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

AMS 5505

Issued 7-15-61
Revised

STEEL SHEET AND STRIP, CORROSION RESISTANT
12.5Cr (SAE 51410 Modified)
Ferrite Controlled

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 and assemblies requiring uniformly high room temperature tensile properties along with oxidation resistance up to 1000 F where control of ferrite content is necessary.

4. COMPOSITION:

Carbon	0.12 - 0.15
Manganese	0.60 max
Silicon	0.50 max
Phosphorus	0.025 max
Sulfur	0.025 max
Chromium	11.50 - 12.50
Nickel	0.75 max
Molybdenum	0.20 max
Aluminum	0.05 max
Copper	0.50 max
Tin	0.05 max
Nitrogen	0.08 max

4.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2248.

5. CONDITION:

5.1 Sheet: Cold rolled, annealed, and descaled (No. 2D Finish).

5.2 Strip: Cold rolled, annealed, and descaled (No. 1 Strip Finish).

5.3 Plate: Hot rolled, annealed, and descaled.

6. TECHNICAL REQUIREMENTS:

6.1 Tensile Properties:

Tensile Strength, psi	95,000 max
Elongation, % in 2 in.	
Nominal Thickness, inches	
0.030 and under	15 min
Over 0.030	20 min

6.1.1 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.

6.2 Bending: Material shall withstand, 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	Type of Bend	Angle deg, min	Bend Factor
0.375 and under	Free Bend	180	1
0.375 and under	V-Block	135	2
Over 0.375 to 0.500, incl	Free Bend	180	2
Over 0.375 to 0.500, incl	V-Block	135	4

6.3 Grain Size: Sheet and strip shall have grain size 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.

6.4 Properties After Heat Treatment: Material 3/8 in. and under in thickness and 3/8 in. thick specimens from heavier material shall be capable of meeting the following properties when heated to 1700 F ± 10, held at heat for 1 hr, cooled in still air, and tempered twice at 600 F ± 10 for 2 hours. Cooling after each tempering operation shall be accomplished in still air. Test specimens shall be suitably cleaned to remove heat treat scale.

6.4.1 Tensile Properties:

Tensile Strength, psi	180,000 min
Yield Strength at 0.2% Offset or at 0.0141 in. in 2 in. Extension Under Load (E = 29,000,000), psi	147,000 min
Elongation, % in 2 in:	
Nominal Thickness, inches	
0.035 and under	4 min
Over 0.035 to 0.070, incl	5 min
Over 0.070 to 0.110, incl	7 min
Over 0.110 to 0.150, incl	9 min
Over 0.150	11 min

6.4.2 Hardness: Shall be Rockwell C 39 - 44 or equivalent

6.4.3 Bend Test: Freedom from excess carburization shall be indicated by material withstanding, without cracking, a V-block or free bend test through an angle of not less than 90 deg around a diameter equal to 4 times the thickness.

6.5 Ferrite Content: The product, after heat treatment as in 6.4, shall contain not more than 5% ferrite (N + d, see 6.5.1) as determined at 250X magnification on polished and etched specimens selected perpendicular to the direction of rolling, using Kalling's etching reagent (HCl 100 ml, cupric chloride 5 g, ethyl alcohol 100 ml) or an electrolytic etch of 5% HCl in methanol, and tinted illumination.

6.5.1 Determination of Ferrite Content: Shall be according to either 6.5.1.1 or 6.5.1.2. In case of dispute, the method of 6.5.1.1 shall apply. In determining per cent ferrite by either method, partially occupied squares are added into sum of fully occupied squares on the basis of an estimate of portions of squares occupied, using not closer than multiples of 1/4.

6.5.1.1 Method 1: Superimpose on the image on a ground glass screen a transparent overlay grid containing small squares within a large square at a ratio of 100 to 1, such as large squares 1 cm on a side divided into smaller squares, 1 mm on a side. The volume per cent of ferrite is then calculated as follows:

$N \pm d = 1.16n \pm 0.08n$ where

N = volume per cent ferrite
n = average number of small squares occupied by ferrite in a minimum of 15 large squares. (Sum of occupied small squares divided by number of large squares used.)
d = standard deviation (value = $\pm$ 0.08n)

6.5.1.2 Method 2: Project image on ground glass screen which has been ruled off into a 400-square grid. Superimpose over grid a template containing 20 randomly located squares, repeating operation for 5 fields across the specimen when the ferrite is evenly distributed. Report volume percentage ferrite on basis of number of squares occupied, with each fully occupied square equivalent to 1% ferrite. When ferrite is unevenly distributed, ten fields across specimen are used, with each fully occupied square equivalent to 1/2% ferrite.

7. QUALITY: Material 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 2242.

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 thickness 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, thickness, size, quantity from each heat, and method used to determine ferrite content.

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 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.