SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-QQ-A-200 | REV. B

Issued 1997-07
Revised 2004-08
Reaffirmed 2012-02

Superseding AMS-QQ-A-200A

Aluminum Alloy, Bar, Rod, Shapes, Structural Shapes, Tube, and Wire, Extruded: General Specification for

RATIONALE

AMS-QQ-A-200B has been reaffirmed to comply with the SAE five-year review policy.

NOTICE

This document is intended to replace Federal Specification QQ-A-200E. The original issue and revision A of AMS-QQ-A-200 were taken directly from Federal Specification QQ-A-200E/GEN, Amendment 1, and contained only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. This revision B changes the heat treatment specification MIL-H-6088 (cancelled) to AMS 2772 (the superseding document) to ensure that the vital heat treat parameters used for heat-treat-response-test samples conform to parameters used for heat treatment of parts (See 6.6).

The original Federal Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, (b) the use of the existing government specification or standard format, and (c) the exclusion of any qualified product list (QPL) sections.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMSQQA200B

1. SCOPE AND CLASSIFICATION:

1.1 Scope:

This specification covers the general requirements for aluminum alloy bar, rod, shapes, structural shapes, tube, and wire extruded. Specific requirements for these products in a particular alloy are covered by the applicable detailed specification (See 6.3).

1.2 Classification:

1.2.1 Tempers: Bar, rod, shapes, structural shapes, tube, and wire are classified in tempers as specified in the detailed specification. Definitions of tempers are specified in American National Standard ANSI H35.1.

1.2.2 Tubing: Tubing shall be additionally classified as follows:

Type I - Tubing extruded by the method defined in 6.4.5.1.
Type II - Tubing extruded by other methods (See 6.4.5.2).

2. APPLICABLE DOCUMENTS:

The following publications, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials

AMS-STD-184 Identification Marking of Aluminum, Magnesium, and Titanium

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 or www.dsp.dla.mil.

MIL-STD-1916 DOD Preferred Methods for Acceptance of Product
AMS-STD-2154 Inspection, Ultrasonic, Wrought Metals, Process for

FED-STD-123 Marking for Shipment (Civil Agencies)

2.3 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 557	Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM E 172	Emission Spectrochemical Analysis, Describing and Specifying the Excitation Source
ASTM E 1004	Electromagnetic (Eddy Current) Measurements of Electrical Conductivity
ASTM E 1282	Quantitative Analysis Methods for Metals, Ores, and Related Materials
ASTM G 34	Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)
ASTM G 47	Determining Susceptibility to Stress-Corrosion Cracking of High-Strength Aluminum Alloy Products

2.4 ANSI Publications:

Available from ANSI, 25 West 43rd Street, New York, NY 10036 or www.ansi.org.

ANSI H35.1	Alloy and Temper Designation System for Aluminum
ANSI H35.2	Dimensional Tolerances for Aluminum Mill Products

3. REQUIREMENTS:

3.1 Specification Sheets:

The individual item requirements shall be as specified herein and in accordance with the applicable detailed specification.

3.2 Chemical Composition:

The chemical composition shall be as specified in the detailed specification.

3.3 Mechanical Properties:

3.3.1 Mechanical properties shall be as specified in the detailed specification. The elongation requirements shall not be applicable to the following:

3.3.1.1 Material of such dimensions that a standard test specimen cannot be taken in accordance with this specification, and of such shape that it cannot be satisfactorily tested in full section.

3.3.1.2 Material thinner than 0.062 inch (nominal).

3.4 Dimensional Tolerances:

Unless otherwise specified, the dimensional tolerances shall not exceed those specified in ANSI H35.2.

3.5 Requirements for Sizes Not Specifically Covered:

Mechanical properties for sizes not covered by the detailed specification and dimensional tolerances for sizes not covered in ANSI H35.2 shall be as specified in the contract or purchase order (See 6.2).

3.6 Electrical Conductivity:

When specified in the detailed specification, the electrical conductivity shall conform to the requirements in the detailed specification (See 4.4.3).

3.7 Exfoliation Corrosion:

When specified in the detailed specification, bars, rods, and shapes processed to meet the applicable mechanical property and electrical conductivity requirements, shall show a level of exfoliation corrosion less than that illustrated by photograph B in Figure 2, of ASTM G 34 when tested as specified in the detailed specification or purchase order. The supplier shall maintain records of all lots so tested.

3.8 Stress-Corrosion Cracking:

When stress-corrosion testing is specified in the detailed specification or purchase order, bars, rods, and shapes of sufficient thickness, processed to meet the applicable mechanical property and electrical conductivity requirements specified in the detailed specification shall show no evidence of stress-corrosion cracking (See 4.4.5) when tested at the stress level specified in the detailed specification. The supplier shall maintain records of the performance of all lots so tested.

3.9 Marking for Identification:

Bar, rod, shapes, structural shapes, tube, and wire shall be marked in accordance with AMS-STD-184 and the detailed specification as required (See 6.3). In addition to other markings specified, Type I tubes shall have the label “Type I” applied on locations and in a manner in accordance with AMS-STD-184 (See 6.4.5.1).

3.10 Heat Treatment:

Unless otherwise specified in the detailed specification, contract, or order, heat treatment for the applicable tempers designated in the detailed specifications shall be in accordance with the applicable requirements of AMS 2772.

3.11 Internal Defects:

When specified in the detailed specification, rod, bar, and shapes shall be inspected ultrasonically for internal defects (See 4.3.2).

3.12 Tube:

When specified, Type I tube shall be supplied (See 6.2 and 6.4.5.1).

3.13 Workmanship:

The bar, rod, shapes, structural shapes, tube, and wire shall be uniform in quality, temper, and condition; clean, sound, smooth, and free from hard and soft spots, internal voids and cavities, surface defects running lengthwise and appearing as folded-over metal crevices, cracks, kinks, damaged ends, and other injurious defects within the limits consistent with best commercial practice. Discoloration due to thermal treatment will not be cause for rejection.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein. Purchaser reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure that supplies and services conform to prescribed requirements.

4.2 Sampling:

4.2.1 Inspection Lot: An inspection lot shall be as follows:

4.2.1.1 Heat-Treated Material: For heat-treated tempers, an inspection lot shall consist of an identifiable quantity of material of the same mill form, alloy, temper, section, and size traceable to a heat-treated lot or lots and subjected to inspection at one time.

4.2.1.2 Non-Heat-Treated Material: For non-heat-treated tempers, an inspection lot shall consist of an identifiable quantity of material of the same mill form, alloy, temper, section, and size subjected to inspection at one time.

4.2.2 Sampling for Chemical Analysis:

4.2.2.1 Ingot Analysis: At least one sample shall be taken from each group of ingots of the same alloy poured simultaneously from the same source of molten metal by the producer and analyzed to determine conformance with 3.1. Ingots not conforming to the requirements of this specification shall be rejected. Complete ingot analysis records shall be available at the producer's plant to the procuring activity.

4.2.2.2 Finish Product Analysis: When compliance with 4.2.2.1 cannot be established, samples shall be selected as follows: From material having a nominal weight of less than one pound per lineal foot, one sample shall be selected from each lot weighing 1,000 pounds or less; from lots weighing more than 1,000 pounds, one additional sample shall be taken for each 1,000 pounds of fraction thereof in excess of the first 1,000 pounds. From material having a nominal weight of one pound or more per lineal foot, one sample shall be taken from each lot consisting of 1,000 feet or less; from lots consisting or more than 1,000 feet, one additional sample shall be taken for each 1,000 feet or fraction thereof in excess of the first 1,000 feet. Only one test specimen shall be taken from any one piece when more than one piece is available. Not more than one analysis shall be required per piece to determine conformance to 3.2.

4.2.3 Samples for Mechanical Property Tests:

4.2.3.1 Samples for Tensile Tests:

4.2.3.1.1 Number of Test Samples in Temper Supplied: From material having a nominal weight of less than one pound per lineal foot, one tension test sample shall be selected from each inspection lot weighing 1,000 pounds or less; from inspection lots weighing more than 1,000 pounds, one additional sample shall be taken for each 1,000 pounds or fraction thereof in excess of the first 1,000 pounds. From material having a nominal weight of one pound or more per lineal foot, one tension test sample shall be taken from each inspection lot consisting of 1,000 feet, or less; from inspection lots consisting of more than 1,000 feet, one additional sample shall be taken from each 1,000 feet or fraction thereof in excess of the first 1,000 feet. Only one tension test specimen shall be taken from any one piece when more than one piece is available.

4.2.4 Sampling for Electrical Conductivity Tests: Sampling shall be in accordance with 4.2.3.

4.2.5 Sampling for Exfoliation and Stress-Corrosion Tests: Two samples shall be taken from each 4,000 pounds or less of the first three production lots of each of the applicable tempers for each thickness or diameter range listed in the table of minimum mechanical properties in the detailed specification, and for shapes with width to thickness ratios of up through 6 and of over 6 within the thickness ranges. Thereafter, surveillance testing shall be performed on at least one sample per month of the applicable tempers for each thickness or diameter range listed in the table of minimum mechanical properties in the detailed specification produced during the month, and for shapes with width to thickness ratios of up through 6 and over 6 within the thickness ranges produced during the month, unless otherwise specified in the detailed specification or purchase order.

4.2.6 Sampling for Visual and Dimensional Examination: Each bar, rod, shape, structural shape, tube, and wire shall be examined to determine conformance to this specification with respect to workmanship and identification marking. Examinations for dimensions shall be made to ensure conformance with the tolerances specified. On approval of the procuring activity, the supplier may use a system of statistical quality control on each inspection lot for dimensional, marking, and workmanship examinations.

4.3 Examination:

4.3.1 Visual and Dimensional Examination: Each sample bar, rod, shape, structural shape, tube, or wire selected in accordance with 4.2.6 shall be visually examined and measured to verify conformance with this specification.

4.3.2 Ultrasonic Inspection: When specified in the detailed specification, rod, bar, and shapes shall be inspected for internal defects in accordance with AMS-STD-2154. Acceptance standards shall be as specified in the detailed specification.

4.3.3 Examination of Preparation for Delivery: When required, an examination shall be made by a representative of the procuring activity to determine compliance with the requirement of section 5. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-1916, VL = I.

4.4 Test Procedures:

4.4.1 Chemical Analysis: Chemical analysis shall be made by the wet chemical method in accordance with ASTM E 1282 or by the spectrochemical method in accordance with ASTM E 172.

4.4.2 Mechanical Testing:

4.4.2.1 Types of Test Specimens: Specimens for tensile testing shall conform to the requirements of ASTM B 557. When practicable, wire and other material should be tested in full section. For bar, rod, shapes, or structural shapes which are not tested in full section, a standard 0.500 inch diameter round tension test specimen shall be used, or small size specimens proportional to the standard having a nominal diameter of 0.350 inch or 0.250 inch. A standard rectangular tension test specimen with 2-inch gage length may also be used. For tube less than 0.500 inch in wall thickness, which is not tested in full section, the standard 1/2 inch wide longitudinal tension test specimen (Figure 12 of ASTM B 557) for large diameter tubular products shall be used. For tube having a wall thickness of 0.500 inch or more, a standard 0.500 inch diameter round tension test specimen shall be used, or small size specimens proportional to the standard having a nominal diameter of 0.350 inch or 0.250 inch. For material which cannot be tested in full section and from which a standard specimen cannot be obtained, a strip cut from the material shall be tested.

4.4.2.2 Location of Test Specimens:

4.4.2.2.1 Rod, Bar, Shapes, and Structural Shapes: For sections which are wholly or predominantly symmetrical, the tension test specimens shall be taken from the locations specified in Table 1. For sections of which the predominant part is unsymmetrical, the specimen shall be taken from a location that most nearly satisfies the intent of Table 1. Unless otherwise specified in the contract or order, for odd-shaped sections, only the predominant part shall be tested.

TABLE 1. Location of Axis of Specimen

Section thickness or width (inches)	Location of axis of specimen with respect to thickness (T) and width (W) of section	
	Thickness	Width
Up thru 1.500, incl	T/2	W/2
Greater than 1.500	T/4	W/4

4.4.2.2.2 Tube: Tension-test specimens shall be taken from the tube in the longitudinal direction as specified in the detailed specification. From tube in wall thicknesses 0.5 to 1.5 inches, inclusive, tension-test specimens shall be taken with the axis midway between the inside and outside diameter surfaces; from tube having wall thickness greater than 1.5 inches, the axis of the tension-test specimen shall be three-fourths of the distance from one surface to the other.

4.4.2.3 Tensile Tests:

4.4.2.3.1 Tensile Strength: Tensile strength shall be determined in accordance with ASTM B 557.

4.4.2.3.2 Yield Strength: The yield strength shall be determined in accordance with ASTM B 557.

4.4.3 Electrical Conductivity: Unless otherwise specified in the detailed specification or purchase order, electrical conductivity shall be determined in accordance with ASTM E 1004. Test specimens may be prepared by the method of the latter specification by machining a flat, smooth surface of sufficient width for proper testing. Chemical milling may be used on flat surface samples.

4.4.4 Resistance to Exfoliation Corrosion: Specimens shall be prepared and tested in accordance with ASTM G 34 unless otherwise specified in the detailed specification or purchase order. Approximately 10 percent of the thickness shall be removed from one surface by machining and the machined surface shall be evaluated after the test. Chemical milling may be used instead of machining.

4.4.5 Resistance to Stress-Corrosion Cracking: Specimens shall be prepared and tested in accordance with ASTM G 47 unless otherwise specified in the detailed specification or purchase order.

4.5 Rejection and Retest:

If any specimen fails to conform to the requirements of this specification, it shall be cause for rejection of the material represented by the specimen subject to the retest provisions of the specified test method. When no sampling plan is provided, or approved by the procuring agency, and when there is evidence that indicates that a failed specimen was not representative of the lot of material, and when the detail specification does not specify otherwise, at least two specimens shall be selected to replace each test specimen which failed. All specimens so selected for retest shall meet the requirements of the specification or the lot shall be rejected.