AEROSPACE
MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York, N.Y. 10017

AMS 6542

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Revised

STEEL BARS AND FORGINGS
0.27Cr - 7.75Ni - 4.0Co - 0.27Mo - 0.09V (0.42 - 0.48C)
Premium Quality, Consumable Electrode Melted, Annealed

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

2. FORM: Bars, forgings, and forging stock.

3. APPLICATION: Primarily for ultra-high strength structural applications requiring a weldable material. Material may be used in either bainitic or quenched and tempered condition.

4. COMPOSITION:

	min	max
Carbon	0.42	0.48
Manganese	0.10	0.35
Silicon	--	0.10
Phosphorus	--	0.010
Sulfur	--	0.010
Chromium	0.20	0.35
Nickel	7.00	8.50
Cobalt	3.50	4.50
Molybdenum	0.20	0.35
Vanadium	0.06	0.12

4.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2259, paragraph titled "Low Alloy Steels"; check analysis limits for cobalt shall be 0.05 under min or over maximum.

5. CONDITION:

5.1 Bars and Forgings: Unless otherwise ordered, annealed and descaled, having hardness not higher than Brinell 321 or equivalent.

5.2 Forging Stock: As ordered by the forging manufacturer.

6. 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.

6.1 Grain Size: Predominantly 5 or finer with occasional grains as large as 3 permissible, determined, unless otherwise specified, in accordance with ASTM E112, McQuaid-Ehn Test.

6.2 Decarburization:

6.2.1 Bars ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces.

6.2.2 Allowable decarburization of bars or billets ordered for redrawing or forging, or to specified microstructural requirements, shall be as agreed upon by purchaser and vendor.

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6.2.3 Decarburization of bars to which 6.2.1 or 6.2.2 is not applicable shall be not greater than the following:

Nominal Diameter or Distance Between Parallel Sides Inches	Depth of Decarburization Inch
Up to 0.375, incl	0.015
Over 0.375 to 0.500, incl	0.017
Over 0.500 to 0.625, incl	0.019
Over 0.625 to 1.000, incl	0.022
Over 1.000 to 1.500, incl	0.025
Over 1.500 to 2.000, incl	0.030
Over 2.000 to 2.500, incl	0.035
Over 2.500 to 3.000, incl	0.040
Over 3.000 to 5.000, incl	0.045

6.2.3.1 Bars over 5.000 in. in nominal diameter or distance between parallel sides shall have depth of decarburization limits as agreed upon by purchaser and vendor.

6.2.4 Unless otherwise agreed upon by purchaser and vendor, decarburization shall be measured by the microscopic method or by Rockwell Superficial 30-N scale hardness method, or equivalent hardness testing method, on hardened but untempered specimens protected during heat treatment to prevent changes in surface carbon content. Depth of decarburization, when measured by a hardness method, is defined as the perpendicular distance from the surface to the non-decarburized depth under that surface below which there is no further increase in hardness. Such measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization or lack of decarburization thereon.

6.2.4.1 When determining the depth of decarburization, it is permissible to disregard local areas provided the decarburization of such areas does not exceed the above limits by more than 0.005 in. and the width is 0.065 in. or less.

6.3 Properties After Heat Treatment: Test specimens, austenitized by heating to a temperature within the range of 1450 - 1500 F (787.8 C - 815.6 C) and holding at the selected temperature within ±10 F (±5.6 C) for 1 hr, transferred immediately to a furnace at 480 - 490 F (248.9 C - 254.4 C), held in that temperature range for not less than 6 hr, air cooled to room temperature, and stress relieved by heating for 2 hr at 425 F ± 10 F (218.4 C ± 5.6 C), shall conform to the following requirements:

6.3.1 Tensile Properties:

Tensile Strength, psi	260,000 min
Yield Strength at 0.2% Offset or at 0.0189 in. in 2 in. Extension Under Load (E = 29,500,000), psi	220,000 min
Elongation, % in 2 in. or 4D	7 min
Reduction of Area, %	20 min

6.3.2 Hardness: Shall be not lower than Rockwell C 51 or equivalent.

7. QUALITY: Steel shall be premium quality and shall conform to the requirements of the latest issue of AMS 2300. Unless otherwise permitted, material shall be multiple melted using consumable electrode process in the remelt cycle; at least one of the melting cycles shall be done in vacuum. 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 all applicable requirements of the latest issue of AMS 2251; for all hexagons, tolerances for cold finished shall apply.