in such a manner as to ensure that the electrodes, during shipment and storage, will be protected against mechanical injury, contamination, and exposure to moisture. Such packaging shall protect the covering from changes in moisture content of such magnitude as to impair use of the electrodes.

5.1.2 Packages of electrodes shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation. .

5.1.3 Each container shall be legibly marked with the following information; individual packages in the shipment shall be identified with the control number:

WELDING ELECTRODES, COVERED, STEEL
AMS 5031B
ELECTRODE DIAMETER AND LENGTH_____
QUANTITY_____
RECOMMENDED CURRENT VALUE_____
CONTROL NUMBER_____
MANUFACTURER'S IDENTIFICATION_____