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

AMS 6435

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Revised

STEEL SHEET AND STRIP
1.8Ni - 0.8Cr - 0.35Mo - 0.2V (0.33 - 0.38C)
Vacuum Melted

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: A weldable grade alloy steel intended primarily for heat treated parts which require through hardening to high strength levels and which may be used at operational stress levels approaching the yield strength.

   NOTE. This material may be notch sensitive when heat treated to 240,000 psi min tensile strength level and, consequently, caution should be exercised in this respect.

4. COMPOSITION:

Carbon	0.33 - 0.38
Manganese	0.60 - 0.90
Silicon	0.40 - 0.60
Phosphorus	0.010 max
Sulfur	0.010 max
Chromium	0.65 - 0.90
Nickel	1.65 - 2.00
Molybdenum	0.30 - 0.40
Vanadium	0.17 - 0.23

4.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2259, paragraph titled "Low Alloy Steels", except that carbon shall vary not more than 0.01 under min or over max and no variation will be permitted for phosphorus and sulfur.

5. CONDITION: Hot finished, annealed, descaled, and oiled, having hardness not higher than Rockwell C 30 or equivalent, unless otherwise specified. When spheroidize anneal is specified, hardness shall not be higher than Rockwell B 95 or equivalent.

6. TECHNICAL REQUIREMENTS:

6.1 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.

6.2 Decarburization:

6.2.1 Thickness under 0.045 in.: The method of test and the tolerances shall be as agreed upon by purchaser and vendor.

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6.2.2 Thickness over 0.045 in.: Material shall be free from complete decarburization and from partial decarburization to the extent that the difference in hardness between the surface and a non-decarburized depth below the surface of a 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
0.045 to 0.249, incl	A	2
Over 0.249	A	3

6.3 Hardenability: Unless otherwise specified, the hardenability shall be J56 = 1 max and J47 = 15 min when determined in accordance with the SAE Method of Determining Hardenability published in the latest issue of the SAE Handbook, except that a laminated end-quench test specimen (Fig. 1) shall be used and the steel shall be normalized at 1700 F ± 10 and the test specimen austenitized at 1625 F ± 10.

6.4 Tensile Properties: Material shall be capable of meeting the following properties when heated to 1625 F ± 25, held at heat for 1 hr, and quenched in oil, and then tempered at 400 - 500 F for not less than 2 hr, and tested with axis of specimen perpendicular to the direction of rolling.

Tensile Strength, psi	240,000 min
Yield Strength at 0.2% Offset or at 0.0185 in. in 2 in. Extension Under Load (E = 29,000,000), psi	210,000 min
Elongation, % in 2 in.:	
Nominal Thickness, Inches	
0.070 and under	5 min
Over 0.070 to 0.249, incl	6 min
Over 0.249	8 min

6.5 Inclusion Rating:

6.5.1 Material for producing product shall be subject to qualification by step-down bar method of magnetic particle inspection in accordance with AMS 2300, unless such inspection be waived.

6.5.2 The inclusion rating determined in accordance with ASTM E45-51, Method A using not less than 9 specimens per heat or lot, selected parallel to the direction of rolling and representing the worst area of inclusions in the inspection samples, shall be as specified below. The method of selection of specimens shall be such that suitable rating of the heat or lot of steel being qualified is assured. Two-thirds of all specimens as well as the average of all specimens shall not exceed the following limits:

	Inclusion Rating			
Type	A	B	C	D
Thin	1.5	1.5	1	2
Thick	1	1	1	1.5

7. QUALITY: Material shall be induction or consumable electrode vacuum melted. 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. 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, grain size, hardenability, and inclusion rating of each heat in the shipment, and the results of tests on each size from each heat to determine conformance to the tensile property 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.

10. IDENTIFICATION: Shall be according to 10.1, unless purchaser permits a method from 10.2.

10.1 Each plate, sheet, and strip shall be marked, in the respective location indicated below, with AMS 6435, manufacturer's identification, and nominal thickness in inches. The characters shall not be 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 characters shall be sufficiently stable to withstand ordinary handling.

10.1.1 Plate, 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.

10.1.2 Flat Strip 6 in. and Under in Width: Shall be marked near one end.

10.1.3 Coiled Sheet and Coiled Strip: Shall be marked near the outside of the coil.

10.2 When purchaser permits, each plate, sheet, and strip may be marked near one end, coils being marked near the outside end, with the purchase order number, AMS 6435, heat number, and nominal thickness in inches, using any suitable marking fluid. As an alternate method, individual pieces and bundles shall have attached a metal or plastic tag embossed with the above information or shall be boxed and the box marked with the same information.

11. PACKAGING: Material shall be packaged with paper interleaving to prevent scratching of surfaces during shipping and handling. Sheets, plates, and strip up to 1/2 in. thick shall be boxed in wooden boxes of one ton lifts. Plate 1/2 in. thick and heavier shall be shipped with standard mill packing in lifts not to exceed one ton.

12. REJECTIONS: Material not conforming to this specification or to authorized modifications will be subject to rejection.