

REQUEST FOR DEVIATION/WAIVER (RFD/RFW)				1. DATE (YYYYMMDD) 2004/07/26		Form Approved OMB No. 0704-0188	
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4. ORIGINATOR				5. (X one)			
a. TYPED NAME (First, Middle Initial, Last) Todd S Johnson		b. ADDRESS (Street, City, State, Zip Code) NAPCO International, LLC 11055 Excelsior Blvd. Hopkins, MN 55343		<input type="checkbox"/> DEVIATION		<input checked="" type="checkbox"/> WAIVER	
				<input type="checkbox"/> MAJOR		<input checked="" type="checkbox"/> MINOR	
						<input type="checkbox"/> CRITICAL	
7. DESIGNATION FOR DEVIATION/WAIVER				8. BASELINE AFFECTED		9. OTHER SYSTEM/CONFIGURATION ITEMS AFFECTED	
a. MODEL/TYPE		b. CAGE CODE 95201		c. SYS. DESIG.		d. DEV. WAIVER NO. W-N008-1	
				<input type="checkbox"/> FUNCTIONAL PRODUCT		<input type="checkbox"/> ALLOCATED	
						<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
10. TITLE OF DEVIATION/WAIVER Bracket Heat Treatment RFW							
11. CONTRACT NO. AND LINE ITEM DAAE07-02-D-N008-0012AA/0013AA				12. PROCURING CONTRACTING OFFICER			
				a. NAME (First, Middle Initial, Last) Daryl F. Witte			
				b. CODE		c. TELEPHONE NO. 586.574.7196	
13. CONFIGURATION ITEM NOMENCLATURE				14. CLASSIFICATION OF DEFECT			
				a. CD NO.		b. DEFECT NO.	
						c. DEFECT CLASSIFICATION <input checked="" type="checkbox"/> MINOR <input type="checkbox"/> MAJOR <input type="checkbox"/> CRITICAL	
15. NAME OF LOWEST PART/ASSEMBLY AFFECTED Bracket				16. PART NO. OR TYPE DESIGNATION 12388149			
17. EFFECTIVITY 1605 pieces, and any additional contract option quantities.				18. RECURRING DEVIATION/WAIVER <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
19. EFFECT ON COST/PRICE None				20. EFFECT ON DELIVERY SCHEDULE No effect if approved.			
21. EFFECT ON INTEGRATED LOGISTICS SUPPORT, INTERFACE OR SOFTWARE No effect.							
22. DESCRIPTION OF DEVIATION/WAIVER See attached supporting information.				Concern: 8/24/04 William Ethel Adams PM			
23. NEED FOR DEVIATION/WAIVER The requested heat treat cycle described in this RFW will be in accordance with current industrial precipitation hardening practice. No heat treat facilities could be identified willing to perform a heat treat cycle as described on the current print. The additional temperature and duration tolerances do not contribute to an improved part. Heat treatment per the requested cycle will produce an acceptable part.							
24. CORRECTIVE ACTION TAKEN An ECP will be submitted to add the referenced specification to the drawing for future procurement.							
25. SUBMITTING ACTIVITY							
a. TYPED NAME (First, Middle Initial, Last) Gary R Gelhaye		b. TITLE QC Manager		c. SIGNATURE 			
26. APPROVAL/DISAPPROVAL							
b. APPROVAL <input checked="" type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED				a. RECOMMEND <input checked="" type="checkbox"/> APPROVAL <input type="checkbox"/> DISAPPROVAL		c. GOVERNMENT ACTIVITY ROECOM, AMSRD-TAR-E/HCS	
d. TYPED NAME (First, Middle Initial, Last)		e. SIGNATURE		f. DATE SIGNED (YYYYMMDD)			
				040826			
g. APPROVAL <input checked="" type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED				h. GOVERNMENT ACTIVITY US Army, TACOM AMSTA-AQ-AHPB			
i. TYPED NAME (First, Middle Initial, Last) Daryl F. Witte		j. SIGNATURE 		k. DATE SIGNED (YYYYMMDD) 2004Aug31			

DD FORM 1594, AUG 96 (EG)

PREVIOUS EDITION MAY BE USED.

Designed using Perform Pro, WBS/DIOR, Aug 96

Bracket
p/n 12388149
DAAE07-02-D-N008
RFW N008-1
Supporting Information

Bracket heat treatment

Drawing 12388149 note 2 specifies the material to be "Steel, Corrosion Resisting, Type 17-7PH (AISI 631, UNS 17700), Condition A (solution heat treated), MIL-S-25043 or AMS 5528, .090 (#13 MS Ga.) thick." Note 3 of the same drawing reads "Precipitation harden to condition TH 1050 in accordance with AMS 5528, hardness C38-46."

AMS 5528 is a material specification entitled "Steel, Corrosion Resistant, Sheet, Strip and Plate, 17Cr-7.1Ni-1.1Al, Solution Heat Treated, Precipitation Hardenable" This material specification contains a paragraph (3.4.2 Response to Heat Treatment) relating to heat treatment, it is not intended to be a heat treatment specification. It describes how the material is this specification should respond to this heat treatment. It is not identified as condition TH 1050. The austenite conditioning and transformation portion of the heat treat cycle described is to heat part to $1400 \pm 25^\circ\text{F}$ for 90 ± 5 minutes, cool to $55 \pm 5^\circ\text{F}$ within 1 hour and hold that temperature for 30 minutes minimum, heat to $1050 \pm 10^\circ\text{F}$ for 90 ± 5 minutes, and cooling to room temperature.

AMS 2759/3 is a heat treat specification entitled "Heat Treatment of Precipitation Hardening Corrosion Resistant and Maraging Steel Parts". Paragraph 1.1 Application lists the various steels to which this heat treatment specification applies, and included in this listing is 17-7PH. Table I describes the austenite conditioning and transformation portion of the heat treat cycle for condition TH 1050 as heating part to 1400°F for 90 minutes, cool to below 60°F within one hour, hold below 60°F for 30 minutes minimum, heat to 1050°F for 90-120 minutes, and cool to room temperature. This cycle differs from the cycle referenced in AMS 5528 only in some of the tolerances at various set points. This is also the heat treat cycle currently performed by heat treat facilities, with no sources willing to perform the more restrictive method explained in AMS 5528.

Drawing note 3 should reflect AMS 2759/3 as the heat treatment standard in place of AMS 5528.

Issued DEC 1953
Revised MAR 1994
Superseding AMS 5528E

Submitted for recognition as an American National Standard

STEEL, CORROSION RESISTANT, SHEET, STRIP, AND PLATE
17Cr - 7.1Ni - 1.1Al
Solution Heat Treated, Precipitation Hardenable

UNS S17700

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 corrosion resistance and high strength up to 600 °F (316 °C), and 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

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3.4.1.2 Hardness: Shall be not higher than 92 HRB, or equivalent (see 8.3).

3.4.1.3 Bending: Product shall withstand, without cracking, bending through the angle indicated below 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 3 - Bending Requirements

Nominal Thickness Inch	Nominal Thickness mm	Type of Bend	Angle deg min	Bend Factor
Up to 0.1874, incl	Up to 4.762, incl	Free Bend	180	1
Up to 0.1874, incl	Up to 4.762, incl	V-Block	135	1
Over 0.1874 to 0.275, incl	Over 4.762 to 6.98, incl	Free Bend	180	3
Over 0.1874 to 0.275, incl	Over 4.762 to 6.98, incl	V-Block	135	3

3.4.2 Response to Heat Treatment: Specimens cut from product 0.005 to 1.000 inch (0.13 to 25.40 mm), inclusive, in nominal thickness shall have the following properties after being austenite-conditioned by heating to $1400\text{ }^{\circ}\text{F} \pm 25$ ($760\text{ }^{\circ}\text{C} \pm 14$), holding at heat for 90 minutes ± 5 , cooling to $55\text{ }^{\circ}\text{F} \pm 5$ ($13\text{ }^{\circ}\text{C} \pm 3$) within 1 hour, holding at that temperature for not less than 30 minutes, and precipitation heat treated by heating to $1050\text{ }^{\circ}\text{F} \pm 10$ ($566\text{ }^{\circ}\text{C} \pm 6$), holding at heat for 90 minutes ± 5 , and cooling to room temperature:

3.4.2.1 Tensile Properties: Shall be as shown in Table 4:

TABLE 4A - Tensile Properties, Inch/Pound Units

Nominal Thickness Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi, Min	Elongation in 2 Inches %, Min
0.005 to 0.010, incl	180 to 210	150	4
Over 0.010 to 0.019, incl	180 to 210	150	5
Over 0.019 to 1.000, incl	180 to 210	150	6

 <p>SAE The Engineering Society For Advancing Mobility Land Sea Air and Space® INTERNATIONAL 400 Commonwealth Drive, Warrendale, PA 15096-0001</p>	<p>AEROSPACE MATERIAL SPECIFICATION</p>	<p>AMS 2759/3</p>
		<p>Issued 10-1-84 Revised</p>

HEAT TREATMENT OF PRECIPITATION HARDENING
CORROSION RESISTANT AND MARAGING STEEL PARTS

1. **SCOPE:** This specification, in conjunction with the general requirements for steel heat treatment covered in AMS 2759, establishes the requirements for heat treatment of precipitation-hardening corrosion-resistant and maraging steel parts. Parts are defined in AMS 2759.

1.1 **Application:** This specification is applicable to parts made from the following steels:

15-5 PH	PH 13-8 Mo	A-286	Custom 450	Maraging 250
17-4 PH	PH 14-8 Mo	AM-350	Custom 455	Maraging 300
17-7 PH	PH 15-7 Mo	AM-355		

The above designations are trademark or commercial designations and are for alloy recognition only.

2. **APPLICABLE DOCUMENTS:** The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Recommended Practices shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 **SAE Publications:** Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 **Aerospace Material Specifications:**

- AMS 2350 - Standards and Test Methods
- AMS 2759 - Heat Treatment of Steel Parts, General Requirements

2.1.2 **Aerospace Recommended Practices:**

- ARP 1820 - Chord Method of Evaluating Surface Microstructural Characteristics

REAFFIRMED

OCT 1991

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TABLE I
HEAT TREATING PROCEDURES

Alloy (1)	Final Heat Treat Condition (2)	Solution Heat Treating		Cooling (4)	Austenite Conditioning and Transformation (See 8.1.3) (3) (4)	Aging		
		Set Temperature, °F (3)	Set Temperature, °C (3)			Set Temperature, °F (5)(6)(7)	Time, hr (5)(6)(7)	
15-5 PH and 17-4 PH	H 900	1900	1040	Air or oil to below 90°F (30°C) (8)		900	480	1
	H 925					925	495	4
	H 950					950	510	4
	H 1000					1000	540	4
	H 1025					1025	550	4
	H 1050					1050	565	4
	H 1075					1075	580	4
	H 1100					1100	595	4
	H 1150					1150	620	4
	H 1150M (9)					(9)		(9)
17-7 PH and PH 15-7 Mo (10)	RH 950	1925	1050	Air	1750°F (955°C), (3), air cool to ambient and within 1 hr cool below -90°F (-70°C), soak 8 - 9 hours, and air warm to ambient.	950	510	1
	RH 1000					1000	540	1
	RH 1050					1050	565	1
	RH 1075					1075	580	1
	RH 1100					1100	595	1
	TH 950	1925	1050	Air	1400°F (760°C) for 90 min., cool to below 60°F (15°C) within 1 hr, hold below 60°F (15°C) for not less than 30 minutes.	950	510	1 1/2
	TH 1000					1000	540	1 1/2
	TH 1050					1050	565	1 1/2
	TH 1075					1075	580	1 1/2
	TH 1100					1100	595	1 1/2
PH 13-8 Mo	H 950	1700	925	Air or oil to below 60°F (15°C) (8)		950	510	4
	H 1000					1000	540	4
	H 1025					1025	550	4
	H 1050					1050	565	4
	H 1100					1100	595	4
	H 1150					1150	620	4
	H 1150M (9)					(9)		(9)
	SRH 950	1825	995	Air or oil	1700°F (925°C), (3), air cool to ambient and within 1 hr cool below -90°F (-70°C), soak 8 - 9 hr, and air warm to ambient.	950	510	1
	SRH 1050					1050	565	1
	A-286 (11)	Aged	(12)	(12)	Air for sheet and oil for bar		(12)	
SCT 650		1925	1050	Air	1750°F (955°C), (3), air cool, cool below -100°F (-75°C), soak for 3 - 5 hr, and air warm to ambient.	650	455	3
AM-350	SCT 950					950	510	3
	SCT 1000					1000	540	3
	SCT 1100					1100	595	3