

AERONAUTICAL MATERIAL SPECIFICATIONS

AMS 5520

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

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Revised

STEEL, CORROSION AND MODERATE HEAT RESISTANT
15Cr - 7.1Ni - 2.5Mo - 1.1Al

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 requiring corrosion resistance, high strength and oxidation resistance up to 800 F, and where such parts may require welding or brazing during fabrication.
4. COMPOSITION:

		<u>Check Analysis</u>	
		Under Min or Over Max	

Carbon	0.09 max	--	0.01
Manganese	1.00 max	--	0.03
Silicon	1.00 max	--	0.05
Phosphorus	0.04 max	--	0.005
Sulfur	0.03 max	--	0.005
Chromium	14.00 - 16.00	0.20	0.20
Nickel	6.50 - 7.75	0.10	0.10
Molybdenum	2.00 - 3.00	0.10	0.10
Aluminum	0.75 - 1.50	0.10	0.10

5. CONDITION:

- 5.1 Sheet: Cold rolled, annealed, and descaled (No. 2D Finish)
- 5.2 Strip: Cold rolled, annealed, and descaled (No. 1 Strip Finish).
- 5.3 Plate: Hot rolled, annealed, and descaled.

6. TECHNICAL REQUIREMENTS:

- 6.1 Heat Treatment: Unless otherwise specified, material shall be annealed by heating to $1950\text{ F} + 25$, holding at heat for not less than 3 min. per 0.1 in. of thickness, and air cooling to room temperature.
- 6.2 Tensile Properties: Applicable to material 0.0015 - 0.500 in. in thickness.

Tensile Strength, psi	150,000 max
Yield Strength at 0.2% Offset or at 0.0085 in. in 2 in. Extension Under Load (E = 29,000,000), psi	65,000 max
Elongation, % in 2 in.	25 min

Section 7C of the SAE Technical Board rules provides that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no intent to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the SAE and its Committee shall not investigate or consider patents which may apply to the subject matter. Prospective users of the reports are responsible for protecting themselves against liability for infringement of patents."

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.

6.3 Hardness: Shall not be higher than Rockwell B 100 or equivalent. (Hardness values not applicable to material 0.010 in. and thinner.)

6.4 Bending: Material shall withstand, without cracking, bending at room temperature through the angle indicated below around a diameter equal to the bend factor times the nominal thickness of the material, with axis of bend parallel to the direction of rolling.

Nominal Thickness Inch	Type of Bend	Angle deg, min	Bend Factor
0.187 and under	Free Bend	180	1
0.187 and under	V-Block	135	1
Over 0.187 to 0.275	Free Bend	180	3
Over 0.187 to 0.275	V-Block	135	3

6.5 Properties After Transformation and Precipitation Hardening: Material shall conform to the following requirements after heating to $1400\text{ F} + 25$, holding at heat for 90 min., cooling to $55\text{ F} + 5$ within 1 hr, holding at $55\text{ F} + 5$ for not less than 30 min., heating to $1050\text{ F} + 10$, holding at heat for 90 min., and cooling in air.

6.5.1 Tensile Properties: Applicable to material 0.0015 - 0.500 in. in thickness.

Tensile Strength, psi	190,000 min
Yield Strength at 0.2% Offset or at 0.0157 in. in 2 in. Extension Under Load ($E = 29,000,000$), psi	170,000 min
Elongation, % in 2 in.	
Nominal Thickness, Inch	
0.0015 to 0.005, excl	2 min
0.005 to 0.010, excl	3 min
0.010 to 0.020, excl	4 min
0.020 to 0.1875, excl	5 min
0.1875 to 0.500, incl	6 min

6.5.1.1 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.

6.5.2 Hardness: Shall be not lower than Rockwell C 40 or equivalent. (Hardness values not applicable to material 0.010 in. and thinner.)

6.6 Properties After Austenite Conditioning, Sub-Zero Transformation, and Precipitation Hardening: Material shall conform to the following requirements after heating to $1750\text{ F} + 25$, holding at heat for 10 min., rapidly cooling to room temperature, cooling to $-100\text{ F} + 10$, holding at this temperature for not less than 8 hr, warming in air to room temperature, heating to $950\text{ F} + 10$, holding at heat for 60 min., and cooling in air.

6.6.1 Tensile Properties: Applicable to material 0.0015 - 0.500 in. in thickness.

Tensile Strength, psi	225,000 min
Yield Strength at 0.2% Offset or at 0.0178 in. in 2 in. Extension Under Load (E = 29,000,000), psi	200,000 min
Elongation, % in 2 in.	
Nominal Thickness, Inch	
0.0015 to 0.005, excl	1 min
0.005 to 0.010, excl	2 min
0.010 to 0.020, excl	3 min
0.020 to 0.1875, excl	4 min
0.1875 to 0.500, incl	5 min

6.6.1.1 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.

6.6.2 Hardness: Shall not be lower than Rockwell C 46 or equivalent. (Hardness values not applicable for material 0.010 and thinner).

7. QUALITY: 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 2242 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 thickness from each heat to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, heat number, material specification number, thickness, 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 the 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 sheet, strip, and plate shall be marked, in the respective location indicated below, with AMS 5520, 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.

10.1 Flat Sheet, and Flat Strip Over 6 in. in Width: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 2 ft, the rows being spaced not more than 3 in. apart and alternately staggered.