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

AMS 6438

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Revised

STEEL SHEET, STRIP, AND PLATE
1.05Cr - 0.55Ni - 1.0Mo - 0.11V (0.45 - 0.50C)
Premium Quality, Consumable Electrode Vacuum Melted

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

2. APPLICATION: Primarily for ultra high strength structural applications requiring a through hardening, weldable material for use at temperatures up to 600 F (315 C).

3. COMPOSITION:

	min - max
Carbon	0.45 - 0.50
Manganese	0.60 - 0.90
Silicon	0.15 - 0.30
Phosphorus	-- 0.015
Sulfur	-- 0.015
Chromium	0.90 - 1.20
Nickel	0.40 - 0.70
Molybdenum	0.90 - 1.10
Vanadium	0.08 - 0.15

3.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2259, paragraph titled "Low Alloy Steels", except that the variations for carbon and vanadium shall apply to "over max" only.

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

4.1 Sheet and Strip: Cold finished, bright or atmosphere annealed, pickled if necessary, and oiled; or hot rolled, annealed, pickled, and oiled; having hardness not higher than Rockwell C 30 or equivalent.

4.2 Plate: Hot rolled, annealed, pickled, and oiled having hardness not higher than Rockwell C 30 or equivalent.

4.3 When normalized and tempered material is specified, hardness shall be not higher than Rockwell C 30 or equivalent.

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

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5.1 Decarburization: Product shall be free from complete decarburization. Partial decarburization shall not exceed the following when measured microscopically:

Nominal Thickness Inches	Depth of Decarburization Inch	
	Product Width, Inches	
	Up to 48, incl	Over 48
Up to 0.040, incl	0.001	0.002
Over 0.040 to 0.065, incl	0.001	0.003
Over 0.065 to 0.090, incl	0.002	0.004
Over 0.090 to 0.125, incl	0.003	0.005
Over 0.125 to 0.250, incl	0.006	0.006
Over 0.250 to 0.375, incl	0.010	0.012
Over 0.375 to 0.500, incl	0.015	0.015
Over 0.500 to 1.000, incl	0.025	0.025
Over 1.000 to 2.000, incl	0.035	0.035

5.2 Grain Size: Predominantly 5 or finer with occasional grains as large as 3 permissible, ASTM E112, Appendix III, Section A1, Treatment (2).

5.3 Properties after Heat Treatment: Test specimens, austenitized by heating in a protective atmosphere to a temperature within the range of 1600 - 1650F (871.1 - 898.9 C), held at the selected temperature within ± 10 F (± 5.6 C) for 1 hr, quenched in oil, stress relieved at 400 F ± 10 (204.4 C ± 5.6) for 1 hr, cooled in air, tempered for 4 hr at not lower than 1000 F (538 C), and cooled in air, shall conform to the following requirements.

5.3.1 Tensile Properties:

Tensile Strength, psi	224,000 min
Yield Strength at 0.2% Offset or at 0.0172 in. in 2 in. Extension Under Load (E = 29,500,000), psi	195,000 min
Elongation, % in 2 in. or 4D	7 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.

5.3.2 Hardness: Not lower than Rockwell C 47 or equivalent.

6. QUALITY: Steel shall be premium quality and shall conform to the requirements of the latest issue of AMS 2300; it shall be multiple melted using vacuum consumable electrode process in the remelt cycle, unless otherwise permitted. 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.