

SOUTH CAROLINA ELECTRIC & GAS COMPANY

POST OFFICE BOX 764
COLUMBIA, SOUTH CAROLINA 29218

T.C. NICHOLS, JR.
VICE PRESIDENT AND GROUP EXECUTIVE
(Nuclear Operations)

September 23, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Underclad Cracking in Reactor
Vessel Nozzles

Dear Mr. Denton:

South Carolina Electric and Gas Company, acting for itself and agent for South Carolina Public Service Authority, provides information request in Mr. A. Schwencer's letter to Mr. E. H. Crews regarding underclad cracking in reactor vessel nozzles. NRC questions and our responses are provided below:

1. Nozzle base metal material specification type and grade, including material certification data of material used in construction.

 The base material of all nozzles in the Virgil C. Summer Nuclear Station reactor vessel is ASTM A-508 Class 2. The base material certification data is provided as Attachment I.

2. The clad process type, electrode size and number of clad layers, including material certification data of material used in construction.

This information is presented in Attachment II.

Certification data for cladding material is not required, and, therefore, not available.

3. Heat input (amps, volts, speed) for each clad layer.

This information is provided in Attachment II.

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Mr. Harold R. Denton
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
September 23, 1980
Page Two

4. Clad pre-and post-heat temperature and interpass temperature for each clad layer.

This information is provided in Attachment II.

5. Vessel stress relief temperature.

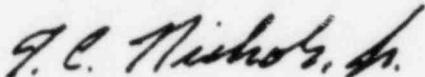
Final Post-Weld Heat Temperature (PWHT) = 1100° - 1175°F held for one hour per inch of weld thickness.

6. The manufacturer or subcontractor who fabricated the vessel and applied the nozzle cladding.

Chicago Bridge and Iron Company.

If additional information on this subject is required, please let us know.

Very truly yours,



T. C. Nichols, Jr.

RBC:TCN:jw

cc: B. A. Bursey
V. C. Summer
G. H. Fischer
W. A. Williams, Jr.
T. C. Nichols, Jr.
E. H. Crews, Jr.
H. T. Babb
D. A. Nauman
O. S. Bradham
J. B. Knotts, Jr.
R. B. Clary
J. B. Cookinham
J. L. Skold
H. Radin
NPCF/Whitaker
File
O. W. Dixon, Jr.

Attachment 1

2007A

INTERSTATE TEST REPORT

DATE

10/21/61

Purchase

Cessna Flying & Travel Co., Allentown

Purchaser's Order No.

101001-1001

Customer

Distributor's Order No.

ITEM #	CTN. #	PRODUCT	SPEC.	HEAT OR CODE NO.	FORGING NO.	HEAT TREATMENT	YR
1	1	Additional tests for inlet nozzles mark 15-1-1.	SAS508-2 & DWR. T13, Rev. 1.	Q2041W	L36B 1	Tests were stress relieved as follows: 1150°F + 25°F for 50 hours. Rate of heating from & cooling to 600°F @100°F/hr. max.	

CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES

FORGING NO.	HEAT NO.	C	Si	P	S	Mn	Cr	Ni	Mo	NOT REPORTS ATTACHED			Dropweight TEST
										U.T.	A.M.P.	D.P.	
													0° Location Two (2) sp break @-10 Two (2) sp -20°F.

FORGING NO.	HEAT NO.	TEST TEMP.	TENSILE PSI @ 1000	YIELD PSI @ 1000	ELASTIC E PSI	E.R. %	S.H.R.	IV-BEND AT -20°F		IMPACT TESTS (Keyhole)		TEST
								ENERGY (FT-LBS)	LATERAL EXP. (IN.)	U.T.	A.M.P.	
15-1	Q2041W							105-117-102 130-133-128		.062-.070-.066 .065-.063-.076		50-60-50 100-100-

Transition curve from the 0° location is attached.

CORRECTED TEST REPORT, DESTROY PREVIOUS COPY.

The family identity you have rights to be carried
or connected to the records of the Service.*P. J. Dill*

Attachment I

Customer _____ Date _____
 Purchaser _____ Purchaser's Order No. _____
 Distributor _____ Distributor's Order No. _____

ITEM	CTN.	PRODUCT	SPEC.	HEAT OR CODE NO.	FORGING NO.	HEAT TREATMENT	F.C.C. CHART ATTACHED	
							YES	NO
1	1	Additional tests for inlet nozzle mark 15-1-1.	SA503-2 & Dwg. T13, Rev. 1.	Q235W	436B 1	Tests were stress relieved as follows: 1150°F+25°F for 50 hours. Rate of heating from & cooling to 600°F 6100 F/hr. max.		

CHEMICAL ANALYSES AND MECHANICAL PROPERTIES

TEST/TEST NO.	WEIGHT IN.	C	Mn	P	S	Si	CR	RE	LD	NOT REPORTS ATTACHED			Dropweight Testin REMARKS
										U.T.	A.M.P.	D.P.	
													0° Location Two (2) specimens mark 0-100°F Two (2) specimens 3-20°F.

TEST/TEST NO.	WEAT NO.	TEST TEMP.	TEMPERATURE FOR 1000	FIELD FOR 1000	ELOPEMENT IN. IN.	R.A. %	S.H.R.	IV. NUMBER OF TESTS			V. IMPACT TESTS (Example)		
								ENERGY IN. IN.	LATERAL EXP. IN. IN.	S SHEAR	1	2	3
15-1	Q235W				10 ¹³ Location - PT ¹³ (J ¹³) D ¹³)			105-117-102 130-133-128	.023-.070-.065 .065-.033-.076		50-60-50(T ² +T ²) 100-100-100(T ²)		

Tension curve from the C° location is attached.

CORRECTED TEST REPORT. IMPACT TESTS FOR 1000

P. L. Kelly
 This document contains neither recommendations nor conclusions of the American Society for Testing and Materials. It is the property of the purchaser who shall determine its suitability for his purpose.

Attachment 1

SA-1000-2 MATERIAL TEST REPORT DATE January 19, 1953
 Purchaser - CESSNA AIRCRAFT CO. - P-446 Purchaser's Order No. LF0306-1/2531
 Distributor's Order No. 11

ITEM	CIV.	PRODUCT	SPEC.	WEIGHT COST	FORGING	L/T APPROVED procedure	HT		HT		HT	
							HT	HT	HT	HT	HT	HT
1	1	Blades fording per CS-A-101 12, Est. 6 (except 33-11/16" dia. is corrected to 35-7/8") Mark: 15-1-1	SAC-3-2 & CS-A-101 M2-11, Part 1 & Q43-101 Part. 3	Q43-114 Supplier No. 123327 VAT	945-L 1		1650°F, +25°F, for 14 hours- 1450°F 1550°F, +25°F, for 14 hours- 1450°F 1290°F, +25°F, for 14 hours- 1450°F					

TESTS WERE SUCCESSFULLY CONDUCTED AS FOLLOWS:
1150°F, +25°F, for 50 hours. L/T APPROVED
Procedure Q43-101, Est. 6.

ITEM	TEST NO.	CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES										NOT REPORTED ATTACHED	REMARKS		
		C	Mn	P	S	Si	Cr	Ni	Mo	V	TEST NO.	U.T.	M.P.	R.P.	
1	Q43-114	.21 .195	.49 .65	.010 .005	.015 .013	.28 .26	.31 .32	.73 .75	.61 .62	.04 .04	Check	1000	1000	1000	REPRODUCTION TEST 1 specimen - 1000 100°F, 2 specimens - break at 100°F to check the heat treatment Testing in con- formity with L/T Approved Procedure Q43-101

ITEM	TEST NO.	IV. MECHANICAL TESTS AT STRESS 1 IMPACT TESTS (INCHES)										REMARKS
		TENSILE PSI @ 100%	YIELD PSI @ 0.2%	ELONG. % H-R	R.A. %	L.D. %	ENGLISH IN. IN	LATERAL EXP. IN. IN	INCHES	INCHES	INCHES	
1	Q43-114	39.7 + 81.675	27.7 + 60.638	30.0	70.0	1	7-100	1	100	100	100	
	1	39.7 + 81.675	27.7 + 60.638	30.0	70.0	1	41 - 39 - 33	1	.032-.033-.026	100	100	
	0	39.7 + 81.625	27.7 + 65.500	27.0	72.2	1	7-100	1	100	100	100	
	150	39.7 + 85.000	27.7 + 65.625	27.0	71.4	1	111 - 116 - 150	1	.072-.073-.067	100	100	
							112 - 129 - 125	1	.076-.080-.076	100	100	

Imperial Forge certifies that all applicable requirements of SAC-3-2 and
Q43-101, Est. 3 & Q43-101, Part. 3 have been complied with.

Test results were reported on this form.

Attachment I

S.A. 16		S-17-2		MATERIAL TEST REPORT		DATE January 19,							
Purchaser		CINCINNATI BRIDGE & IRON CO. - Mfg.		Purchase's Order No.		165000-1/19/51							
Distributor				Distributor's Order No.		H							
ITEM NO.	ITEM	PRODUCT		SPEC.	HEAT OR COATING	FORGING NO.	L/T Approved procedure S-12, Part 2 HEAT TREATMENT						
1	1	Inlets Forging per CINC. 2 Drawing 72, Part 6 (except S-11/16" dia. is corrected to 15-7/8") Mark 15-1-1		S-16503-2 & C-165 Spec'd MS-111, Part Suppliers 3 & C-12-101 Rev. 3	Q20110 16503-2 MS-111, Part Suppliers 3 & C-12-101 Rev. 3	946-L 1 VAT	1650°F., 25°F., for 14 hours- Air cool 1550°F., 25°F., for 14 hours- Water cool 1250°F., 25°F., for 14 hours- Oil cool Tests were stress relieved as follows: 1150°F., 25°F., for 50 hours. L/T Procedure SP-101, Part 6.						
CHART OF MECHANICAL PROPERTIES													
TESTS	TEST NO.	E2	TEST NO.	YIELD POINT	UTS	ELONG.	REDUCTION OF AREA	ROCKWELL C	ROCKWELL B	ROCKWELL D	NOT REPORTS ATTACHED	REMARKS	
S-12-L 1	Q20110	.21 .195	.49 .65	.010 .015	.015 .013	.23 .25	.31 .32	.73 .75	.61 .62	.08 .04	Check	PROJECTION Specimen - 1650°F., 25°F., mark G-25-2 Each side 10% Coatings in all parts L/T 1650°F., 25°F., mark G-25-2	
IV. HOLLOW AS DRAWN IMPACT TESTS (INCHES)								TESTS				TESTS	
S-12-L 1	Q20110	1	1	14 - 16.500 (100%)	14 - 16.500 (100%)	20.0	20.0	41 - 39 - 33	41 - 39 - 33	.032-.030-.026	.032-.030-.026	25 - 25 - 25	
		2	2	14 - 16.500 (100%)	14 - 16.500 (100%)	27.0	27.0	41 - 39 - 33	41 - 39 - 33	.072-.073-.075	.072-.073-.075	60 - 50 - 50	
		3	3	14.125	14.125	27.0	27.0	111 - 115 - 115	111 - 115 - 115	.076-.070-.076	.076-.070-.076	60 - 50 - 50	
		4	4	15.000	15.000	27.0	27.0	112 - 129 - 125	112 - 129 - 125	.076-.070-.076	.076-.070-.076	60 - 50 - 50	

It is to be noted that all applicable requirements of S-12-L 2 and
S-12-L 11, Sec. 2 & C-12-101, Rev. 3 have been complied with.

1/19/51 G.P.D.

Attachment I

600 N Western Ave, Chicago, Illinois 60603
Orange Tower Division
Phone 312-535-1000

Attachment I

Product Description: Lamb Chops

Batch Number: C-001-1

ITEM	PRODUCT	SPECIFICATION	STAT. NO.	STAT. OF CONTROLE	TESTING LAB.	MEAT TREATMENT	TESTS & RESULTS		
							TEST	TEST	TEST
1	Minced meat for infant food code mark 14-1-1	1500-2 G L.C. 513, Rev. 1.	Q1007	L173	1	Cuts into cubes tailored to size: 1150°F-115°F cut 50 hours. Rate of heating from 6°C to 600°F (160°C) min. max.			
<i>Chemical Analysis Test Results</i>									
ITEM	STAT. NO.	C	N	P	S	A	Ca	Na	TEST
									U.T. M.P. C.P.
									REMARKS
									GP Inspection Two (2) samples no-break 6-10 Two (2) stable no-break 60°F.
<i>Impact Tests (Kg/cm²)</i>									
ITEM	STAT. NO.	TEST NO.	TEST NO.	TEST NO.	TEST NO.	TEST NO.	TEST NO.	TEST NO.	TEST
1					115°F	1007-1	107-214-135	101-106-1072	101-107-107
							170-212-102		110-107-107

Information comes from GMP Standard for control.

Prepared by: [Signature], Date: 10/10/2012.

P. P. 004

Attachment I

P-1001
Task Order No. 11

Radium Content: 1.15%

Cadmium Content: 0.3%

No.	Subject	Date	TESTER	LOAD NO.	TEST TREATMENT												TEST APPLIED
					1	2	3	4	5	6	7	8	9	10	11	12	
1	Additional testing for critical radiation levels, 14-1.2	1552-6 Drg. 213, Rev. 1.	CONRAD	1300 2	Specs were stressed relieved as follows: 1150°F ^{450°F} for 50 hours. Rate of heating from & cooling to 600°F 100°F/hr. min.												
No.	TEST	c	m	s	a	b	d	e	f	g	h	i	j	k	l	TEST APPLIED	
																	TEST APPLIED
																	O ³ Activation LSD (S) sample no-breaks on 24
No.	TEST	TEST	TESTED ATTEMPT	TEST PERIOD	TEST METHOD	TEST TEST	TEST	TEST									
1	CONRAD			1552-6	1550 ⁴⁵⁰ °F for 50 hrs.	1550 ⁴⁵⁰ °F for 50 hrs.											1550 ⁴⁵⁰ °F for 50 hrs.

This table gives the test results in accordance.

Dated this day of May, 1957.

J. D. Jones

Attachment I

EXHIBIT I TESTIMONY												
TESTIMONY NUMBER	NAME	TITLE	REPORTING NUMBER	HEAT TREATMENT			TEST NUMBER			TEMPERATURE DETERMINATION		
				SUPERFICIAL TESTS	SHALLOW TESTS	PROF. TEST	TEST	TEST	TEST	D.W.	D.P.	C.S.
2	W.H. & S. (1)	TESTIMONY	200-100-412	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822
				800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822
				800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822	800-800-822

W.H. & S. (1) Heat Treatment Test No. 200-100-412

RECORDED AND INDEXED, PREPARED FOR USE.

200-100-412

Attachment I

Attachment I

BUDGET BY COUNTRIES													
	1	2	3	4	5	6	7	8	9	10	11	12	13
Argentina	\$137	\$133	\$118	\$115	\$111	\$108	\$105	\$102	\$100	\$98	\$95	\$92	\$90
Bolivia	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Brazil	\$137	\$133	\$118	\$115	\$111	\$108	\$105	\$102	\$100	\$98	\$95	\$92	\$90
Chile	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Ecuador	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Colombia	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Uruguay	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Venezuela	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110

(2) BUDGET BY COUNTRIES AND CATEGORIES OF EXPENDITURE

	1	2	3	4	5	6	7	8	9	10	11	12	13
Argentina	\$137	\$133	\$118	\$115	\$111	\$108	\$105	\$102	\$100	\$98	\$95	\$92	\$90
Bolivia	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Brazil	\$137	\$133	\$118	\$115	\$111	\$108	\$105	\$102	\$100	\$98	\$95	\$92	\$90
Chile	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Ecuador	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Colombia	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Uruguay	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110
Venezuela	\$132	\$131	\$129	\$127	\$125	\$124	\$122	\$120	\$118	\$116	\$114	\$112	\$110

(3) BUDGET BY COUNTRIES AND CATEGORIES OF EXPENDITURE

Attachment I

Purchaser's Order No. 150075-1/2671

Distributor's Order No.

ITEM	PRODUCT	SPEC	HEAT TREATMENT CODE NO.	FORGING NO.	L/P APPROVED PROCESSING HEAT TREATMENT EST. 4	TESTS	TESTS
					1550°F+25°F for 10 hrs. Air Cool	1550°F+25°F for 10 hrs. Water Quenched	1290°F+25°F for 10 hrs. Air Cooled
	Cast Iron Furnace per GMW Draw. 11, Rev. 6 Prints 16-1-2	SIS-35-2 & GMW Spec WL-112, Rev 3 & GMW-101 Rev. 3	150-104	5077-1	1550°F+25°F for 10 hrs. Air Cool,ed Tests were stress relieved as follows: 1150°F+25°F for 50 hrs. L/P approved process SIS-101, Rev. 0		

CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES

ITEM	HEAT NO.	C	Si	Mn	P	S	N	V	C-44 S15	TEST REPORTS ATTACHED			REMARKS
										U.T.	I.R.P.	D.P.	
	122 1204	.22 .09	.02 .007	.011 .003	.21 .26	.15 .37	.82 .31	.62 .61	C-44 S15 Locally Charred	X	X	X	Specimen No. 1 1 specimen each at -30°F, -20°F, & -10°F 2 specimens not heat treated to establish HTC G-1007. Specimen in accordance with specification 450000

IV. NUMBER 12 TESTS 1 IMPACT TESTS

ITEM	E.T. TEST TIME	TYPE PSI IN 1000	CYLINDRICAL WATER TESTING	CLOSURE IN INCHES	R.A. IN DEGREES	ENERGY IN FT-LBS	LATERAL EXP. IN %	REMARKS
		10 X 6 (S15-1000)						
		91.055	70.774	25.0	69.8	33-74-67	.073-.051-.060	20-60-70
		T x 27 Tests						
	09 150	99.092 85.400	61.733 67.253	23.5 27.0	70.0 73.5	95-61-85 112-59-125	.051-.055-.052 .073-.073-.073	53-45-52 70-50-70

It is further certified that all test results are in accordance with SIS-35-2 and GMW Draw. 11, Rev. 3 & GMW-101, Rev. 3 have been compiled with.

It is further certified that the above results are in accordance with the requirements of the specification.

L.P.

Attachment I

RECEIVED MATERIAL TESTS DATE 5-26-79
 FROM CINCINNATI & OHIO SUPPLY - M-7151

Purchaser's Order No. 150306-1/6521

Distributor's Order No.

Distributor's Order No.

ITEM NO.	PRODUCT	SPEC.	HEAT CODE NO.	FORGING NO.	U/F APPROVED PROCEDURE H-12, Rev. 4		TEST PLATES ATTACHED
					HEAT TREATMENT	VIT. NO.	
1	Outlet Nozzle Forging per CBM Draw. 12, Rev. 6 Mark: 15-1-2	S.A.S.C.-2 & CBM Specs. NS-113, Part 3 & Q.S-101 Rev. 3	Q235C4 Suppliers Et. No. 124-274	947L-2	1650°F+250°F for 10' hrs. Air Cooled 1550°F+250°F for 10' hrs. Water Quenched 1290°F+250°F for 10' hrs. Air Cooled Tests True stress Relieved as follows: 1150°F+250°F for 50 hrs. - U/F approved procedure SPHT-101, Part. 0		X

CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES

ITEM NO.	HEAT NO.	C	Mn	P	S	Ni	Cr	Mo	Cu	V	Y	Grain Size	NOT REPORTS ATTACHED			REMARKS
													U.T.	A.F.	D.P.	
H-2	Q235C4	.22 .207	.66 .71	.012 .005	.011 .012	.21 .33	.38 .40	.82 .80	.62 .52	.04 .03	Ladle Check	7	-	-	-	Dropweight Test 1 specimen break at -20°F, & -100°F. 2 was no-break at 0°C to establish hot 3-1 Testing in accordance with U/F approved plan C-21-23, Part 0

ITEM NO.	HEAT NO.	R.T. TEST TEMP.	TENSILE PSI @ 1000	YIELD PSI @ 1000	ELONG. % IN	E.A. %	E.H.R.	IV-BEND AS SHOWN & IMPACT TESTS (KWH/M)			REMARKS
								ENERGY IN. J/M	LATERAL EXP. IN. %		
H-2	Q235C4		41,000	71,750	25.0	70.5		71-72-56	.050-.051-.050	50-50-50	
			T = 27								
		0°	41,600	73,605	25.0	72.5		121-111-108	.070-.073-.079	50-50-70	
		100°	43,377	71,649	25.5	72.2		128-111-153	.079-.075-.094	72-70-70	

Specimen surfaces were all applicable requirements of SAE 500-2 and CBM Drawings 12-111, Rev. 3 and Q.S-101, Rev. 3 have been complied with.

Sample specimens were removed from the 1000 test section of each bar. Impact test specimens used for the transition curve.

Impact test specimens were to be cut out of the center of the transition curve.

Attachment I

CRAIG CO. MATERIAL TEST REPORT

CRAIG STAINES & IRV CO. - Memphis

DATE February 26, 1972

Purchaser's Order No. 100000-1000

Distributor's Order No.

ITEM	PRODUCT	SPEC.	MEAT OR CODE NO.	FORGING NO.	L/F APPROVED PROCEDURE E1-12 REV. 6		FOLLOWING INSTRUCTIONS YES	NO	
					MEAT TREATMENT	TEST			
1	Castell Forgings per CENI Spec. E1, Rev. 6 Mark: 14-1-3	S1505-2 & CENI Spec. E1-111, Rev. 3 & CEN-101 Rev. 3	C24111 Supplier Est. No. 1273319	947L-3	1650°F+250°F for 10 hrs. Air Cooled 1500°F+250°F for 10 hrs. Water Quenched 1250°F+250°F for 10 hrs. Air Cooled Tests were stress relieved as follows: 1150°F+250°F for 50 hrs. L/F approved procedure SPXH-101, Rev. 0				

CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES

MEAT NO.	C	N	P	S	SI	CR	R	100	V	C-21 Size	NOT REPORTS ATTACHED			REMARKS	
											U.T.	M.P.	D.P.		
3	C24111	.21 .22	.67 .65	.009 .006	.012 .010	.24 .25	.33 .37	.78 .78	.65 .62	.04 .03	Lewis Check	8	X	X	4 Specimens - Break at -30°F & -20°F. Two specimens - No break at -10°F to establish that C-200°F. Test in accordance with L approved test plan

MEAT NO.	P.T. TEST TEMP.	TENSILE PSI X 1000	YIELD PSI X 1000	ELONG. % H.R.	R.R. %	Z.H.W.	IV. BEND TESTS		V. IMPACT TESTS		C-21-2, REV. 4
							ENERGY IN JPSI	LATERAL EXP. UNIT	V-Notch 0° +20°F	V-Notch 0° +10°F	
3	C24111	53.215 27.714	83.422 67.500	25.5 25.5	69.9 72.0		75-37-75 116-111-115		.055-.026-.054 .076-.073-.074	40-20-50 70-70-70	00 01 02 03

2 Tests certifies that all applicable requirements of
CENI Spec. E1-111, Rev. 3 & CEN-101, Rev. 3 have been complied with.

1 Specimens were removed from the 180° location different
from the impact specimens used for the transition curves.

We certify that the above results are correct
and accurate in the opinion of the Company.

Attachment I

S.O. No.	5257-2	MATERIAL TEST REPORT				DATE		January 19, 1951			
Purchaser	CHICAGO BEAMS & IRON CO. - F. W. Ha.					Purchase's Order No.		LG3306-1/2531			
Shipper						Distributor's Order No.		H			
QTY.	1	PRODUCT		SPEC.	MANUFACTURER CODE NO.	FORGING NO.	U/P reported procedure S-12, Est. 1 HEAT TREATMENT				
		Inlets forgings per CS-12 Standard S2, Est. 6 (except 35-11/16" dia. is corrected to 35-7/8") S-12 15-1-1		CAS509-2 & CS57 Specs. M2-11, Part 3 & Q.S-101 Rev. 3	C2G-L16 Suppliers Ht. No. 1252R7 VAT	945-L 1	1650°F, +25°F, for 14 hours- 1450°F, +25°F, for 16 hours- 1290°F, +25°F, for 14 hours- Tests were stress relieved as follows: 1150°F, +25°F, for 50 hours. U/P reported procedure S-12 15-1-1, Est. 6.				
CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES											
TESTED NO.	TEST NO.	C	N	S	M	W	V	Grain Size	NOT REPORTS ATTACHED		
S-12 1	C2G-L16	.21	.69	.010	.015	.28	.31	.78	.61	REMARKS	
		.195	.65	.005	.013	.26	.32	.76	.62	Specimen S-12 1, Specified Material 2-2531 Tested by Festinger 12-12 Date 1/19/51 by C. P. D.	
TESTING AS SHOWN IN IMPACT TESTS (INCHES)											
TESTED NO.	TEST NO.	TEST TEMP. °F.	TEST TEMP. °F.	YIELD PSI @ 1000	YIELD PSI @ 1000	ELONG. % @ 2"	R.A.	1/2 INCH. S.H.R.	ENERGY (in.)	LATERAL EXP. (in.)	REMARKS
S-12 1	C2G-L16	72.7 + 20°C (DAZ) 81.1 + 15°C	72.7 + 20°C (DAZ) 81.1 + 15°C	60.628	30.0	70.0	1.1	41 - 32 - 33	.032-.033-.026	20 - 23.6	
		1	72.7 + 20°C (DAZ) 81.1 + 15°C	63.500	27.0	72.2	1.1	111 - 116 - 125	.072-.073-.065	60 - 52.3	
		0	63.125	63.500	27.0	71.4	112 - 129 - 125	.076-.050-.076	60 - 53 - 5		

Lehigh Forge certifies that all applicable requirements of S-12 12-111, Est. 3 & Q.S-101, Est. 3 have been complied with.

The specimens were removed from the 1000 location indicated.

OCT 19 1951 C.P.D.

Attachment I

ITEM	TEST NUMBER	PRODUCT	TEST NO.	MATERIAL TESTED	TESTING NO.	L/T APPROVED PROCEDURE E-12, REV. 6.	TEST TREATMENT	TEST REPORT ATTACHED			
								TEST 1	TEST 2	TEST 3	
1.		Cast aluminum per CBAI E-12, Rev. 6 (except the 35-11/16" x 2" corrected to 35-7/8"). Mark: 15-1-3	E1 500-2 & CBAI specs. E-111, Rev. 3 & CIS-101 Rev. 3.	Q32333 Supply Et. No. 1233335 V12	Q32333 Supply Et. No. 1233335 V12	Q32333 Supply Et. No. 1233335 V12	1650°F, +35°F, for 14 hours - 14% break 1550°F, +25°F, for 14 hours - Metal Quenched 1250°F, +25°F, for 14 hours - 14% break				
TESTS WERE SIMILARLY RELATED AS FOLLOWS:											
1150°F, +35°F, for 50 hours. L/T approved procedure E-101, Rev. 0.											
CIRCUIT BREAKER AND MECHANICAL REQUIREMENTS											
ITEM	WEIGHT LB.	C	D	E	F	G	H	I	J	K	
13	Q32333	.40	.75	.475	.3016	.21	.35	.42	.54	.64	TESTS OK
		.400	.71	.455	.3012	.22	.35	.51	.63	.74	TESTS OK
NOT REPORTS ATTACHED											
ITEM	WEIGHT LB.	C	D	E	F	G	H	I	J	K	
13	Q32333										TESTS OK
TESTS IN 2000, IMPACT TESTS (CONT'D)											
ITEM	TEST TIME	VEHICLE PER 81000	VEHICLE PER 81000	VEHICLE NO.	VEHICLE NO.	R.A. W	S.H.W.	FRONT END	LATERAL END	REAR	
13	Q32333	40 ± 6 67.415	Fronts (Q32333) 69.573	25.5	69.56			V-Metal 0 25-40-15	10°F .022-.031-.035	10 - 30	
		7 ± 22 6	Fronts 69.573	25.5	70.3			V-Metal 0 115-115-03	10°F .075-.069-.063	03 - 80 - 60	
		100	67.500	25.5	71.2			115-111-120	.052-.014-.075	03 - 50 - 50	

It is considered that all requirements of E1 500-2 and
E-111, Rev. 3 & CIS-101, Rev. 3 have been complied with.

Test results from the 1000 impact tests are as follows:

OK

Attachment I

C.C. No.		MATERIAL TESTED		DATE									
				1-17-65, 10:30									
Purchase Order No.				131077-2631									
Distributor				Distributor's Order No.									
ITEM NO.	PRODUCT	SPEC.	HEAT OR CODE NO.	FORGING NO.	HEAT TREATMENT		F.C.C. CHARTS ATTACHED						
					YES	NO							
1	1 Additional Testing for inlet nozzle Mark: 15-1-3	S-17-2 & L-15-113, Ker. 1.	Q2039W	435B 3	Irons were stress relieved as follows: 1150°F-25°F for 50 hrs. Rate of heating from & cooling to 600°F (100°F/hr. max.)								
CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES													
FORGING NO.	HEAT NO.	C	Mn	P	S	Si	Cr	Ni	Mo	NOT REPORTS ATTACHED			Dropweight Testin REMARKS
											U.T.	M.P.	
FORGING NO.	HEAT NO.	TEST TEMP.	TENSILE PSI @ 1%RO	YIELD PSI @ 100%	ELONG. % IN 2"	R.A. %	E.H.R.	IV-Mach 4125 81000			IMPACT TESTS (Keyhole)		
								ENERGY (H-I-B)	LATERAL EXP. (H-I)	BSHEAR			
150-3					120° location			112-101-96 110-112-153		.074-.054-.050 .039-.016-.073		50-10-10(10°F) 100-100-100(10°F)	

Position curve from the 0° location is attached.

CORRECTED TEST REPORT. DESTROY PREVIOUS COPY.

ENCL. COPY OF THE ABOVE ATTACHED TEST REPORT
IS MAILED TO THE PURCHASER BY AIR MAIL.*L. L. L.*

Attachment II

OUTLET NOZZLES

Nozzle	Process Type	Electr. TVs/sec.	Amps	Volts	Speed	Reheat Pct-AH	Tulc-Max Temp.	Process Type	Electr. TVs/sec.	Amps	Volts	Speed	Reheat Pct-AH	Tulc-Max Temp.	
25°	Bare & Fine	309 / $\frac{1}{8}$ "	90-150	71-25	\approx 82PM	200°F Max	400°F Max	Sub-Arc #	308L / $\frac{1}{8}$ "	230-275	34-40	34-44	250°F Max	100-1175°F	400°F Max
Tan Layer		5/32"	120-190	22-26	"	"	"	GA MA	308L / $\frac{1}{8}$ "	275-375	28-34	5-8	IRMA	"	"
No. Sprink.		3/16"	150-225	22-26	"	"	"								
Reheat 20%	SMA	308L / $\frac{1}{8}$ "	90-150	21-25	\approx 82PM	None	None	GA MA	308L / $\frac{1}{8}$ "	275-375	28-34	5-8	IRMA	"	"
Cutter 27° Sprink.		5/16"	100-190	22-26	"										
		3/8"	150-225	22-26	"										
		1/4"	205-290	23-27	"										
145°	Bare & Fine	309 / $\frac{1}{8}$ "	90-150	71-25	\approx 82PM	200°F Max	400°F Max	GA MA #	308L / $\frac{1}{8}$ "	275-375	28-34	5-8	2PM	100-1175°F	400°F Max
Tan Layer		5/32"	120-190	22-26	"	"	"	GA MA	308L / $\frac{1}{8}$ "	375-425	31-35	6-0-1.5	IRMA	"	"
No. Sprink.		3/16"	150-225	22-26	"	"	"								
SMA Aeo		308L / $\frac{3}{32}$ "	100-150	34-36	60-65PM	"	"								
Reheat 25% Sprink.	SMA Aeo	As 25° No Reheat													
		SP 25%													
265°	Bare & Fine	309 / $\frac{1}{8}$ "	90-150	21-25	\approx 82PM	200°F Max	400°F Max	GA MA #	308L / $\frac{1}{8}$ "	275-375	28-34	5-8	IRMA	100-1175°F	400°F Max
Tan Layer		5/32"	120-190	22-26	"	"	"	GA MA	308L / $\frac{1}{8}$ "	80-150	21-25	≤ 0.3 PM	"	"	"
No. Sprink.		3/16"	150-225	22-26	"	"	"								
Reheat 25% Sprink.		1/4"	205-290	23-27	"										
		SP 25%	As 25° No Reheat												

Tulc Nozzles

Nozzle	Process Type	Electr. TVs/sec.	Amps	Volts	Speed	Reheat Pct-AH	Tulc-Max Temp.	Process Type	Electr. TVs/sec.	Amps	Volts	Speed	Reheat Pct-AH	Tulc-Max Temp.	
115°	SMA	309 / $\frac{1}{8}$ "	80-150	21-25	\approx 82PM	200°F Max	400°F Max	GA MA	308L / $\frac{1}{8}$ "	60-150	21-25	≤ 0.3 PM	"	"	
95°		5/32"	120-190	22-26	"	"	"								
215°		3/16"	150-225	22-26	"	"	"								
335°		1/4"	205-290	23-27	"										
215°	SMA	As 215° Layer													
335°		SP 215°													

(3)