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

AEROSPACE MATERIAL SPECIFICATION

AMS 6406A
Superseding AMS 6406
Issued 6/30/60
Revised 11/1/69

STEEL SHEET, STRIP, AND PLATE
1.6Si - 2.1Cr - 0.58Mo - 0.05V (0.41 - 0.46C)

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

2. APPLICATION: Primarily for parts and structures requiring high strength, and where welding may be required during fabrication.

3. COMPOSITION:

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	min	max
Carbon	0.41	0.46
Manganese	0.75	1.00
Silicon	1.40	1.75
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	1.90	2.25
Molybdenum	0.45	0.60
Vanadium	0.03	0.08
Nickel	--	0.25
Copper	--	0.35

3.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2259, paragraph titled "Low Alloy Steels."

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

4.1 Sheet and Strip: Cold finished, annealed, and descaled.

4.2 Plate: Hot rolled, annealed, and descaled.

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

5.1 Heat Treatment: Unless otherwise specified, the product shall be annealed by heating to 1355 F ±25 (735 C ± 14), holding at heat for not less than 40 hr, and cooling in air to room temperature.

5.2 Properties as Annealed:

5.2.1 Tensile Properties: Material 0.020 - 2.000 in., incl, in thickness shall conform to the following requirements:

Tensile Strength, psi	120,000 max
Yield Strength at 0.2% Offset or at 0.0106 in. in 2 in. Extension Under Load (E = 30,000,000), psi	95,000 max
Elongation, % in 2 in. or 4D	15 min

5.2.1.1 For widths 9 in. and over, tensile test specimens shall be taken with the axis perpendicular to the direction of rolling. For widths less than 9 in., tensile test specimens shall be taken with the axis parallel to the direction of rolling. Tensile properties of material under 0.750 in. in thickness shall be determined on a standard sheet type or 0.250 in. diameter tensile specimen in accordance with ASTM E8. (The elongation shall be measured in 1 in. on 0.250 in. diameter test specimens.) Material 0.750 to 2.000 in., incl, in thickness shall be tested using a round tensile specimen in accordance with ASTM E8.

5.2.2 Hardness: Shall be not higher than Rockwell B 97 or equivalent.

5.2.3 Grain Size: Predominantly 5 or finer with occasional grains as large as 3 permissible, ASTM E112, ø McQuaid-Ehn test.

5.2.4 Decarburization:

5.2.4.1 Material Under 0.045 In. in Thickness: The method of test and the allowance shall be as agreed upon ø by purchaser and vendor.

5.2.4.2 Material 0.045 In. and Over in Thickness:

5.2.4.2.1 Specimens: Shall be the full thickness of the material except that specimens from plate over 0.249 ø in. thick shall be slices approximately 0.250 in. thick cut parallel to and preserving one original surface of the plate. Recommended specimen size is 1 x 4 inches.

5.2.4.2.2 Procedure: Specimens from material 0.045 to 0.375 in., excl, in thickness shall be hardened by austenitizing and quenching; preferably, they shall not be tempered but, if tempered, the tempering temperature shall be not higher than 300 F (149 C). During heat treatment, specimens shall be protected by suitable atmosphere or medium or by suitable plating to prevent carburization or further ø decarburization. Protective plating, if used, shall then be removed from specimens of material 0.045 to 0.250 excl, in thickness and a portion of the specimen shall be step ground to a depth of 0.050 in. or half thickness, whichever is less. Specimens from material 0.250 to 0.375 in., excl, in thickness shall be ground to remove 0.020 in. of metal from the original surface of the plate and a portion of the specimen shall be further ground to a depth of at least 1/3 the original thickness of the specimen. At least three Rockwell hardness readings shall be taken on each prepared step and each group of readings averaged.

5.2.4.2.3 Allowance:

5.2.4.2.3.1 Material 0.045 to 0.250 In., Excl, Thick: Unless otherwise specified, the product shall be free from complete decarburization. It shall also be free from partial decarburization to the extent ø that the difference in hardness between the surface and the nondecarburized depth below the surface shall be not greater than 2 points on the Rockwell A scale.

5.2.4.2.3.2 Material 0.250 to 0.375 In., Excl, Thick: Shall be from decarburization to the extent that the ø difference in hardness between the two prepared steps shall be not greater than 3 points on the Rockwell A scale.

5.2.4.2.3.3 Material 0.375 In. and Over Thick: The total decarburization as determined microscopically on the plate as supplied shall be not greater than the following:

Nominal Thickness Inches	Depth of Decarburization Inch
0.375 to 0.500, incl	0.015
Over 0.500 to 1.000, incl	0.025
Over 1.000 to 2.000, incl	0.035

5.2.5 Inclusion Rating: A minimum of 6 specimens representing each heat or lot taken parallel to the direction of rolling shall be used to determine the inclusion rating of each thickness of material in accordance with ASTM E45, Method A. Two-thirds of all specimens, using the worst area of inclusions in each specimen, as well as the average of all specimens shall not exceed the following:

	Inclusion Rating Type			
Series	A	B	C	D
Thin	2	2	3	2-1/2
Heavy	2	2	2	2

5.3 Properties After Hardening and Tempering Heat Treatment: Material shall conform to the following requirements after being heated to 1725 F ± 25 (940.6 C ± 14), held at heat for not less than 15 min., and cooling as required, and tempered at 600 - 750 F (315.6 - 398.9 C) for not less than 30 minutes.

5.3.1 Tensile Properties: Material 0.020 - 2.000 in., incl, in thickness shall have the following properties:

Tensile Strength, psi	270,000 min
Yield Strength at 0.2% Offset or at 0.0193 in. in 2 in. Extension Under Load (E = 30,000,000), psi	230,000 min
Elongation, % in 2 in. or 4D	5 min

5.3.1.1 For widths 9 in. and over, tensile test specimens shall be taken with the axis perpendicular to the direction of rolling. For widths less than 9 in., tensile test specimens shall be taken with the axis parallel to the direction of rolling. Tensile properties of material under 0.750 in. in thickness shall be determined on a standard sheet type or 0.250 in. diameter tensile specimen in accordance with ASTM E8. (The elongation shall be measured in 1 in. on 0.250 in. diameter test specimens.) Material 0.750 to 2.000 in., incl, in thickness shall be tested using a round tensile specimen in accordance with ASTM E8.

5.3.2 Hardness: Shall be not lower than Rockwell C 53 or equivalent.

6. QUALITY: Steel shall be aircraft quality and shall conform to the latest issue of AMS 2301. 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.

7. QUALITY ASSURANCE SAMPLING AND TESTING: Shall be in accordance with all applicable requirements of the latest issue of AMS 2370.

8. TOLERANCES: Unless otherwise specified, tolerances shall conform to all applicable requirements of the latest issue of AMS 2252; for strip, tolerances for cold finished shall apply.

9. REPORTS:

9.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment and the results of tests on each size from each heat to determine conformance to the technical requirements of this specification. The report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat.

9.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.