ADOPTION NOTICE

SAE-AMS5595, "STEEL, CORROSION RESISTANT, SHEET, STRIP, AND PLATE 9.0MN - 20CR - 6.5NI - 0.28N SOLUTION HEAT TREATED", was adopted on 15-AUG-90 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: Commander, Defense Supply Center Philadelphia, ATTN: DSCP-ILEA, 700 Robbins Avenue, Philadelphia, PA 19111-5096. Copies of this document may be purchased from the Society of Automotive Engineers 400 Commonwealth Drive Warrendale, Pennsylvania, United States, 15096-0001. http://www.sae.org/

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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5595E

Issued NOV 1968
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Superseding AMS 5595D

Steel, Corrosion Resistant, Sheet, Strip, and Plate
9.0Mn - 20Cr - 6.5Ni - 0.28N
Solution Heat Treated

UNS S21904

1. SCOPE:

1.1 Form:

This specification covers a corrosion-resistant steel in the form of sheet, strip, and plate.

1.2 Application:

These products have been used typically for parts requiring high strength and corrosion resistance from -423 to +1100 °F (-253 to +593 °C) where such parts may require welding during fabrication, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2242	Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
MAM 2242	Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
AMS 2248	Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2807	Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
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2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 262	Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steel
ASTM A 370	Mechanical Testing of Steel Products
ASTM E 112	Determining Average Grain Size
ASTM E 353	Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	--	0.04
Manganese	8.00	10.00
Silicon	--	1.00
Phosphorus	--	0.060
Sulfur	--	0.030
Chromium	19.00	21.50
Nickel	5.50	7.50
Nitrogen	0.15	0.40
Molybdenum	--	0.75
Copper	--	0.75

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Sheet and Strip: Cold rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to 3.2.1.1 or 3.2.1.2 as applicable (See 8.2).

3.2.1.1 Sheet: No. 2D finish.

3.2.1.2 Strip: No. 1 strip finish.

3.2.2 Plate: Hot rolled, solution heat treated, and descaled.

3.3 Solution Heat Treatment:

The product shall be solution heat treated by heating to a temperature not lower than 1900 °F (1038 °C), holding at the selected temperature within ± 25 °F (± 14 °C) for a time commensurate with cross-sectional thickness and the heating equipment and procedure used, and cooling at a rate equivalent to a rapid air cool or faster.

3.4 Properties:

The product shall conform to the following requirements; tensile, hardness, and bend testing shall be performed in accordance with ASTM A 370:

3.4.1 Grain Size: Shall be as shown in Table 2, determined by comparison of a polished and etched specimen with the chart in ASTM E 112.

TABLE 2 - Average Grain Size

Inch	Millimeters	ASTM Grain Size No.
Up to 0.1875, excl	Up to 4.762, excl	7 or finer
0.1875 to 1.00 incl	4.762 to 25.4, incl	3 or finer

3.4.2 Tensile Properties: Shall be as shown in Table 3.

TABLE 3A - Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.1875, excl	100	60.0	40
0.1875 and over	90.0	50.0	40

TABLE 3B - Minimum Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 4.762, excl	689	414	40
4.762 and over	621	345	40

3.4.3 Hardness: Should be not higher than 100 HRB, or equivalent, but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.2 are met.

3.4.4 Bending: Product 0.749 inch (19.02 mm) and under in nominal thickness shall withstand, without cracking, bending through the angle shown in Table 4 around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling. Only one type of test will be required in routine inspection; in case of dispute, results of tests using the V-block procedure shall govern.

TABLE 4 - Bending Parameters

Nominal Thickness Inch	Nominal Thickness Millimeters	Type of Bend	Angle Deg, min	Bend Factor
Up to 0.249, incl	Up to 6.32, incl	Free Bend	180	1
Up to 0.249, incl	Up to 6.32, incl	V-Block	135	1
Over 0.249 to 0.749, incl	Over 6.32 to 19.02, incl	Free Bend	90	1
Over 0.249 to 0.749, incl	Over 6.32 to 19.02, incl	V-Block	135	2

3.4.4.1 Bend requirements for product over 0.749 inch (19.02 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.5 Susceptibility to Intergranular Attack: Specimens shall be sensitized by heating in air to 1250 °F ± 10 (677 °C ± 6), holding at heat for 60 minutes ± 5, and cooling in air. The sensitized specimens shall show no evidence of intergranular attack when immersed in acidified copper sulfate solution in accordance with ASTM A 262, Practice E, except that exposure time shall be 72 hours and metallic copper shall not be added. After immersion, the specimens shall withstand, without cracking, bending in accordance with ASTM A 262, Practice E.

3.5 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.6 Tolerances:

Shall conform to all applicable requirements of AMS 2242 or MAM 2242.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for composition (3.1), grain size (3.4.1), tensile properties (3.4.2), hardness (3.4.3), and tolerances (3.6) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Tests for bending (3.4.4) and susceptibility to intergranular attack (3.4.5) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2371.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat, for grain size, tensile properties, and hardness of each lot and, when performed, the results of tests to determine conformance to the periodic test requirements. This report shall include the purchase order number, heat and lot number, AMS 5595E, size, and quantity.