

# AERONAUTICAL MATERIAL SPECIFICATIONS

## AMS 6406

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

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Revised

STEEL, SHEET AND STRIP  
2.1Cr - 1.6Si - 0.55Mo - 0.05V (0.41 - 0.46C)

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. FORM: Sheet, strip, and plate.
3. APPLICATION: Primarily for parts and structures requiring high strength, and where welding may be required during fabrication.

4. COMPOSITION:

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

- 4.1 Check Analysis: Unless otherwise specified, composition variations shall meet the requirements of the latest issue of AMS 2259, paragraph titled "Low Alloy Steels".

5. CONDITION:

- 5.1 Sheet and Strip: Cold finished, annealed, descaled, and oiled.
- 5.2 Plate: Hot rolled, annealed, descaled, and oiled.

6. TECHNICAL REQUIREMENTS:

- 6.1 Heat Treatment: Unless otherwise specified, material shall be annealed by heating to  $1355\text{ F} + 25$ , holding at heat for not less than 40 hr, and air cooling to room temperature.
- 6.2 Tensile Properties: Applicable to material 0.020 - 2.000 in., incl, in thickness.

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.	15 min

6.2.1 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 E8-57T. (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 E8-57T.

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

6.4 Grain Size: Unless otherwise specified, grain size shall be 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 E112-58T.

6.5 Decarburization: Material shall be free from decarburization to the extent that the difference in hardness between the surface and a nondecarburized depth below the surface of an oil hardened specimen, protected during heat treatment to prevent changes in surface carbon content, shall be not more than shown below:

Nominal Thickness Inches	Rockwell Scale	Variation
0.249 and under	A	2
Over 0.249	A	3

6.6 Inclusion Rating: A minimum of 6 specimens representing each heat or lot taken parallel to direction of rolling shall be used to determine the inclusion rating of each thickness of material in accordance with ASTM E45-51, 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:

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

6.7 Properties After Hardening and Tempering Heat Treatment: Material shall conform to the following requirements after heating to 1725 F ± 25, holding at heat for not less than 15 min., air cooling or oil quenching, and tempering at 600 - 750 F for not less than 30 minutes.

6.7.1 Tensile Properties: Applicable to material 0.020 - 2.000 in., incl, in thickness.

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.	5% min

6.7.1.1 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 E8-57T. (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 E8-57T.

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

7. QUALITY:

7.1 Material for making product shall be subject to magnetic particle inspection in accordance with the latest issue of AMS 2301.

7.2 Material 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. TOLERANCES: Unless otherwise specified, tolerances shall conform to the latest issue of AMS 2252 as applicable.

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, 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, 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.

10. IDENTIFICATION: Unless otherwise specified, each plate, sheet, and strip shall be marked, in the respective location indicated below, with AMS 6406, heat number, manufacturer's identification, and nominal thickness in inches. The characters shall be not less than 3/8 in. in height, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance. The characters shall be sufficiently stable to withstand ordinary handling.