

# AEROSPACE MATERIAL SPECIFICATION



**AMS-S-8840A**

Issued JUN 1999  
Cancelled SEP 2002

Superseding AMS-S-8840

Steel Sheet and Strip, Corrosion-Resistant, Precipitation  
Hardening (AM350 and AM355), Premium Quality  
Composition AM350, Annealed  
Composition AM355, CRT 150/180/120

## CANCELLATION NOTICE

Composition AM350 of this specification has been declared "CANCELLED" by the Aerospace AM350 has been superseded by AMS 5548. The requirements of the latest issue of AMS 5548 shall be fulfilled whenever reference is made to composition AM350 in accordance with the cancelled AMS-S-8840. Composition AM355 is cancelled with no replacement. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications, noting that Composition AM350 has been superseded by AMS 5548.

SAENORM.COM : Click to view the full PDF of amss8840a

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright 2002 Society of Automotive Engineers, Inc.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

### TO PLACE A DOCUMENT ORDER:

Tel: 877-606-7323 (inside USA and Canada)  
Tel: 724-776-4970 (outside USA)  
Fax: 724-776-0790  
Email: [custsvc@sae.org](mailto:custsvc@sae.org)  
<http://www.sae.org>

### SAE WEB ADDRESS:

## NOTICE

This document has been taken directly from U.S. Military Specification MIL-S-8840B, Amendment 1 and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-S-8840B, Amendment 1. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

SAENORM.COM : Click to view the full pdf of AMS-S-8840A

## 1. SCOPE:

### 1.1 Scope:

This specification covers corrosion-resistant, heat treatable steel in sheet and strip form (see 6.3), of the compositions and conditions indicated.

### 1.2 Classification:

Materials shall be supplied in the following compositions, forms, and conditions, as specified (see 6.2):

Composition - AM350 - Sheet: Hot or cold rolled, annealed and descaled (No. 2D finish, or equivalent).

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

Composition - AM355 - Sheet    Hardened to CRT 150 (see table 3)  
  and        Hardened to CRT 180 (see table 3)  
  strip:    Hardened to CRT 210 (see table 3)

## 2. APPLICABLE DOCUMENTS:

The following publications, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

### 2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

FED-STD-151    Metals; Test Methods

FED-STD-183    Continuous Identification Marking of Iron and Steel Products

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

MS33520        Tolerances, Corrosion Resistant Steel Plate, Sheet and Strip

## 3. REQUIREMENTS:

### 3.1 Material:

The steel shall be manufactured by the electric furnace process.

### 3.2 Chemical composition:

The chemical composition shall be as specified in table I.

TABLE I. Chemical composition

Element	Composition		Check analysis	
	AM350	AM355	Under min.	Over max.
Carbon	0.07 to 0.11	0.10 to 0.15	0.01	0.01
Manganese	.50 to 1.25	.50 to 1.25	.04	.04
Silicon	.50 (max)	.50 (max)	....	.05
Phosphorus	.040 (max)	.040 (max)	....	.005
Sulfur	.030 (max)	.030 (max)	....	.005
Chromium	16.00 to 17.00	15.00 to 16.00	.20	.20
Nickel	4.00 to 5.00	4.00 to 5.00	.07	.07
Molybdenum	2.50 to 3.25	2.50 to 3.25	.10	.10
Nitrogen	0.07 to 0.13	0.07 to 0.13	.01	.01

### 3.3 Condition:

3.3.1 AM350 (annealed): Composition AM350 material shall be in the annealed condition, obtained by heating to 1,950° ±25° F and holding at temperature for 45 minutes per inch of thickness, followed by water quenching.

3.3.1.1 Hardness in the annealed condition: The annealed hardness of the AM350 material shall be not higher than Rockwell C30, or equivalent.

3.3.1.2 Bending: As-received AM350 material shall withstand, without cracking, bending at room temperature through an angle of 180 degrees (free bend) or 135° (guided bend) with the axis of bend parallel to the direction of rolling. The radius of bend shall be not greater than two times the nominal thickness.

3.3.2 AM355 cold rolled and tempered: Composition AM355 material shall be supplied by the producer in the cold rolled and tempered condition obtained by tempering at 850° to 950° F subsequent to final cold rolling to conform to the requirements of 3.5.

### 3.4 Response to heat treatment:

3.4.1 AM350: As-received material, when heat treated as specified in 4.6.2, shall develop the respective mechanical properties specified in table II.

3.4.2 AM355 (Reheat treatment): AM355 material supplied in the CRT (see 6.3.3) condition is not normally heat treated by the customer. However, if the formability is not adequate for some parts, the material may be reheat treated as indicated in 4.6.2 and may be expected to develop the respective nominal properties indicated by table II.

TABLE II. Mechanical properties (heat treated)

Properties	AM350		AM355 (nominal properties) Reheat treated SGT1000
	SCT850	SCT1000	
Yield strength at 0.2 percent, offset, psi	160,000	150,000	150,000
Tensile strength, psi	185,000	165,000	170,000
Elongation, percent in 2 inches, Nominal thickness, inch:			
0.0005 to 0.0015, incl.	2 (min)	2 (min)	2
Over 0.0015 to 0.0020, incl.	4	4	3
Over .0020 to .0050, incl.	6	6	5
Over .0050 to .020, incl.	8	8	7
Over .020 to .1875, excl.	8	10	8

## 3.5 Properties of AM355 (as received):

The properties of AM355 shall equal or exceed the minimum requirements of table III for the respective condition.

TABLE III. Mechanical properties cold rolled and tempered AM355 (as received)

Properties	CRT 150	CRT 180	CRT 210
Yield strength, min., 0.2% offset	150,000 psi	180,000 psi	210,000 psi
Elongation, % in 2 inches, (min)			
Thickness			
0.0005 - 0.002, excl.	10	5	3
.002 - .005, incl.	12	6	4
Over .005 - .010, incl.	15	8	5
Over .010 - .015, incl.	15	10	6
Over .015 - .020, incl.	20	15	8
Over .020 - .125, incl.	20	15	10

## 3.6 Dimensional tolerances:

Permissible variations from nominal dimensions shall be within the limits of MS33520.

## 3.7 Identification of product:

The material shall be marked in accordance with Federal Standard No. 183. The marking shall include this specification number, composition designator, condition, and the heat number.

## 3.8 Workmanship:

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.

#### 4. QUALITY ASSURANCE PROVISIONS:

##### 4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any other commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

##### 4.2 Quality conformance inspection:

Inspection of the steel sheet and strip is classified as quality conformance inspection.

##### 4.3 Examinations:

- 4.3.1 Examination of product: Sample units shall be randomly selected to represent each respective thickness, of a number not less than indicated by table IV, and examined to determine conformance to this specification with respect to surface finish (1.2), identification of product (3.7), dimensions (3.6), and workmanship (3.8). Inspection for thickness and crown shall consist of measurements distributed along, and 1/2 inch from a longitudinal (with respect to rolling direction) edge, plus measurements near the center (as rolled).

TABLE IV. Sampling

Lot size	Sample size	Acceptance number
1 - 65	4	0
66 - 110	5	0
111 - 300	7	0
301 - 500	10	0
501 - 800	15	0
Over 800	25	0

- 4.3.2 Preservation, packaging, packing, and marking: Preparation for delivery shall be examined for conformance to section 5.

##### 4.4 Chemical analysis:

- 4.4.1 Sampling: Samples for chemical analysis shall be selected to represent each heat in the shipment.

- 4.4.1.1 Samples for chemical analysis may be waived at the discretion of the procuring activity, provided that all of the material under inspection can be identified as being made from a heat previously analyzed and found to be in accordance with the chemical composition specified herein.

- 4.4.2 Method: Analysis shall be made in accordance with Method 111 or 112 of Federal Test Method Standard No. 151, or other appropriate analytical methods. In the even of dispute, analysis shall be by Federal Test Method Standard No. 151.
- 4.5 Tensile strength of AM355 (as received):
- 4.5.1 Sampling: Two tensile test samples shall be selected to represent each 200 sheets or each coil of steel from each heat, of the same thickness and condition.
- 4.5.2 Preparation of specimens: Two or more tensile test specimens of 2-inch gage length conforming to F1 or F2 of Method 211 of Federal Test Method Standard No. 151 shall be cut from each sample and heat treated in accordance with 3.4.1. For widths 9 inches and over, tensile test specimens shall be taken with the axis perpendicular to the direction of rolling. For widths less than 9 inches, tensile test specimen shall be taken with the axis parallel to the direction of rolling. Prior to testing, specimens shall be heat treated in accordance with 3.4.
- 4.5.3 Method: Tensile tests shall be conducted in accordance with applicable requirements of Method 211 of Federal Test Method Standard No. 151. The properties shall be equal to or exceed the minimum requirements of table III.
- 4.6 Response to heat treatment:
- 4.6.1 Sampling: Two samples shall be selected to represent each heat of steel from which materials are supplied in the annealed condition.
- 4.6.2 Processing: Transverse specimens conforming to types F1 or F2, Method 211 of Federal Test Method Standard No. 151 shall be austenite conditioned by heating to  $1,710^{\circ} \pm 25^{\circ} \text{ F}$ , held at heat for not less than 45 minutes per inch of thickness, quenched in water or otherwise quenched very rapidly to room temperature, cooled to  $-100^{\circ} \text{ F}$  or lower, held at this temperature for not less than 3 hours, warmed to room temperature, heated to either  $1,000^{\circ} \text{ F}$  or  $850^{\circ} \pm 10^{\circ} \text{ F}$ , held at temperature for not less than 3 hours nor more than 4 hours, and air cooled to room temperature.
- 4.6.3 Method: Tensile tests shall be conducted in accordance with Method 211 of Federal Test Method Standard No. 151.
- 4.7 Hardness:
- Hardness tests shall be conducted in accordance with Method 243 of Federal Test Method Standard No. 151 on each material and condition of material in the "as-received" condition.
- 4.8 Bend test:
- 4.8.1 Sampling: Two or more bend test samples shall be selected from each 200 sheets or from each coil of steel from each heat, of the same thickness and condition.

4.8.2 Preparation of specimens: Where dimensions permit, strip specimens shall be cut from each sample with the longitudinal axis transverse to the direction of rolling.

4.8.3 Method:

4.8.3.1 Free bend test: Specimens shall be bent cold, either by pressure or by blows; however, in case of dispute, tests shall be made by pressure.

4.8.3.2 Controlled bend (V-block) test: Specimens shall be bent cold by means of V-blocks or mating punch and die having an included angle of 45 degrees, and with proper curvature of surfaces at the bend areas to impart the desired shape and diameter of bend to the specimen.

4.9 Rejection:

When the failure of one or more specimens indicate that the test sample fails to meet the specified requirement, the entire lot shall be rejected.

4.9.1 Retest: At the discretion of the supplier, retest will be permitted. A retest sample of five specimens shall be tested to replace each failed specimen of the initial sample. If one or more of the retest specimens fail, the lot shall be rejected with no further retesting permitted.

4.9.2 Resubmittal: If the defectives in a lot previously rejected can be identified and removed from the lot, resampling at the frequency of the initial sampling will be acceptable.

## 5. PREPARATION FOR DELIVERY:

5.1 Preservation, packaging, packing, and marking:

Preservation, packaging, packing, and marking shall be in accordance with MIL-STD-163. The marking shall include the following nomenclature:

Specification number  
Heat treated condition  
Surface finish  
Size(s)  
Thickness(es)  
Heat number

## 6. NOTES:

6.1 Intended use:

The steel sheet and strip is intended for use in the fabrication of structural parts requiring corrosion resistance, formability, and high strength at operating temperatures up to 800° F, and where such parts may require welding during fabrication.

6.1.1 Weldability: The steel is weldable by standard welding processes.