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

AEROSPACE MATERIAL SPECIFICATION

AMS 5611

Issued 5-1-70
Revised

STEEL BARS, FORGINGS, AND TUBING, CORROSION AND MODERATE HEAT RESISTANT
12Cr
Ferrite Controlled
Premium Quality, Consumable Electrode Melted

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. FORM: Bars, wire, forgings, mechanical tubing, and forging stock.

3. APPLICATION: Primarily for pressure vessels or structural parts requiring uniformly high room temperature tensile properties; and having resistance to moderately corrosive environments.

4. COMPOSITION:

	min	max
Carbon	0.12	0.15
Manganese	--	0.60
Silicon	--	0.50
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	11.50	12.50
Nickel	--	0.75
Molybdenum	--	0.20
Aluminum	--	0.05
Copper	--	0.50
Tin	--	0.05
Nitrogen	--	0.18

4.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2248.

5. CONDITION: Unless otherwise ordered, the product shall be supplied in the following condition:

5.1 Bars: Annealed, in a machinable condition, having hardness not higher than Brinell 241 or equivalent.

5.1.1 Round bars shall be turned or ground.

5.1.2 Hexagons shall be cold finished.

5.1.3 Other bars 2.75 in. and under in distance between parallel sides shall be cold finished and those over 2.75 in. in distance between parallel sides shall be hot finished.

5.2 Wire: Annealed and cold finished having tensile strength not higher than 115,000 psi.

5.3 Forgings: Normalized and tempered having hardness not higher than Brinell 241 or equivalent.

5.4 Mechanical Tubing: Cold finished, having hardness not higher than Brinell 241 or equivalent.

5.5 Forging Stock: As ordered by the forging manufacturer.

6. TECHNICAL REQUIREMENTS: When ASTM methods are specified for determining conformance to the following requirements, tests shall be conducted in accordance with the issue of the ASTM method listed in the latest issue of AMS 2350.

6.1 Decarburization: Bars ordered ground or turned shall be free from decarburization on such ground or turned surfaces.

6.2 Properties After Heat Treatment: Material 0.500 in. or less in diameter or distance between parallel sides and 0.500 in. diameter specimens cut from larger bars and forgings shall be capable of meeting the following requirements when heated in a neutral atmosphere to 1735 F ± 10 (946.1 C ± 5.6), held at heat for 1 hr, cooled in still air, and tempered twice at 600 F ± 10 (315.6 ± 5.6) for 2 hours.

6.2.1 Tensile Properties:

Tensile Strength, psi	180,000 min
Yield Strength at 0.2% Offset or at 0.0141 in. in 2 in. Extension Under Load (E = 29,000,000), psi	145,000 min
Elongation, % in 2 in. or 4D	10 min
Reduction of Area (round specimens), %	30 min

6.2.2 Hardness: Rockwell C 39 - 44 or equivalent.

6.2.3 Ferrite Content: The product shall contain not more than 5% ferrite as determined by a method given in the latest issue of AMS 2315.

6.2.4 Grain Size: The product shall have grain size predominantly 5 or finer with occasional grains as large as 3 permissible, as determined by comparison of a polished and etched specimen with the chart in ASTM E112.

6.3 Macroetch Test: Full cross-sectional specimens representing the top and bottom of the first, middle, and last usable ingots shall be obtained from the finished billet or a suitable rerolled product and shall be macroetched in hot hydrochloric acid (1:1) at 160 - 180 F (71.1 - 82.2 C) for sufficient time to develop a well-defined macrostructure. The macroetched specimens, when examined visually, shall show no injurious imperfections, such as pipe, porosity, blowholes, segregation, and inclusions detrimental to fabrication or performance of parts. Macrostructure shall be equal to or better than standards agreed upon by purchaser and vendor.

7. QUALITY: Material shall conform to the requirements of the latest issue of AMS 2300; it shall be produced by multiple melting using vacuum consumable electrode practice in the remelt cycle, unless otherwise permitted. The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

8. SAMPLING: Bars shall be sampled in accordance with all applicable requirements of the latest issue of AMS 2371 and as specified here in. Forgings and forging stock shall be sampled as agreed upon by purchaser and vendor.

9. TOLERANCES: Unless otherwise specified, tolerances shall conform to all applicable requirements of the following:

9.1 Bars and Wire: The latest issue of AMS 2241.

9.2 Tubing: The latest issue of AMS 2243.