

# **Carondelet Division**

8600 Commercial Blvd. • Pevely, MO 63070 USA Phone: 636-475-2199 • Fax: 636-479-3399 E-Mail: Charles.Ruud@MetalTek.com

1671

Draft Corrective Action Carondelet Division Corrective Action Type Date 4-10-06 CA Originator C. Ruud Applies to: A-6 Coil

### **Description of Defect / Non-Conformance**

NCR

Test bar from zone 1 failed elongation at -320 F. Result was 20% versus a minimum of 32%. The original set of three bars, Z-1, Z-2 and Z-3 were sent for testing. Z-1 failed for elongation, 26% vs 32% minimum and Z-3 failed for elongation 19% vs 32% minimum. All other results were acceptable. Retests were ordered. The second results were similar. Z-1 failed for elongation, 25% vs 32% minimum and Z-3 failed for elongation 13% vs 32% minimum, but broke outside the gauge length. The third set of bars was tested. Z-3 passed and Z-1 failed for elongation, 20% vs 32% minimum, but broke outside the gauge length. All other test results were acceptable. See attached test reports.

### **Root Cause**

We believe the failures are due to the test bars are located where the metal flowing into the casting is cooler and large grains form as a result. This has caused failures on C-5 and C-6 coils. We have ordered photo macrographs to see if this is the case.

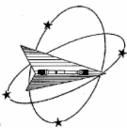
### **Corrective Action**

Use A-6 as is.

Actual Completion Date TBD

Signed: C. Ruud

CC: B. Craig, J. Edwards, E.J. Kubick, J. Markham, J. Galaske



March 9, 2006

MetalTek International The Carondelet Division 8600 Commercial Blvd. I-55 Industrial Park Pevely, MO 63070-1528

Jim Galaske Attention:

All processes, performed upon the material as received, were conducted at WMT&R, Inc. in accordance with the WMT&R Quality Assurance Manual, Rev. 9, dated 4/1/2000. Subject: The following tests were performed on this order: TENSILE

#### TENSILE RESULTS: ASTM E21-05

Requirements: UTS ksi (Min 95\Max ---) 0.2% YS ksi (Min 72\Max ---) 4D Elong. % (Min 32\Max ---) Modulus Msi (Min 21\Max ---)

Website: www.wmtr.com

SOAK TIME: 5 Minutes

SPEED OF TESTING: 0.003 in./in./min., 0.05 in./min./in.

#### MATERIAL: 316 S/S

#### **DISPOSITION: Acceptable**

Coll	Specimen	TestLog	Temp.	UTS	0.2% YS	Elong	RA	Modulus	Ult. Load	0.2% YLD.	Orig.	Final	4D Orig	4D Final	Orig. Area	Machine	AUR
No.		Number	۴F	ksi	ksi	%	%	Msi	lbf	lbf	Dia. (in.)	Dia. (in.)	GL (in.)	GL (in.)	(sq. in.)	Number	
A6	Z2	D18313	-320	163.7	100.1	61	41	28.0	15730	9616	0.3498	0.2698	1.40	2.25	0.09610135	M9	A

Westmoreland Mechanical Testing & Research, Inc.

Fax: 724-537-3151

A/U/R: A=ACCEPTABLE, U=UNACCEPTABLE, R=REPORT

Section 1 of 1

P.O. No. 19386

Requisition No. 7580

#### TENSILE RESULTS: ASTM E21-05

Requirements: UTS ksi (Min 95\Max ---) 0.2% YS ksi (Min 72\Max ---) 4D Elong. % (Min 32\Max ---) Modulus Msi (Min 21\Max ---)

SOAK TIME: 5 Minutes

SPEED OF TESTING: 0.003 in./in./min., 0.05 in./min./in.

#### MATERIAL: 316 S/S

Coil	Specimen	TestLog	Temp.	UTS	0.2% YS	Elong	RA	Modulus	Ult. Load	0.2% YLD.	Orig.	Final	4D Orig	4D Final	Orig. Area	Machine	A\U\R
No.		Number	۴F	ksi	ksi	%	%	Msi	lbf	lbf	Dia. (in.)	Dia. (in.)	GL (in.)	GL (in.)	(sq. in.)	Number	
A6	Z1	D18312	-320	161.1	108.9	26	30	29.7	15470	10460	0.3497	0.2929	1.40	1.76	0.09604641	M9	U
A6	Z3	D18314	-320	157.5	111.2	19	28	30.9	15140	10690	0.3498	0.2959	1.40	1.67	0.09610135	M9	U

A\U\R: A=ACCEPTABLE, U=UNACCEPTABLE, R=REPORT

Rov E March 9, 2006 Technical Services Manager ensile.Supervisor

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Testing Specialists for Aerospace, Automotive, and Material Testing Fields Locations in Youngstown, PA U.S.A. ~ Tel. (724) 537-3131 and

**DISPOSITION: Unacceptable** 

P.O. Box 388 Westmoreland Drive

CERTIFICATION

Youngstown, Pa. 15696-0388 U.S.A. Telephone: 724-537-3131 WMT&R is a technical leader in the material testing industry.

621-01 & 621-02

WMT&R Report No. 6-23847





### Westmoreland Mechanical Testing & Research, Inc. P.O. Box 388

Westmoreland Drive Youngstown, Pa. 15696-0388 U.S.A. Telephone: 724-537-3131 Fax: 724-537-3151

Website: www.wmtr.com WMTOR is a technical leader in the material testing industry.

April 3, 2006

CERTIFICATION

MetalTek International The Carondelet Division 8600 Commercial Blvd. 1-55 Industrial Park Pevely, MO 63070-1528

Attention: Jim Galaske

All processes, performed upon the material as received, were conducted at WMT&R, Inc. in accordance with the WMT&R Quality Assurance Manual, Rev. 9, dated 4/1/2000. Subject: The following tests were performed on this order: TENSILE

### TENSILE RESULTS: ASTM E21-05

Requirements: UTS ksi (Min 95/Max ---) 0.2% YS ksi (Min 72/Max ---) 4D Elong. % (Min 32/Max ---) Modulus Msi (Min 21/Max ---)

SOAK TIME: 5 Minutes

SPEED OF TESTING: 0.003 in./in./min., 0.05 in./min./in.

### MATERIAL: Metaltek CF8MNMnMOD

#### **DISPOSITION: Acceptable**

- 1	Coll	Specimen	TestLog	Temp.	UTS	0.2% YS	Elong	RA	Modulus	Lift Load	0.2% YLD.	Orig.	Final	10.01			-	
	No.		Number									-	i rinal	4D Ong	4D Final	Orig. Area	Machine	A\U\R
- 1	_		Number	- P	ksi	ksi	%	%	Msi	lbf	bf	Dia. (In.)	Dia. (in.)	GL (in.)	GL (in )	(sq. in.)	Number	
- 1	A6	Z2 .	D90740	-320	166.2	99.8	58	44 -	25:3-	. 16120	\$677						Number	
						00.0	00		20.0	. 10120	1 30/7	0.35:4	0.2622	1.40	2.24	0.09638250	ไทยี	A
											AVI NR: 4	A=ACCED	TADLE	UNACCEPT/				
		TENSILE P	ESIN TE-	ACTU C	14 AF						Private 1	-ACCEL	IABLE, U	-UNACCEP1/	UBLE, R=R	EPORT		

TENSILE RESULTS: ASTM E21-05

Requirements: UTS ksl (Min 95\Max ---) 0.2% YS ksi (Min 72\Max ---) 4D Elong. % (Min 32\Max ----) Modulus Msi (Min 21\Max ----)

SOAK TIME: 5 Minutes

SPEED OF TESTING: 0.003 in./in./min., 0.05 in./min./in.

#### MATERIAL: Metaltek CF8MNMnMOD Call Calaina Tr.

### **DISPOSITION: Unacceptable**

10	매	Specimen	restLog	Temp.	UTS	0.2% YS	Flong	RA	Modulue	Codec	Lift Lood	0.2% YLD.	0.1						
1.5	_						- Ciong		moodulus	00068	OIL LOad	0.2% YLD.	Orig.	Final	4D Orig	4D Final	Orig. Area	Machine	AUAR
N	0.		Number	-F	ksi	ksi	%	%	Msi		lbf	lhf	Dia. (in.)	Dia Gol	CI Gal	0.0			1 1
	6	71	D30718	-320	166.1	400.4						101	Cia. (iii.)	Dia. (in.)	GL (IN.)	GL (in.)	(sq. in.)	Number	1. I
1.	~		030718	-320	100.1	. 108.1	25	26	27.6	-	16050	10450	0.3508	0.3024	1.40	4.70			
A	6	73	D30720	-320	129.7	405.0	40	40					0.0000	0.3024	1.40	1.75	0.09665160	M9	U
L.	~	2.0	030120	-320	129.7	105.2	13	19	27.9	D	12540	10170	0.3508	0.3153	1.40	4 50	0.00000400		
												10110	0.0000	0.0100	1,40	1.58	0.09665160	MQ	

A/U/R: A=ACCEPTABLE, U=UNACCEPTABLE, R=REPORT

Requirements provided by MetalTek International

D - Ruptured outside middle half of gage length.

Technical Services Manager Tertaile Supervisor

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April 3, 2006

KNOWINGLY OR WALFULLY FALSIFYING OR CONCERLING A WATERIAL FACT ON THIS FORM OR MACHINE FALSE, PICTITIOUS OR FRAUDULENT STRATEMENTS OR REPRESENTATIONS HEREIN COULD CONSTITUTE A FELORY PURISHING UNDER FEDERA STATUTES, THE CERTIFICATE OR REPORT GIVEL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVE, OF WATH, INC.

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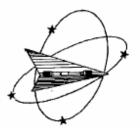
621-01 & 621-02

Section 1 of 1

P.O. No. 19386

Requisition No. 7580

WMT&R Report No. 6-25662



Westmoreland Mechanical Testing & Research, Inc. P.O. Box 388 Westmoreland Drive Youngstown, Pa. 15696-0388 U.S.A. Telephone: 724-537-3131 Fax: 724-537-3151 Website: www.wmtr.com WMTOR is a technical leader in the material testing industry.



MetalTek International The Carondelet Division 8600 Commercial Blvd. I-55 Industrial Park Pevely, MO 63070-1528

April 10, 2006

CCREDITED 621-01 & 621-02



Section 1 of 1

WMT&R Report No. 6-26780 P.O. No. 19386 Regulation No. 7580

Attention:

All processes, performed upon the material as received, were conducted at WMT&R, Inc. in accordance with the WMT&R Quality Assurance Manual, Rev. 9, dated 4/1/2000. Subject: The following tests were performed on this order: TENSILE

### TENSILE RESULTS: ASTM E21-05

Jim Galaske

Requirements: UTS ksi (Min 95/Max ---) 0.2% YS ksi (Min 72/Max ---) 4D Elong. % (Min 32/Max ---) Modulus Msi (Min 21/Max ---)

SOAK TIME: 5 Minutes

SPEED OF TESTING: 0.003 in./in./min., 0.05 in./min./in.

### MATERIAL: Metallek CF8MNMnMOD

#### Machine A\U\R 4D Orig 4D Final Orig. Area Ult. Load 0.2% YLD. Orig. Final Modulus Elong RA 0.2% YS UTS Coil Specimen TestLog Temp. Number GL (in.) (sq. in.) GL (in.) Dia. (in.) Dia. (in.) lbf % % Msi ibf ksi ۰F ksi No. Number M9 0.09692731 А 1.40 1.90 9774 0.3513 0.2923 16070 28.6 100.8 36 31 165.8 D38883 -320 A6 Z2 0.09659650 M9 Α 2.02 0.3507 0.2686 1.40 15540 9049 25.5 44 41 -320 160.9 93.7 D38884

AUUR: A=ACCEPTABLE, U=UNACCEPTABLE, R=REPORT

### TENSILE RESULTS: ASTM E21-05

Requirements: UTS ksi (Min 95\Max ---) 0.2% YS ksi (Min 72\Max ---) 4D Elong. % (Min 32\Max ---) Modulus Msi (Min 21\Max ---)

SOAK TIME: 5 Minutes

Z3

A/6

SPEED OF TESTING: 0.003 in./in./min., 0.05 in./min./in.

#### MATERIAL: Metaltek CF8MNMnMOD

	1	MATERIAL:	Metaltek	CF8MNN	InMOD												01.1	Machine	AUDD
			<b>M</b>	Toma	UTS	0.2% YS	Elona	RA	Modulus	Codes	Ult. Load	0.2% YLD.	Orig.	Final	4D Orig	4D Final	Orig. Area	Machine	MOR
10	oil	Specimen	TestLog	I emp.	013	0.27010	Cloud							Dia. (in.)	ໄດ້ເຫັນ	GL (in.)	(sg. in.)	Number	
1.	<b>I</b> O.		Number	•F	ksi	ksi	%	%	Msi		lbf	101			OL (may			140	U
- H	-			-320	134.7	100.2	20	23	26.0	D	13030	9700	0.3510	0.3084	1.40	1.68	0.09676184	M9	
- 17	46	Z1	D38882	-320	104.7	100.2								AVI BO-	-ACCEP	TABLE 11	=UNACCEPT/	ABLE, R=P	EPORT

Requirements provided by MetalTek International

D - Ruptured outside middle half of gage length.

-10-0 Rov April 10, 2006 Technical Services Manager ensile Supervisor

INNOVINGLY OR WELFLELY FALSEFUNG OR CONCEALING A MATERIAL PACT ON THE FORM OR MANYO FALSE, FICTITIOUS OR FRANKLENT STATISHENTS OR REPO

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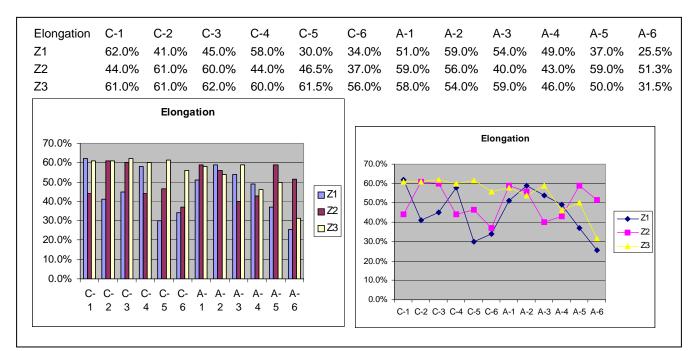
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#### **DISPOSITION: Acceptable**

**DISPOSITION: Unacceptable** 

### Disposition:

Casting A1 is accepted AS IS, and EIO is authorized to release this casting for shipment as soon as they feel it is appropriate. However, this NCR will be left open, pending MTK's final analysis of why the elongation test results for many of the A6 specimens were significantly below spec and previous results and varied so much. It is noted that the test values other than elongation are very good. The data below compares the elongation values for most of the castings produced to date. What is unusual about A6 is that the Z2 values are better than the values for many of the other castings. However, the values for Z1 and Z3 are lower than the others. MTK thinks this is due to the faster cooling rate at the cast on specimens. This first "slug" of alloy is cooled as it travels through the cold mold. However, the mold dryers are on for 12 hrs. or so prior to the pour, so the mold temperatures are not thought to vary very much. The third bar broke outside of the gauge length. The "valid" bars broke at 25 and 26%. One of the "good" bars failed at 19% (thought to be due to a defect); a substitute bar had a value of 44% elongation. The rule is if there is a defect in a test bar, it is appropriate to re-test.



## Approved by:

Tech. Rep.

RLM

Implemented by:

EIO Representative(s