

ILLINOIS POWER COMPANY



CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

November 20, 1984

Mr. Paul Cortland  
U. S. Nuclear Regulatory Commission  
359 E/W-W  
Washington, DC 20555

Subject: 10CFR50.55(e) Investigation of ASTM A36 Plate Material

Dear Mr. Cortland:

In response to your request of J. M. Gruber of the Illinois Power Company Quality Assurance Department, enclosed please find documentation pertinent to the 10CFR50.55(e) investigation (84-18) concerning A36 plate material. The information is summarized below.

Attachment 1 - The Stone & Webster Engineering Corp. and the St. Louis Testing Laboratories, Inc. results of the retest of the Phoenix Steel plate (HT #81177-21). Please note that these tests were performed on the same heat of material but not the same piece of material.

Attachment 2 - The results of testing performed by the electrical hanger test program of materials traceable to Interstate Steel Company.

We trust that this will provide the data necessary for your investigation. If you should require further information, please contact Illinois Power.

Sincerely yours,

D. P. Hall  
Vice President

JG:lsc  
attach.

cc: NRC Resident Office  
Regional Administrator, Region III, USNRC  
Director, Office of I & E, USNRC  
Washington, DC 20555  
Illinois Dept. of Nuclear Safety

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1/1  
SEND ORIGINAL TO  
P. COURTLAND

Rec. 7/25/84  
DH/KA

STONE & MENSTER ENGINEERING CORPORATION  
MATERIALS ENGINEERING LABORATORY

SHEET M33-84, HT No. 8117721

I.D. No. 14373.04 WPOIM

DATE 7-10-84

FREE CROSS HEAD SPEED 10in per min.

LOAD RANGE 60K

SCALE Full

MAGNIFICATION 250

TENSILE TESTED IN ACCORDANCE WITH SA370

MATERIAL Unknown

Specimen No.	SIZE		Area Sq. In.	TENSILE STRENGTH		YIELD POINT PERCENT		Elongation in 2 in. (Percent)	REDUCTION OF AREA		NATURE of Fracture	LOCATION of Fracture	REMARKS
	Dia. or Thk. (in.)	Width (in.)		Tensile (psi)	Yield (psi)	Low (lbs)	High (psi)		New Dia. (in.)	Reduction (Percent)			
T1-L	.499	1.49	.748	33,380	44,600	22,700	30,300	56%	-	-	Ductile	-	-
T2-L	.499	1.50	.750	33,640	44,900	23,000	30,700	60%	-	-	Ductile	-	-
T1-TR	.499	1.49	.746	33,620	45,000	23,100	31,000	51%	-	-	Ductile	-	-
T2-TR	.490	1.49	.748	33,900	45,300	23,400	31,300	53%	-	-	Ductile	-	-

Chemical Analysis

HT Number	Carbon	Sulfur	MN	P
8117721				
S12948	.101	.013	.37	.01

*R. Jovan*

C. D. TROWBRIDGE, Director

# St. Louis Testing Laboratories, Inc.



2810 CLARK AVENUE • ST. LOUIS, MO. 63103  
631-8080 Code 314

*Chemical, Metallurgical, Physical, Non-Destructive, Spectrographic,  
Agricultural Testing and Analyses  
Investigations, Research and Development, Inspection, Field Services*

RECEIVED

May 7, 1984  
Report No. 84-2657  
Lab No. 84C1194  
P.O. No. C45915

MAY 18 1984

BALDWIN ASSOCIATES  
P.O. Box 306  
Clinton, Illinois 61727

Baldwin Associates

Attention: R. J. Surrock

## REPORT OF TESTS

### TESTS REQUESTED:

Sample/Part ID: Carbon steel sample Ht. 8117721, S12949

Type of Testing: Chemical Testing

### RESULTS:

Carbon, %	-----	.03
Silicon, %	-----	< .01
Sulfur, %	-----	.012
Manganese, %	---	.30
Phosphorus, %	--	.014
Nickel, %	-----	.02
Chromium, %	----	.03
Copper, %	-----	.03

Respectfully submitted,

J. W. Davidson  
Chief Chemist

BALDWIN SOCIATES

PO Box 306

Clinton, IL. 61727



Report No. 84-2657 Date May 4 19 84

Lab No. 84P1229

Attn: Manager of Quality Assurance PO #C45915

FORM B 11

ORIGINAL		REDUCED		REDUCTION IN AREA	YIELD POINT		TENSILE STRENGTH		ELONGATION In. 1.4 Inchee	
Diameter	Area	Diameter	Area	Per Cent	Actual	Per Sq. In.	Actual	Per Sq. In.	Inches	%
.364	.1040	.180	.0254	75.5	3936	37846	5180	49807	.48	34.2

Yield taken at .2% offset

Bar Broke in center.

MATERIAL: Ht. 8117721, S12949

Test per ASTM A-370

Bar returned under separate cover.

Respectfully submitted,

Richard F. Kemplage  
Physical Testing Dept. Supervisor

PO	HEAT	PIC	THICKNESS	A SIZE	PROPERTIES PER CERT	PROPERTIES PER TEST	TEST ID	NOTES			
C 30358	S 17671	S 13618	Austenitic Steel	14 x 14 x 1/2	%C .21 %Si .06 %S .019 %Mn .99 %P .023 %Cu .02	TENSILE	%C .21 %Si .05 %S .015 %Mn .95 %P .024 %Cu .02	B0 #39			
						63277				TENSILE	71452
						YIELD				YIELD	
						39957				41415	
						ELONGATION				ELONGATION (2")	
30%	45%										
C 30358	S 19542	S 13823	Austenitic Steel	10 x 10 x 1/2 12 x 12 x 1/2	%C .18 %Si .06 %S .080 %Mn .80 %P .014 %Cu .02	TENSILE	%C .19 %Si .04 %S .022 %Mn .71 %P .015 %Cu .02	EL GH AH	AVG OF 3 TESTS		
						63135				TENSILE	64581
						YIELD				YIELD	
						37824				41129	
						ELONGATION				ELONGATION (2")	
26%	37.8%										
C 30359	S 17624	S 13738	Austenitic Steel	12 x 12 x 1/2	%C .20 %Si .07 %S .035 %Mn .74 %P .029 %Cu —	TENSILE	%C .16 %Si .05 %S .017 %Mn .72 %P .018 %Cu .02	BH #57			
						66690				TENSILE	63679
						YIELD				YIELD	
						44792				39253	
						ELONGATION				ELONGATION (2")	
26%	35.5%										
C 30422	S 5502290	S 15739	Austenitic Steel	10 x 10 x 1/2 11 x 11 x 1/2	%C .20 %Si .011 %S .024 %Mn 1.10 %P .013 %Cu —	TENSILE	%C .17 %Si .05 %S .015 %Mn .44 %P .017 %Cu .02	GI #160			
						69000				TENSILE	67085
						YIELD				YIELD	
						40000				38479	
						ELONGATION				ELONGATION (2")	
32%	36%										
C 30030	A 3227521	S 13958	Austenitic Steel	10 x 10 x 1/2 14 x 18 x 1/2	%C .23 %Si .20 %S .015 %Mn 1.15 %P .017 %Cu —	TENSILE	%C .04 %Si <.01 %S .02 %Mn .29 %P .009 %Cu .02	AH #11			
						79700				TENSILE	43439
						YIELD				YIELD	
						47600				30378	
						ELONGATION (8")				ELONGATION (2")	
24%	51.5%										

MATERIAL SAMPLE LOG SHEET

LETTER CODE	SAMPLE SIZE	STOCK SIZE	SAMPLE SOURCE	REMARKS	QC VERIFICATION	
					SIGNATURE	DATE
AA	3/8 X 1 X 7	ANGLE 3/8 X 5/8 X 2 1/2 X 7	E30-1001-05A-H11	QC STAMP #22 SAMPLE PLAN # 252 NO HT OR AIR# CUT LONGITUDINALLY QC STAMP #22 SAMPLE PLAN # 252 NO HT OR AIR	Jim Dickson	8-20-84
AB	3/8 X 3/4 X 8	ANGLE 3/2 X 2 1/2 X 1/2 X 8	E30-1001-05A-H11	QC STAMP #50 SAMPLE PLAN # 447 HT # HT84235 AIR # S-14235	Jim Dickson	8-20-84
AC	3/8 X 3/4 X 8	PLATE 3/8 X 8 X 9	E26-1000-01A-CC19	QC STAMP #13 SAMPLE PLAN # 50 HT # HT88131	Jim Dickson	8-20-84
AD	3/8 X 2 X 15 1/16 5/16 X 3-10-84	W X 31	E30-1002-01A-AS-48	QC STAMP #13 SAMPLE PLAN # 50 HT # HT65743 AIR # S-13750	Jim Dickson	8-20-84
AE	5/8 X 3/4 X 8	ANGLE 4 X 3 X 3/8 X 8	E30-1002-01A-AS-48	QC STAMP #25 SAMPLE PLAN # 41 HT # HT84824 AIR # S-13384	Jim Dickson	8-20-84
AF	1/2 X 1 1/8 X 8	ANGLE 3/2 X 2 1/2 X 1/2 X 8	E28-1000-07A-WV-11	QC STAMP #37 SAMPLE PLAN # 18 HT # HTA3975 AIR # S-15595	Jim Dickson	8-20-84
AG	1/2 X 3/4 X 8	PLATE 1/2 X 10 X 10	E30-1002-01A-CC-79B	QC STAMP #7 SAMPLE PLAN # 18 HT # HT51958 AIR # S-15823	Jim Dickson	8-20-84
AH	1/2 X 3/4 X 8	PLATE	E30-1002-01A-CC-79B	QC STAMP #57 SAMPLE PLAN # 15 HT # HT88131 AIR # S-14900	Jim Dickson	8-21-84
AI	1/4 X 2 1/8 X 15 5/8	W X 8 X 17	E28-1000-06A-AS-14 DELETED 8/22/84	QC STAMP #57 SAMPLE PLAN # 15 HT # HT88131 AIR # S-14900	Jim Dickson	8-21-84
AJ	3/8 X 3/4 X 8 3/8 X 9-2-34	PLATE 3/8 X 8 X 9	E38-1000-06A-AS-14	QC STAMP #26 SAMPLE PLAN # 194 HT # HT88131 AIR # S-14900	Jim Dickson	8-21-84
AK	5/16 X 2 3/16 X 79	W X 8 X 17	E29-1002-01A-AS-F-9	QC STAMP #26 SAMPLE PLAN # 194 HT # HT88131 AIR # S-14900	Jim Dickson	8-21-84
AL	15 7/16	PLATE 1/2 X 10 X 10	E29-1002-01A-AS-F-9	QC STAMP #50 SAMPLE PLAN # 67 HT # HT43267521 AIR # S-19258	P. Sullivan	9-10-84
AM	1/2 X 3/4 X 8	PLATE 1/2 X 10 X 10	E29-1002-01A-CC-125	QC STAMP #50 SAMPLE PLAN # 67 HT # HT43267521 AIR # S-19258	Jim Dickson	8-21-84

MATERIAL SAMPLE LOG SHEET

LETTER CODE	SAMPLE SIZE	STOCK SIZE	SAMPLE SOURCE	REMARKS	QC VERIFICATION	
					SIGNATURE	DATE
BM	1/2 X 3/4 X 7 1/16	PLATE 1 1/2 X 12 X 12 ANGLE	E28-1002-05A-CC-48	QC STAMP # 26 SAMPLE PLAN # 220 HT # HTS17824 RIR # S-13738 CUT UNKNOWN	Jim Dialon	8-24-84
BN	1/2 X 3/4 X 7 1/16	8 X 2 1/2 X 1/2 3/8 PLATE	E28-1002-05A-CC-48	QC STAMP # 26 SAMPLE PLAN # 220 HT # HT83814 RIR # S-12150 CUT LONGITUDINALLY	Jim Dialon	8-24-84
BO	1 X 1 1/2 X 1 1/4 1 X 1 1/2 X 1 1/4	1 X 1 1/4 X 1 1/4 ANGLE	E26-1000-01A-WA3	QC STAMP # 57 SAMPLE PLAN # 84 HT # HT8178 RIR # S-13618 CUT UNKNOWN HT # 17871	Jim Dialon	8-24-84
BP	1/2 X 3/4 X 8	1/2 X 3 1/2 X 2 1/2 X 8 PLATE	E26-1000-01A-WA3	QC STAMP # 57 SAMPLE PLAN # 84 HT # HTR4301 RIR # S-14235 CUT LONGITUDINALLY	Jim Dialon	8-24-84
BQ	3/4 X 3/4 X 8	3/4 X 8 X 8 1/2 W 8 X 31 X 36	E29-1000-01A-AS-37	QC STAMP # 22 SAMPLE PLAN # 23154 HT # HT84131 RIR # S-14100 CUT UNKNOWN	Jim Dialon	8-27-84
BR	5/16 X 2 1/4 X 15 1/16		E29-1000-01A-AS-37	QC STAMP # 22 SAMPLE PLAN # 23154 HT # HT75877 RIR # S-13750 CUT LONGITUDINALLY	Jim Dialon	8-27-84
BS	5/16 X 2 X 15 1/2	W 8 X 31 X 18	E30-1001-01B-AS-1A	QC STAMP # 22 SAMPLE PLAN # 188 HT # HT-71248 RIR # S-6992 CUT LONGITUDINALLY	Jim Dialon	8-27-84
BT	3/8 X 1 1/4 X 8	PLATE 3/8 X 8 X 9	E30-1001-01B-AS-1A	QC STAMP # 22 SAMPLE PLAN # 188 HT # HT-737 RIR # NA CUT UNKNOWN	Jim Dialon	8-27-84
BV	3 1/2 X 2 1/2 X 7 1/2 X 1/2 ENTIRE ANGLE	ANGLE 3 1/2 X 2 1/2 X 8 X 1/2	E30-1000-03B-CC-19A	QC STAMP # 50 SAMPLE PLAN # 141 HT # HT40562 RIR # S-6365 CUT ENTIRE ANGLE AS SAMPLE	Jim Dialon	9-6-84
BW	ENTIRE ANGLE	ANGLE 2 1/2 X 3 1/4 X 8 X 1/2	E29-1002-01A-CC-11A	QC STAMP # 10 SAMPLE PLAN # 45 HT # HT20848 RIR # S-9624 ENTIRE ANGLE AS SAMPLE	Jim Dialon	9-6-84
BX	1/4 X 3/4 X 8	TOOL STEEL 4 X 2 X 1/4 X 30	E22-1012-DET 30-11	QC STAMP # 22 SAMPLE PLAN # 72 HT # HT2397 RIR # S-14736 CUT UNKNOWN	Jim Dialon	9-6-84
BY	ENTIRE PLATE	PLATE 1/2 X 2 X 4	E26-1000-01A-WCA-3	QC STAMP # 26 SAMPLE PLAN # 131 HT # HT08579 RIR # S-8086 CUT UNKNOWN	Jim Dialon	9-6-84
	ENTIRE PLATE	PLATE 1/2 X 2 X 3 1/8	E26-1000-01A-WCA-3	QC STAMP # 51 SAMPLE PLAN # 32 HT # HT2025 RIR # S-17502 CUT UNKNOWN	Jim Dialon	9-6-84
		1 1/4 X 2 X 3 1/8	E26-1611-WCA-4	RIR # S-17502	Jim Dialon	9-6-84

MATERIAL SAMPLE LOG SHEET

ITEM #	SAMPLE SIZE	STOCK SIZE	SAMPLE SOURCE	REMARKS	QC VERIFICATION SIGNATURE	DATE
I	1/4" X 2" X 15 1/2"	W8X21X28"	(Supp) E30-1002-04A-AS-12	QC STAMP #40 SAMPLE PLAN #303 HT # 8043 RIR # 59464 QC STAMP #36 SAMPLE PLAN #297 HT # 1034 RIR # 55551	Spurne E. M. SELLERS	10-1-84
A	5/16" X 2" X 15 1/2"	W8X21X28"	E26-1000-02A-AS-12	QC STAMP #13 SAMPLE PLAN #394 RIR # N/A HT # N/A RIR # N/A	Spurne E. M. SELLERS	10-1-84
B	3/8" X 2 1/4" X 7 3/4"	3/8" X 8" X 9" PLATE	E26-1000-02A-AS-12	QC STAMP #13 SAMPLE PLAN #394 RIR # N/A HT # N/A RIR # N/A	Spurne E. M. SELLERS	10-1-84
C	1/4" X 2" X 15 1/2"	W8X21X28"	E30-1000-06B-AB	QC STAMP #13 SAMPLE PLAN #394 RIR # N/A HT # N/A RIR # N/A	Spurne E. M. SELLERS	10-1-84
D	1/4" X 2" X 7 1/2"	1/4" X 7 1/2" X 8" PLATE	E30-1000-06B-AB	QC STAMP #13 SAMPLE PLAN #394 RIR # N/A HT # N/A RIR # N/A	Spurne E. M. SELLERS	10-1-84
E	3/8" X 2 1/4" X 7"	3/8" X 2" X 7" PLATE	E30-1000-06B-AB	QC STAMP #13 SAMPLE PLAN #394 RIR # N/A HT # N/A RIR # N/A	Spurne E. M. SELLERS	10-2-84
F	3/8" X 2 1/4" X 7"	3/8" X 2" X 7" PLATE	E30-1000-06B-AB	QC STAMP #13 SAMPLE PLAN #394 RIR # N/A HT # N/A RIR # N/A	Spurne E. M. SELLERS	10-2-84
G	3/8" X 2" X 15 1/2"	W8X21X28"	E25-1000-08A-AS-24	QC STAMP #40 SAMPLE PLAN #281 HT # 61066 RIR # 55966	Spurne E. M. SELLERS	10-2-84
H	3/8" X 2" X 8"	1" X 8" X 9" PLATE	E25-1000-08A-AS-24	QC STAMP #40 SAMPLE PLAN #281 HT # 61066 RIR # 510935	Spurne E. M. SELLERS	10-2-84
I	1" X 1" X 10"	1" X 1" X 10" SHIM	DELETE E25-1003-03A-SS-1	QC STAMP #26 SAMPLE PLAN #449 HT # N/A RIR # N/A	Spurne E. M. SELLERS	10-4-84
J	1" X 1 1/2" X 5 1/2"	1" X 1 1/2" X 5 1/2" SHIM	DELETE E27-1003-03A-SS-1	QC STAMP #26 SAMPLE PLAN #449 HT # N/A RIR # N/A	Spurne E. M. SELLERS	10-4-84
K	1" X 1 1/2" X 7 1/4"	1" X 1 1/2" X 7 1/4" PLATE	E27-1003-01C-H1	QC STAMP #26 SAMPLE PLAN #332 HT # 1350 RIR # 510210	Spurne E. M. SELLERS	10-4-84
L	1 1/2" X 2 1/4" X 7 1/4"	1 1/2" X 10" X 10" PLATE	E29-1002-01A-CC-146	QC STAMP #40 SAMPLE PLAN #42 HT # 519542 RIR # 513823	Spurne E. M. SELLERS	10-4-84



MATERIAL SAMPLE LOG SHEET

LETTER CODE	SAMPLE SIZE	STOCK SIZE	SAMPLE SOURCE	REMARKS	QC VERIFICATION	
					SIGNATURE	DATE
Z	$\frac{3}{8} \times \frac{3}{4} \times 6 \frac{3}{4}$	$\frac{3}{8} \times \frac{3}{4} \times 7$ ANGLE	E26-1003-03A-H10	QC STAMP #13 SAMPLE PLAN #460 HT# N/A 2076 10-9-84 RIR# N/A 2076 10-9-84 ENTIRE ANGLE SENT AS SAMPLE	Lawrence E. Mitchell	10-9-84
A	$\frac{1}{2} \times \frac{3}{4} \times 7 \frac{3}{4}$	$\frac{1}{2} \times 10 \times 10$ PLATE	E30-1001-02B-CC-7A	QC STAMP #22 SAMPLE PLAN #315 HT# 962 RIR# N/A 2076 10-10-84 CUT UNKNOWN	Lawrence E. Mitchell	10-10-84
B	$\frac{1}{2} \times \frac{3}{4} \times 7 \frac{3}{4}$	$\frac{1}{2} \times \frac{3}{4} \times \frac{3}{4} \times 7 \frac{3}{4}$ ANGLE	E30-1001-02B-CC-7A	QC STAMP #22 SAMPLE PLAN #315 HT# 90862 RIR# 56365 CUT LONGITUDINALLY	Lawrence E. Mitchell	10-10-84
C	$\frac{1}{2} \times 6 \frac{1}{2} \times 2$	$\frac{1}{2} \times 6 \frac{1}{2} \times 2$ PLATE	E30-1001-02B-CC-7A	QC STAMP #22 SAMPLE PLAN #315 HT# 1332 RIR# N/A 2076 10-10-84 CUT UNKNOWN ENTIRE PLATE SENT AS SAMPLE	Lawrence E. Mitchell	10-10-84
D	$\frac{1}{4} \times 2 \times 4$	$\frac{1}{4} \times 2 \times 4$ PLATE	E30-1001-05A-H11	QC STAMP #22 SAMPLE PLAN #252 HT# N/A 2076 10-10-84 RIR# 513585 CUT UNKNOWN ENTIRE PLATE SENT AS SAMPLE	Lawrence E. Mitchell	10-10-84
E	$\frac{3}{8} \times \frac{3}{4} \times 11 \frac{1}{2}$	$\frac{3}{8} \times 11 \frac{1}{2} \times 11 \frac{1}{2}$ PLATE	E26-1003-03A-H10	QC STAMP #13 SAMPLE PLAN #460 HT# 91633 RIR# 511519 CUT UNKNOWN	Lawrence E. Mitchell	10-10-84
F	$\frac{3}{8} \times \frac{3}{4} \times 2 \frac{1}{2} \times 7$	$\frac{3}{8} \times \frac{3}{4} \times 2 \frac{1}{2} \times 7$ ANGLE	E26-1003-03A-H10	QC STAMP #13 SAMPLE PLAN #460 HT# N/A 2076 10-10-84 RIR# N/A 2076 10-10-84 CUT LONGITUDINALLY ENTIRE ANGLE SENT AS SAMPLE	Lawrence E. Mitchell	10-10-84
G	$\frac{3}{8} \times \frac{3}{4} \times 2 \frac{1}{2} \times 7$	$\frac{3}{8} \times \frac{3}{4} \times 2 \frac{1}{2} \times 7$ ANGLE	E26-1003-03A-H10	QC STAMP #13 SAMPLE PLAN #460 HT# N/A 2076 10-10-84 RIR# N/A 2076 10-10-84 CUT LONGITUDINALLY ENTIRE ANGLE SENT AS SAMPLE	Lawrence E. Mitchell	10-10-84
H	$\frac{1}{2} \times \frac{3}{4} \times 7 \frac{1}{2}$	$\frac{1}{2} \times \frac{3}{4} \times 2 \frac{1}{2} \times 7$ ANGLE	E28-1000-06A-51B (54PP/0)	QC STAMP #40 SAMPLE PLAN #64 HT# 93814 RIR# 512407 CUT LONGITUDINALLY	Lawrence E. Mitchell	10-11-84
I	$\frac{1}{2} \times \frac{3}{4} \times 7 \frac{3}{4}$	$\frac{1}{2} \times 10 \times 10$ PLATE	E29-1002-01A-CC-94	QC STAMP #22 SAMPLE PLAN #68 HT# 5502890 RIR# 515739 CUT UNKNOWN	Lawrence E. Mitchell	10-11-84
J	$\frac{1}{2} \times \frac{3}{4} \times 7 \frac{3}{4}$	$\frac{1}{2} \times \frac{3}{4} \times 2 \frac{1}{2} \times 7$ ANGLE	E29-1002-01A-CC-94	QC STAMP #22 SAMPLE PLAN #68 HT# A 2975 RIR# 513959 CUT LONGITUDINALLY	Lawrence E. Mitchell	10-11-84
K	$\frac{1}{4} \times 2 \times 13 \frac{5}{8}$	W8X31X20	E28-1000-07A-AS-16	QC STAMP #40 SAMPLE PLAN #274 HT# 61076 RIR# 59481 CUT LONGITUDINALLY	Lawrence E. Mitchell	10-11-84
L	$\frac{3}{8} \times \frac{3}{4} \times 6$	$\frac{3}{8} \times 8 \times 9$ PLATE	E28-1000-07A-AS-16	QC STAMP #40 SAMPLE PLAN #274 HT# 1378 RIR# 57688-223 CUT UNKNOWN	Lawrence E. Mitchell	10-11-84



C. D. TROWBRIDGE, Director

# St. Louis Testing Laboratories, Inc.



2810 CLARK AVENUE • ST. LOUIS, MO. 63103  
531-8080 Code 314

*Chemical, Metallurgical, Physical, Non-Destructive, Spectrographic,  
Agricultural Testing and Analyses  
Investigations, Research and Development, Inspection, Field Services*



**ST. LOUIS TESTING LABORATORIES, INC.**

October 4, 1984  
Report No. 84-5981  
Lab No. 84C2551  
P.O. No. C47980

Baldwin Associates  
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	<u>BL-QE55</u> <u>STL #36</u>	<u>BM-QE55</u> <u>STL #37</u>	<u>BN-QE55</u> <u>STL #38</u>	<u>BO-QE55</u> <u>STL #39</u>	<u>BP-QE55</u> <u>STL #40</u>
Carbon, % -----	.13	.16	.18	.21	.19
Silicon, % -----	.26	.05	.23	.05	.29
Sulfur, % -----	.027	.017	.027	.015	.023
Manganese, % ---	.55	.72	.67	.95	.97
Phosphorus, % --	.020	.018	.009	.024	.008
Copper, % -----	.24	.02	.15	.02	.24
	<u>BQ-QE55</u> <u>STL #41</u>	<u>BR-QE55</u> <u>STL #42</u>	<u>BS-QE55</u> <u>STL #43</u>	<u>BT-QE55</u> <u>STL #44</u>	<u>BU-QE55</u> <u>STL #45</u>
Carbon, % -----	.22	.22	.22	.20	.20
Silicon, % -----	.03	.05	.03	.02	.26
Sulfur, % -----	.027	.034	.027	.019	.024
Manganese, % ---	.76	.62	.64	.82	.70
Phosphorus, % --	.010	.012	.012	.012	.008
Copper, % -----	.14	.18	.03	.02	.12
	<u>BV-QE55</u> <u>STL #46</u>	<u>BW-QE55</u> <u>STL #47</u>	<u>BX-QE55</u> <u>STL #48</u>	<u>BY-QE55</u> <u>STL #49</u>	<u>BZ-QE55</u> <u>STL #50</u>
Carbon, % -----	.22	.20	.25	.22	.21
Silicon, % -----	.02	< .01	.04	.19	.20
Sulfur, % -----	.023	.014	.018	.031	.031
Manganese, % ---	.63	.72	.44	.45	.51
Phosphorus, % --	.008	.009	.008	.012	.019
Copper, % -----	.02	.03	.01	.14	.30
	<u>CA-QE55</u> <u>STL #51</u>	<u>CB-QE55</u> <u>STL #52</u>	<u>CC-QE55</u> <u>STL #52</u>	<u>CD-QE55</u> <u>STL #54</u>	<u>CE-QE55</u> <u>STL #55</u>
Carbon, % -----	.20	.13	.17	.13	.25
Silicon, % -----	.21	.18	.21	.14	.05
Sulfur, % -----	.031	.018	.021	.030	.023
Manganese, % ---	.58	.56	.60	.47	.49
Phosphorus, % --	.019	.019	.008	.027	.010
Copper, % -----	.29	.18	.08	.40	.18

C. D. TROWBRIDGE, Director

# St. Louis Testing Laboratories, Inc.



2810 CLARK AVENUE • ST. LOUIS, MO. 63103  
531-8080 Code 314

*Chemical, Metallurgical, Physical, Non-Destructive, Spectrographic,  
Agricultural Testing and Analyses  
Investigations, Research and Development, Inspection, Field Services*

**ST. LOUIS TEST**

October 23, 1984  
Report No. 84-5981  
Lab No. 84C2551  
P.O. No. C47980

BALDWIN ASSOCIATES  
P.O. Box 306  
Clinton, Illinois 61727

Attention: Manager of Quality Assurance

## REPORT OF TESTS

### TESTS REQUESTED:

Sample/Part ID: Sixty (60) samples identified below

Type of Testing: Chemical Testing

### RESULTS:

	<u>DN-QE55</u> <u>STL #110</u>	<u>EL-QE55</u> <u>STL #111</u>	<u>EM-QE55</u> <u>STL #112</u>	<u>EN-QE55</u> <u>STL #113</u>	<u>EO-QE55</u> <u>STL #114</u>
Carbon, % -----	.25	.22	.22	.21	.21
Silicon, % -----	.03	.02	.04	.18	.20
Sulfur, % -----	.014	.025	.024	.021	.033
Manganese, % -----	.71	.67	.66	.51	.50
Phosphorus, % -----	.009	.008	.015	.010	.019
Copper, % -----	.04	.02	.03	.24	.32
	<u>EP-QE55</u> <u>STL #115</u>	<u>EQ-QE55</u> <u>STL #116</u>	<u>ER-QE55</u> <u>STL #117</u>	<u>ES-QE55</u> <u>STL #118</u>	<u>ET-QE55</u> <u>STL #119</u>
Carbon, % -----	.23	.22	.21	.21	.20
Silicon, % -----	.03	.02	.04	.02	.04
Sulfur, % -----	.020	.022	.014	.019	.017
Manganese, % -----	.70	.64	.79	.67	.41
Phosphorus, % -----	.022	.008	.012	.008	.006
Copper, % -----	.04	.02	.01	.04	.03
	<u>EU-QE55</u> <u>STL #120</u>	<u>EV-QE55</u> <u>STL #121</u>	<u>EW-QE55</u> <u>STL #122</u>	<u>EX-QE55</u> <u>STL #123</u>	<u>EY-QE55</u> <u>STL #124</u>
Carbon, % -----	.22	.21	.21	.21	.21
Silicon, % -----	.04	.07	.05	.05	.05
Sulfur, % -----	.012	.027	.021	.023	.021
Manganese, % -----	.59	.50	.49	.49	.49
Phosphorus, % -----	.010	.008	.008	.008	.008
Copper, % -----	.04	.02	.02	.02	.02

C. D. TROWBRIDGE, Director

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**ST. LOUIS TEST**

October 23, 1984  
Report No. 84-5981  
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Baldwin Associates  
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	<u>FT-QE55</u> <u>STL #145</u>	<u>FU-QE55</u> <u>STL #146</u>	<u>FV-QE55</u> <u>STL #147</u>	<u>FW-QE55</u> <u>STL #148</u>	<u>FX-QE55</u> <u>STL #149</u>
Carbon, % -----	.21	.22	.22	.22	.19
Silicon, % -----	.06	.03	.04	.06	.04
Sulfur, % -----	.029	.017	.016	.023	.019
Manganese, % ----	.89	.69	.69	.88	.70
Phosphorus, % ---	.007	.013	.020	.006	.008
Copper, % -----	.05	.03	.03	.05	.03
	<u>FY-QE55</u> <u>STL #150</u>	<u>FZ-QE55</u> <u>STL #151</u>	<u>GA-QE55</u> <u>STL #152</u>	<u>GB-QE55</u> <u>STL #153</u>	<u>GC-QE55</u> <u>STL #154</u>
Carbon, % -----	.22	.21	.23	.18	.21
Silicon, % -----	.04	.04	.04	.25	.05
Sulfur, % -----	.016	.014	.014	.015	.026
Manganese, % ---	.69	.68	.70	.66	.45
Phosphorus, % --	.010	.009	.009	.008	.011
Copper, % -----	.01	.01	.06	.09	.22
	<u>GD-QE55</u> <u>STL #155</u>	<u>GE-QE55</u> <u>STL #156</u>	<u>GF-QE55</u> <u>STL #157</u>	<u>GG-QE55</u> <u>STL #158</u>	<u>GH-QE55</u> <u>STL #159</u>
Carbon, % -----	.14	.20	.19	.19	.17
Silicon, % -----	.22	.04	.04	.04	.23
Sulfur, % -----	.021	.018	.013	.013	.027
Manganese, % ---	.64	.70	.66	.65	.65
Phosphorus, % --	.019	.008	.008	.008	.008
Copper, % -----	.18	.03	.01	.01	.17
	<u>GI-QE55</u> <u>STL #160</u>	<u>GJ-QE55</u> <u>STL #161</u>	<u>GK-QE55</u> <u>STL #162</u>	<u>GL-QE55</u> <u>STL #163</u>	<u>GM-QE55</u> <u>STL #164</u>
Carbon, % -----	.17	.18	.25	.20	.18
Silicon, % -----	.05	.15	.03	.05	.05
Sulfur, % -----	.015	.027	.020	.018	.021
Manganese, % ---	.44	.54	.51	.52	.74
Phosphorus, % ---	.017	.013	.010	.016	.018
Copper, % -----	.02	.24	.03	.02	.02

C. D. TROWBRIDGE, Director

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Agricultural Testing and Analyses*

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ST. LOUIS TESTING

October 4, 1984  
Report No. 84-5981  
Lab No. 84C2551  
P.O. No. C47980

BALDWIN ASSOCIATES  
P.O. Box 306  
Clinton, Illinois 61727

Attention: Manager of Quality Assurance

## REPORT OF TESTS

### TESTS REQUESTED:

Sample/Part ID: Sixty-four (64) samples identified below

Type of Testing: Chemical Testing

### RESULTS:

	AA-QE55 STL #1	AB-QE55 STL #2	AC-QE55 STL #3	AD-QE55 STL #4	AE-QE55 STL #5
Carbon, % -----	.27	.26	.20	.22	.19
Silicon, % -----	.05	.05	.28	.03	.08
Sulfur, % -----	.022	.025	.021	.026	.033
Manganese, % ----	.48	.49	.96	.77	.59
Phosphorus, % ---	.010	.010	.008	.010	.019
Copper, % -----	.20	.20	.27	.15	.17
	AF-QE55 STL #6	AG-QE55 STL #7	AH-QE55 STL #8	AK-QE55 STL #9	AL-QE55 STL #10
Carbon, % -----	.19	.19	.17	.22	.26
Silicon, % -----	.20	.15	.05	.03	.04
Sulfur, % -----	.025	.029	.020	.026	.027
Manganese, % ----	.67	.56	.73	.77	.48
Phosphorus, % ---	.010	.013	.019	.010	.008
Copper, % -----	.21	.26	.02	.15	.16
	AM-QE55 STL #11	AN-QE55 STL #12	AO-QE55 STL #13	AP-QE55 STL #14	AQ-QE55 STL #15
Carbon, % -----	.04	.18	.14	.23	.23
Silicon, % -----	< .01	.14	.20	< .01	.07
Sulfur, % -----	.012	.027	.021	.019	.019
Manganese, % ----	.29	.69	.62	.75	.48
Phosphorus, % ---	.009	.020	.010	.011	.020
Copper, % -----	.00	.00	.00	.00	.00

C. D. TROWBRIDGE, Director

# St. Louis Testing Laboratories, Inc.



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	<u>CF-QE55</u> <u>STL #56</u>	<u>CG-QE55</u> <u>STL #57</u>	<u>CH-QE55</u> <u>STL #58</u>	<u>CI-QE55</u> <u>STL #59</u>	<u>CJ-QE55</u> <u>STL #60</u>
Carbon, % -----	.26	.21	.23	.19	.19
Silicon, % -----	.05	.17	.04	.03	.04
Sulfur, % -----	.023	.027	.016	.021	.032
Manganese, % ---	.48	.43	.60	.82	.67
Phosphorus, % --	.010	.012	.023	.011	.020
Copper, % -----	.18	.13	.03	.02	.17

  

	<u>CK-QE55</u> <u>STL #61</u>	<u>CL-QE55</u> <u>STL #62</u>	<u>CM-QE55</u> <u>STL #63</u>	<u>CN-QE55</u> <u>STL #64</u>	<u>AM-QE55 *</u> <u>STL #11</u>
Carbon, % -----	.20	.16	.21	.18	.03
Silicon, % -----	.03	.06	.20	.04	< .01
Sulfur, % -----	.027	.020	.025	.020	.012
Manganese, % ---	.76	.53	.50	.52	.29
Phosphorus, % --	.010	.010	.014	.011	.009
Copper, % -----	.14	.16	.28	.10	.02

The testing was performed in accordance with St. Louis Testing Laboratories, Inc., Quality Assurance Program, 1-09-80 Rev. 3, which was surveyed, qualified and audited by Baldwin Associates.

\* Sample identified as AM-QE55 STL #11 was rechecked.

Respectfully submitted,

J. W. Davidson  
Chief Chemist

Saint Louis  
Testing  
Laboratories, Inc.



2810 Clark Avenue  
St. Louis, Missouri 63103  
314/531-8080

Baldwin Associates  
Lab No. 84P2655  
PO No. C-47980  
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Longitudinal Tensiles

Yield taken at .2% offset

\* Elongation in 1.0"

Sample	Original Area	Reduced Area	Reduction In Area %	Yield PSI	Tensile PSI	Elongation in 2" %	BHN		Fracture
							3000	Kg. Load	
GA-QE55	.2539	.1019	59.8	41709	70401	35.5	131		Ductile
GB-QE55	.2433	.0909	62.6	49568	73777	33.0	152		Ductile
GC-QE55	.2538	.1599	36.9	35460	69542	33.0	128		Ductile
GD-QE55	.0609	.0230	62.2	50049	73070	25.0 *	140		Ductile
GE-QE55	.3914	.1793	54.1	37557	65981	37.0	126		Ductile
GF-QE55	.1866	.0641	65.6	47009	67390	33.5	143		Ductile
GG-QE55	.1861	.0686	63.1	43009	66496	32.5	140		Ductile
GH-QE55	.2452	.0948	61.3	45880	72491	37.0	143		Ductile
GI-QE55	.2565	.1320	48.5	38479	62085	36.0	116		Ductile
GJ-QE55	.2139	.1045	51.1	57503	82748	28.5	146		Ductile
GK-QE55	.4189	.2177	48.0	35736	69407	35.0	131		Ductile
GL-QE55	.2056	.0860	58.1	39834	65904	37.0	121		Ductile
GM-QE55	.2600	.1148	55.8	40038	64134	38.5	121		Ductile
GN-QE55	.2482	.1060	57.2	50886	73428	33.0	146		Ductile
GO-QE55	.1361	.0576	57.6	46024	65833	31.0	131		Ductile
GP-QE55	.3732	.16819	54.9	44292	66988	38.0	128		Ductile
QQ-QE55	.3727	.1500	59.7	44110	64663	41.5	126		Ductile
GR-QE55	.5340	.2218	58.4	43932	70973	38.0	179		Ductile



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Page -7- 10/22/84

Longitudinal Tensiles

Yield taken at .2% offset

Sample	Original Area	Reduced Area	Reduction In Area %	Yield PSI	Tensile PSI	Elongation in 2" %	BHN		Fracture
							3000	Kg. Load	
DN-QE55	.2530	.1010	60.0	40079	68577	36.5	140		Ductile
EL-QE55	.2478	.0962	61.1	45762	66283	35.5	140		Ductile
EM-QE55	.2545	.1200	52.8	42318	68074	35.0	126		Ductile
EN-QE55	.1858	.0962	48.2	44564	70775	31.0	137		Ductile
EO-QE55	.2479	.1401	43.4	46591	75635	32.5	143		Ductile
EP-QE55	.2535	.1217	51.9	40591	68934	34.0	131		Ductile
EQ-QE55	.2468	.0931	62.2	47285	66653	35.0	137		Ductile
ER-QE55	.1880	.0911	51.5	45000	69547	32.0	140		Ductile
ES-QE55	.3466	.1490	57.0	53058	66142	31.5	126		Ductile
ET-QE55	.3919	.1545	60.5	39117	63153	39.5	126		Ductile
EU-QE55	.5319	.2784	47.6	42865	69044	34.0	179		Ductile
EV-QE55	.3134	.1223	60.9	43363	64374	38.0	126		Ductile
EW-QE55	.3205	.1357	57.6	44929	65288	37.5	128		Ductile
EX-QE55	.3162	.1294	59.0	42409	64120	39.0	126		Ductile
EY-QE55	.3161	.1326	58.0	44416	65011	39.0	121		Ductile
EZ-QE55	.3145	.1250	60.2	42543	65421	38.5	126		Ductile
FA-QE55	.3140	.1282	59.1	42611	63694	36.0	121		Ductile
FB-QE55	.3176	.1292	59.3	43167	63995	38.5	121		Ductile
FC-QE55	.3209	.1290	59.8	41508	63882	38.5	123		Ductile
FD-QE55	.3138	.1242	60.4	40822	63495	39.5	128		Ductile
FE-QE55	.4055	.1923	52.5	46091	66769	38.0	118		Ductile

**Saint Louis  
Testing  
Laboratories, Inc.**



2810 Clark Avenue  
St. Louis, Missouri 63103  
314/531-8080

BALDWIN ASSOCIATES  
P.O. Box 306  
Clinton, Il. 61727

October 4, 1984  
Report No. 84-5981  
Lab No. 84P2655  
PO No. C-47980

Attention: Manager of Quality Assurance

REPORT OF ANALYSIS

MATERIAL: Carbon steel samples

SUBJECT: Tensile tests per ASTM A-370. Longitudinal Tensiles Yield taken at .2% offset

RESULTS:

Sample	Original Area	Reduced Area	Reduction In Area %	Yield PSI	Tensile PSI	Elongation in 2" %	BHN 3000 Kg Load	Fracture
#1	.1884	.0794	57.8	45605	72584	32.5	143	Ductile
#2	.1887	.0788	58.2	47376	73131	31.5	140	Ductile
#3	.2519	.0995	60.5	44898	83287	29.0	183	Ductile
#4	.1867	.1066	42.9	51290	73915	28.5	143	Ductile
#5	.4743	.2179	54.0	45540	68311	36.0	128	Ductile
#6	.3136	.1001	68.0	47257	69834	39.0	140	Ductile
#7	.2413	.1060	56.0	55200	73145	31.5	146	Ductile
#8	.2570	.0953	62.9	37587	63326	39.5	121	Ductile
#9	.1873	.0982	47.5	51959	74079	29.5	143	Ductile
#10	.4380	.2569	41.3	51506	73230	33.0	137	Ductile

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Baldwin Associates  
Lab No. 84P2655  
PO No. C-47980  
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Longitudinal Tensiles

Yield taken at .2% offset

Sample	Original Area	Reduced Area	Reduction In Area %	Yield PSI	Tensile PSI	Elongation in 2" %	BHN 3000 Kq. Load	Fracture
#11	.2536	.0628	75.2	30378	43439	51.5	103	Ductile
#12	.2507	.1143	54.4	65696	81172	25.0	179	Ductile
#13	.2497	.0912	63.4	44573	65478	40.0	131	Ductile
#14	.1168	.0486	58.3	85171	86472	19.5	163	Ductile
#15	.3762	.1987	47.1	56778	69112	33.0	134	Ductile
#16	.2560	.1056	58.7	67968	83203	28.5	187	Ductile
#17	.2606	.1107	57.5	42709	67920	37.5	128	Ductile
#18	.2528	.1261	50.1	46518	68433	33.0	131	Ductile
#19	1.5025	.5657	62.3	40173	75207	50.0	143	Ductile
#20	.2502	.1151	53.9	42565	70443	33.0	131	Ductile
#21	.2484	.1064	57.1	51555	77474	31.0	149	Ductile
#22	.2595	.1036	60.0	44613	70503	34.5	137	Ductile
#23	.2443	.1062	56.5	48610	72016	35.0	146	Ductile
#24	.3752	.1602	57.3	44616	66297	39.0	121	Ductile
#25	.1848	.0849	54.0	48368	72504	31.0	149	Ductile
#26	.1822	.0739	59.4	51860	70793	32.0	143	Ductile
#27	.2534	.1426	43.7	64275	82859	22.5	179	Ductile
#28	.2504	.1006	59.8	41327	67980	34.5	137	Ductile
#29	.2534	.0961	62.0	40830	66274	35.0	137	Ductile
#30	.2550	.1002	60.7	50095	70193	36.0	137	Ductile



Longitudinal Tensiles

Yield taken at .2% offset

Sample	Original Area	Reduced Area	Reduction In Area %	Yield PSI	Tensile PSI	Elongation in 2" %	BHN 3000 Kg. Load	Fracture
#31	.2469	.0925	62.5	40826	65714	38.0	137	Ductile
#32	.2424	.1040	57.0	60396	74876	27.5	163	Ductile
#33	.2510	.0943	62.4	45418	64840	35.5	121	Ductile
#34	.2595	.1391	46.3	45549	66358	34.0	140	Ductile
#35	.3117	.1652	47.0	50433	73115	30.0	146	Ductile
#36	.1227	.0461	62.4	51149	69845	29.5	137	Ductile
#37	.2438	.0925	62.0	39253	63679	35.5	126	Ductile
#38	.2432	.0992	59.2	47861	71093	35.5	143	Ductile
#39	1.4835	.7281	50.9	41415	71452	45.0	140	Ductile
#40	.2550	.1063	58.3	67058	86666	27.5	179	Ductile
#41	.1854	.1045	43.6	47087	74298	29.5	143	Ductile
#42	.4458	.2086	53.2	50672	69762	36.5	131	Ductile
#43	.4472	.2385	46.6	47093	68537	39.5	116	Ductile
#44	.1916	.0795	58.5	42275	64848	35.0	126	Ductile
#45	.2499	.1166	53.3	49219	73629	32.5	170	Ductile
#46	.2535	.0924	63.5	48402	65285	37.0	131	Ductile
#47	.1183	.0500	57.7	77092	78021	18.0	149	Ductile
#48	.1357	.0439	67.6	39174	64112	40.0 *	118	Ductile
#49	.0689	.0296	57.0	49375	74310	33.0 *	134	Ductile
#50	.2514	.1141	66.5	68138	76869	32.5	149	Ductile

\* Elongation in 1.0"