

**Detroit
Edison**

Date: December 23, 1987

To: S. K. Sharma
Fermi 2

From: R. L. Colwell *RLC*
P. M. Beckwith *PMB*
Engineering Research

Subject: Chemical and Physical Testing of Fasteners for
Fermi 2
Fermi Test Req. 610142
Engineering Research Report 87C71-24, Revision 2

Ten items were delivered to Engineering Research for material analysis. They are described as follows.

<u>Item #</u>	<u>DEQB #</u>	<u>Description</u>
1	1	1-1/8" - 12 - 6-1/4" Bolt A193 Gr. B7
2	3	2" - 8 - 11-7/8" Stud SA193 Gr. B7
3*	4 (Two)	3/8" - 16 - 1-5/8" Bolt SAE J429 Gr. 5
4	5	1/2" - 13 - 3" Stud SA193 Gr. B7
5	6	1" - 8 - 5-1/4" Bolt SA193 Gr. B7
6	7	7/8" - 9 - 3-1/4" Bolt A325 Type 1
7	13	5/8" - 11 - 2" Bolt A307 Gr. B
8	14	1/2" - 13 - 2-1/2" Bolt SAE J429 Gr. 5
9	15 (Two)	1/4" - 20 - 3/4" Bolt A307 Gr. B
10	16	1/2" - 13 - 2" Stud SA193 Gr. B7

The test results are displayed on attached NRC Data Summary Form along with the appropriate specifications for each item.

*An additional bolt was requested for hardness testing. The first bolt was damaged during tensile testing and could not be hardness tested.

Test Procedures

1. TP-FL-009 Rev. 0 Test Procedure for the Determination of Carbon in Steel.
2. TP-FL-032 Rev. 0 Test Procedure for Dissolution of Material by Acid Digestion for Total Metals Analysis
3. TP-FL-045 Rev. 0 Test Procedure for Determination of Sulfur in Steel and Cast Iron.

PE.14/25

BB01200257 880114
PDR ADOCK 05000341
Q PDR

Test Requisition #610142

DATA SUMMARY

Item #	Mechanical Analysis				Chemical Analysis (Wt. %)							
	Grade	Hardness		UTS	C	Mn	P	S	Si	Mo	Cr	
		Core HRC	Superficial 30-N									
1	Al93 Gr. B7	28.9	N/A	127.2 (ksi)	.46	0.89	0.024	0.021	0.22	0.19	0.99	
2	"	25.3	N/A	129.6 "	.48	0.85	<0.020	0.017	0.22	0.16	0.87	
4	"	32.4	N/A	148.6 "	.40	0.97	"	0.023	0.23	0.16	1.10	
5	"	28.5	N/A	134.7 "	.37	0.91	"	0.019	0.19	0.18	0.94	
10	"	32.4	N/A	151.8 "	.37	0.96	"	0.026	0.22	0.16	1.10	
	Spec	----	---	(125 min)	(.37-.49)	(.65-1.10)	(<0.035)	(<0.040)	(.15-.35)	(.15-.25)	(.75-1.2)	
Test/Required (lbs.)												
3	SAE J429 Gr. 5	27.9	46.3	10,300/9,300	.38		<0.020	0.013				
8	"	28.8	48.7	20,400/17,000	.32		<0.020	0.035				
	Spec	(C25-C34)	54 max.		(.28-.55)	(--)	(<0.048)	(<0.058)	(--)	(--)	(--)	
6	A325 Type 1	27.1 HRC	N/A	70,600/55,450	.37	0.75	<0.020	0.029				
	Spec	(24-35) HRC			(0.27 min)	(0.47)	(<0.048)	(<0.050)	(--)	(--)	(--)	
		(HRB)		(lbs)								
7	A307 Gr. B	89.6	N/A	16,650/ (13550-22600)			<0.020	0.018				
9A	"	82.5	N/A	2860			<0.020	<0.010				
9B	"	91.2	N/A	2640			0.024	"				
	Spec.	(69-95)		(1900-3180)	(--)	(--)	(<0.040)	(<0.050)	(--)	(--)	(--)	

4. TP-FL-046 Rev. 0 Test Procedure for the Analysis of Steel and Cast Iron Samples by Inductively Coupled Plasma Spectroscopy
5. TP-AM-003 Rev. 2 Test Procedure for Material Evaluation in Accordance with ASTM, ANSI, ASME, AWS, and SAE Test Methods.

MT&E Equipment

ER0007	Riehle Testing Machine
EK0013	Wilson Rockwell Hardness Tester
ER7025	LECO Carbon Analyzer
ER7027	Sulfur Analysis System
ER7000	Analytical Balance
ER0553	Balance Weights
ER7002	Inductively Coupled Plasma Spectrometer

All work was performed in accordance with the Engineering Research Quality Assurance Program.

Approved by:

J. D. Cyrulewski
J. D. Cyrulewski
Supervisor

J. C. Guillaumin
J. C. Guillaumin

QA Administrator:

R. L. Gamble
R. L. Gamble

Copies to: R. L. McIntyre (File)
Fermi 2 Dist.