AERONAUTICAL MATERIAL SPECIFICATIONS

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

AMS 5545

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Revised

ALLOY SHEET AND STRIP, CORROSION AND HEAT RESISTANT
Nickel Base - 19Cr - 11Co - 10Mo - 3Ti - 1.5Al
Vacuum Melted - Solution Heat Treated

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 high strength up to 1600 F and oxidation resistance up to 1800 F which may be welded during fabrication and subsequently precipitation heat treated.

4. COMPOSITION:

Carbon	0.12 max
Manganese	0.10 max
Silicon	0.50 max
Sulfur	0.015 max
Chromium	18.00 - 20.00
Cobalt	10.00 - 12.00
Molybdenum	9.00 - 10.50
Iron	5.00 max
Titanium	3.00 - 3.30
Aluminum	1.40 - 1.60
Boron	0.0030 - 0.010
Nickel	remainder

4.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2269.

5. CONDITION: Unless otherwise specified, material shall be supplied in the following condition:

5.1 Sheet and Strip: Hot or cold rolled, solution heat treated, and descaled, having an appearance as close as possible to a commercial corrosion resistant steel No. 2D finish; standards for acceptance and rejection shall be as agreed upon by purchaser and vendor.

5.2 Plate: Hot rolled, solution heat treated, and descaled.

6. TECHNICAL REQUIREMENTS:

6.1 Heat Treatment: Material shall be solution heat treated by heating to 1975 F + 25, holding at heat at least for a minimum time based on 60 min. per inch of thickness, followed by rapid cooling in air blast or quenching in oil or water.

6.2 Tensile Properties:

Nominal Thickness Inch	Tensile Strength psi, max	Yield Strength at 0.2% Offset or at Extension Indicated (E = 31,600,000)		Elongation % in 2 in. min
		psi, max	Extension Under Load in. in 2 in.	
0.010 to 0.187, incl	170,000	100,000	0.0103	30
Over 0.187	195,000	140,000	0.0128	20

6.2.1 When a dispute occurs between purchaser and vendor over the yield strength value, yield strength determined by the offset method shall apply.

6.2.2 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 axis parallel to the direction of rolling.

6.3 Hardness:

Nominal Thickness Inch	Hardness, Max (or Equivalent)
0.040 and under	Rockwell 15-N 75
Over 0.040 to 0.070, incl	Rockwell A 64
Over 0.070 to 0.187, incl	Rockwell C 30

6.3.1 Material shall not be rejected on the basis of hardness if the tensile properties are met.

6.4 Bending: Material shall be capable of withstanding, 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	Angle deg, min	Bend Factor
0.062 and under	180	2
Over 0.062 to 0.187, incl	180	2.5

6.5 Properties After Precipitation Heat Treatment: Material shall be capable of meeting the following requirements after heating to 1400 F ± 25, holding at heat for 16 hr, and cooling in air.

6.5.1 Tensile Properties at Room Temperature:

Tensile Strength, psi	170,000 min
Yield Strength at 0.2% Offset or at 0.0122 in. in 2 in. Extension Under Load (E = 31,600,000), psi	130,000 min
Elongation, % in 2 in.	10 min

6.5.1.1 When a dispute occurs between purchaser and vendor over the yield strength value, yield strength determined by the offset method shall apply.

6.5.2 Tensile Properties at 1400 F: Tensile specimens shall be heated to 1400 F ± 10, held at heat for 30 min. before testing, and tested at 1400 F ± 10 at a strain rate of approximately 0.005 in. per in. per min. to the 0.2% yield strength and at a strain rate of approximately 0.075 in. per in. per min. to fracture.

Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 24,700,000)		Elongation % in 2 in. min
		psi, min	Extension Under Load in. in 2 in.	
0.018 and under	130,000	110,000	0.0129	3
Over 0.018 to 0.024, incl	135,000	110,000	0.0129	3
Over 0.024	140,000	110,000	0.0129	3

6.5.2.1 When a dispute occurs between purchaser and vendor over the yield strength value, yield strength determined by the offset method shall apply.

6.5.2.2 For widths 9 in. and over, tensile test specimens for the tests of 6.5.1 and 6.5.2 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.

6.5.3 Hardness: Shall be not lower than Rockwell C 35 or equivalent.

6.5.4 Grain Size: Unless otherwise specified, shall be predominantly 3 or finer with occasional grains as large as 1 permissible, as determined by comparison of a polished and etched specimen with the chart in ASTM E112-58T.

7. QUALITY: Material shall be produced by vacuum induction melting or by double vacuum melting. It 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 2262 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. This 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 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.