



AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

485 Lexington Ave., New York, N. Y. 10017

AMS 6545A

Superseding AMS 6545

Issued 2-15-65

Revised 11-1-67

STEEL SHEET, STRIP, AND PLATE

0.48Cr - 8.0Ni - 4.0Co - 0.48Mo - 0.09V (0.24 - 0.30C)

Annealed

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
2. **APPLICATION:** Primarily for heat treated parts, such as pressure vessels, requiring through-hardening to high strength levels, and where such parts may require welding.
3. **COMPOSITION:**

Ø	min	max
Carbon	0.24 - 0.30	
Manganese	0.10 - 0.35	
Silicon	-- 0.35	
Phosphorus	-- 0.010	
Sulfur	-- 0.010	
Chromium	0.35 - 0.60	
Nickel	7.00 - 9.00	
Cobalt	3.50 - 4.50	
Molybdenum	0.35 - 0.60	
Vanadium	0.06 - 0.12	
Copper	-- 0.35	

- 3.1 **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.
4. **CONDITION:** Unless otherwise specified, material shall be supplied in the following condition:
 - 4.1 **Sheet and Strip:** Cold finished, bright or atmosphere annealed, and pickled if necessary; or hot rolled, annealed, and pickled, having hardness not higher than Rockwell C 36 or equivalent.
 - 4.2 **Plate:** Hot rolled, annealed, and pickled, having hardness not higher than Rockwell C 36 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.
 - 5.1 **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.
 - 5.2 **Decarburization:**
 - 5.2.1 **Material Under 0.045 In. in Thickness:** The method of test and the allowance shall be as agreed upon by purchaser and vendor.

SAE Technical Board rules provide 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 agreement 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 Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

Ø 5.2.2 Material 0.045 In. and Over in Thickness:

5.2.2.1 Specimens: Shall be the full thickness of the material except that specimens from plate over 0.250 in. thick shall be slices approximately 0.250 in. thick cut parallel to and preserving one original surface of the plate. Recommended specimen size is 1 x 4 inches.

5.2.2.2 Procedure: Specimens shall be hardened by austenitizing and quenching; preferably, they shall not be tempered but, if tempered, the tempering temperature shall be not higher than 300 F (149 C). During heat treatment, specimens shall be protected by suitable atmosphere or medium or by suitable plating to prevent carburization or further decarburization. Protective plating, if used, shall then be removed from specimens of material 0.045 to 0.250 in., excl, in thickness and a portion of the specimen shall be step ground to a depth of 0.050 in. or half thickness, whichever is less. Specimens from material 0.250 in. and over in thickness shall be ground to remove from the original surface of the plate the amount of metal shown below and a portion of the specimen shall be further ground to a depth of at least 1/3 the original thickness of the specimen. At least three Rockwell hardness readings shall be taken on each prepared step and each group of readings averaged.

Nominal Original Thickness Inches	Surface Depth Removal Inch
0.250 to 0.375, incl	0.020
Over 0.375 to 0.500, incl	0.025
Over 0.500 to 0.750, incl	0.030
Over 0.750 to 1.000, incl	0.035
Over 1.000 to 2.000, incl	0.040

Ø 5.2.2.3 Allowance:

5.2.2.3.1 Material 0.045 to 0.250 In., Excl, Thick: Shall be free from complete decarburization and from partial decarburization to the extent that the difference in hardness between the surface and the nondecarburized depth below the surface shall be not greater than 2 points on the Rockwell A scale.

5.2.2.3.2 Material 0.250 In. and Over Thick: The difference in hardness between the two prepared steps shall be not greater than 2 points on the Rockwell C scale.

5.3 Micro-Inclusion Rating: Unless otherwise specified, the inclusion rating, determined in accordance with ASTM E45, 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 sample, 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 shall not exceed the following limits, except that the length of any inclusion shall be not greater than 0.025 inch.

Type	Inclusion Rating			
	A	B	C	D
Thin	2.0	2.0	2.0	2.5
Heavy	1.5	1.5	1.5	1.5

5.4 Properties After Heat Treatment: Material heat treated as in 5.4.1, except that annealing (5.4.1.1) is optional, shall conform to the requirements of 5.4.2 and 5.4.3.

5.4.1 Heat Treatment:

5.4.1.1 Annealing: Heat to 1140 F $\pm$ 25 (615.6 C $\pm$ 14), hold at heat for 8 - 24 hr, and cool in air to room temperature.