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AUTH.NAME AUTHOR AFFILIATION
SORENSEN,G.C. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Forwards response to Rev 1 to Generic Ltr 92-01 re reactor vessel structural integrity.Util participated in all BWR Owners Group activities re reactor vessel matl embrittlement issues.

DISTRIBUTION CODE: A028D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 31
TITLE: Generic Letter 92-01 Responses (Reactor Vessel Structural Integrity 1

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R I D S / A D D S

R I D S / A D D S

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MA4

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • 3000 George Washington Way • Richland, Washington 99352-0968 • (509) 372-5000

July 6, 1992
G02-92-160

Docket No. 50-397

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: WNP-2, OPERATING LICENSE NPF-21
RESPONSE TO GENERIC LETTER 92-01, REVISION 1

This submittal provides the Supply System's response to Generic Letter 92-01, Revision 1, "Reactor Vessel Integrity, 10 CFR 50.54(f)."

The letter identifies the information required by the NRC to assess compliance with requirements and commitments regarding reactor vessel integrity. The following discussions provide the information required for each of the identified questions contained in the Generic Letter.

Question 1

Certain addressees are requested to provide the following information regarding Appendix H to 10 CFR Part 50:

> Addressees who do not have a surveillance program meeting ASTM E 185-73, -79, or -82 and who do not have an integrated surveillance program approved by the NRC (see Enclosure 2), are requested to describe actions taken or to be taken to ensure compliance with Appendix H to 10 CFR Part 50. Addressees who plan to revise the surveillance program to meet Appendix H to 10 CFR Part 50 are requested to indicate when the revised program will be submitted to the NRC staff for review. If the surveillance program is not to be revised to meet Appendix H to 10 CFR Part 50, addressees are requested to indicate when they plan to request an exemption from Appendix H to 10 CFR Part 50 under 10 CFR 50.60(b).

Response

The Supply System's FSAR Section 5.3, Tables 5.3-1a and 5.3-1b, provide detailed paragraph by paragraph discussion of the Supply System's compliance with both 10 CFR 50, Appendix G and Appendix H requirements. Included in the tables is the information relative to the compliance with ASTM E185-73. The WNP-2 surveillance program complies with the ASTM E185-73 standard with the exception of the limiting beltline material and the minimum number of Charpy impact test specimens required.

The ASTM standard requires the surveillance materials to be taken from the limiting plate material. The test specimens in WNP-2's surveillance program are from actual beltline material, but not from the limiting plate material. The information obtained from the nonlimiting plate can be used to predict the behavior of the limiting plate material.

The ASTM E185-73 specification also requires a minimum of twelve Charpy specimens and two tension specimens (as needed) each taken from the base metal, weld metal and the heat affected zone (HAZ) metal. Two of the three capsules contain eight Charpy specimens and two or three tensile specimens for each material location. The third surveillance capsule contains the required 12 Charpy specimens and three or four tensile specimens for each of the required material locations. The capsule containing the 12 Charpy specimens is currently planned to be removed at 24 EFPY and will provide the more critical trending data for the prediction of the irradiation damage for the WNP-2 vessel. One of the capsules containing eight specimens, planned for removal at eight EFPY, will provide enough information to determine the shift in transition temperature for the vessel. The Supply System also intends on reconstituting the surveillance specimens from the first capsule pull which will allow a fourth specimen set if needed.

In addition, the Supply System is a member of the BWROG Supplemental Surveillance Program (SSP) Committee. The objective of that committee is to develop supplemental surveillance data which will allow the Supply System to better understand the extent of beltline embrittlement with increasing fluence. The testing being undertaken by the SSP Committee will greatly increase the BWR surveillance data base.

Considering that alternate compliance to Appendix G and Appendix H was identified in the FSAR and was approved during the review process (WNP-2 Safety Evaluation Report, NUREG-0892, March 1982), request for an exemption from Appendix H to 10 CFR Part 50 under 10 CFR 50.60 (b) for WNP-2 is not necessary.

Question 2

Certain addressees are requested to provide the following information regarding Appendix G to 10 CFR Part 50:

a. Addressees of plants for which the Charpy upper shelf energy is predicted to be less than 50 foot-pounds at the end of their licenses using the guidance in Paragraphs C.1.2 or C.2.2 in Regulatory Guide 1.99, Revision 2, are requested to provide to the NRC the Charpy upper shelf energy predicted for December 16, 1991, and for the end of their current license for the limiting beltline weld and the plate or forging and are requested to describe the actions taken pursuant to Paragraphs IV.A.1 or V.C of Appendix G to 10 CFR Part 50.

Response

The initial upper shelf energies (USE) for WNP-2 have not been determined at this time. The current plan is to test the baseline set of specimens provided by the NSSS supplier for upper shelf energy when the first capsule specimens are tested. The baseline set consists of 24 Charpy specimens each for the base metal, weld metal, and HAZ metal. Also, there are four base metal tensile specimens, five HAZ metal tensile specimens and three weld metal tensile specimens. Even though upper shelf energies have not yet been determined, it is not expected that the end of life upper shelf energy for the limiting material would be below 50 ft. lbs. This has been confirmed by the current USE prediction methodology developed by the BWROG Fracture Toughness Committee which the Supply System is a member. The Committee is developing methods to estimate USE in cases where plant beltline materials were only tested at transition temperatures. A report is currently being prepared for the NRC by the Committee.

b. Addressees whose reactor vessels were constructed to an ASME Code earlier than the Summer 1972 Addenda of the 1971 Edition are requested to describe the consideration given to the following material properties in their evaluations performed pursuant to 10 CFR 50.61 and Paragraph III.A of 10 CFR Part 50, Appendix G:

(1) the results from all Charpy and drop weight tests for all unirradiated beltline materials, the unirradiated reference temperature for each beltline material, and the method of determining the unirradiated reference temperature from the Charpy and drop weight test;

(2) the heat treatment received by all beltline and surveillance materials;

(3) the heat number for each beltline plate or forging and the heat number of wire and flux lot number used to fabricate each beltline weld;

(4) the heat number for each surveillance plate or forging and the heat number of wire and flux lot number used to fabricate the surveillance weld;

(5) the chemical composition, in particular the weight in percent of copper, nickel, phosphorous, and sulfur for each beltline and surveillance material; and

(6) the heat number of the wire used for determining the weld metal chemical composition if different than Item (3) above.

Response

The Supply System has provided a detailed discussion of the RPV beltline material properties and their use in developing the pressure temperature limits curves for operation. The detailed discussion is provided in WNP-2's FSAR Section 5.3.1.5.2.2. Included in this section of WNP-2's FSAR are the tables containing the beltline plate and weld metal heat numbers, chemistries (including copper, nickel, sulfur and phosphorus) and the highest determined RT_{NDT} temperature. Additional information relative to the vessel material is contained in letter G02-81-532, G.D. Bouchey to A. Schwencer, "Appendix G and H Information, Response to Materials Engineering Branch - Component Integrity Section," dated December 18, 1981.

Sufficiently detailed information with respect to the surveillance capsule materials may not have been provided. Attachment 1 contains this information for the surveillance materials. As stated earlier, this material is not from our limiting plate; however, correlations with respect to RT_{NDT} shift can still be performed.

Question 3

Addressees are requested to provide the following information regarding commitments made to respond to GL 88-11:

a. How the embrittlement effects of operating at an irradiation temperature (cold leg or recirculation suction temperature) below 525° F were considered. In particular licensees are requested to describe consideration given to determining the effect of lower irradiation temperature on the reference temperature and on the Charpy upper shelf energy.

b. How their surveillance results on the predicted amount of embrittlement were considered.

c. If a measured increase in reference temperature exceeds the mean-plus-two standard deviations predicted by Regulatory Guide 1.99, Revision 2, or if a measured decrease in Charpy upper shelf energy exceeds the value predicted using the guidance in Paragraph C.1.2 in Regulatory Guide 1.99, Revision 2, the licensee is requested to report the information and describe the effect of the surveillance results on the adjusted reference temperature and Charpy upper shelf energy for each beltline material as predicted for December 16, 1991, and for the end of its current license.

Response

The Supply System has not tested any of their surveillance capsules at this time. Therefore parts 3b and 3c do not apply.

In response to question 3a, embrittlement effects at temperatures below 525°F have been reviewed. A review of WNP-2's recent operating history was performed to determine the amount of time the reactor vessel experiences fluence at temperatures below 525°F. The total time the vessel was below 525°F was 3.63% with 2.35% occurring during heatup and 1.28% during cooldown. Using the information from the reactor vessel dosimetry wire data, a total expected end of life fluence was approximated for the time below 525°F. This number was below 1×10^{16} n/cm^2 and is well below the threshold limit for vessels not requiring a surveillance program for a fluence below 1×10^{17} n/cm^2. If any neutron damage were to occur at these lower temperatures, it will be reflected in the Charpy data from the surveillance specimen test and incorporated into the pressure temperature limit curves for WNP-2.

In summary, the Supply System has taken a proactive approach with regards to irradiation embrittlement of the WNP-2 reactor vessel. As a utility, we have participated in all BWROG activities with respect to reactor vessel material embrittlement issues. Currently the estimated end of life reference temperature is well below 200°F and upper shelf energy is expected to be above 50 ft.lb. Throughout the vessel life, the Supply System intends to maintain its vessel integrity at the highest level possible through active monitoring and tracking of vessel damage. In addition, specimen reconstitution will provide more data for our specific vessel which may also be used to confirm predictions or respond to regulatory changes. If there is a change in regulatory requirements or our vessel's irradiation damage exceeds the Regulatory Guides prediction, the utility will have the material available for additional testing.

Sincerely,

G. C. Sorensen, Manager
Regulatory Programs (Mail Drop 280)

TME/bk
Attachments

cc: JB Martin - NRC RV
NS Reynolds - Winston & Strawn
RR Assa - NRC
DL Williams - BPA/399
NRC Site Inspector - 901A
K Cozens - NUMARC

STATE OF WASHINGTON)

COUNTY OF BENTON)

Subject: Response to Generic Letter 92-01, Revision 1

I. G. C. SORENSEN, being duly sworn, subscribe to and say that I am the Manager, Regulatory Programs for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that I have the full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information, and belief the statements made in it are true.

DATE 6 July, 1992

G. C. Sorensen, Manager
Regulatory Programs

On this date personally appeared before me G. C. SORENSEN, to me known to be the individual who executed the foregoing instrument, and acknowledged that he signed the same as his free act and deed for the uses and purposes herein mentioned.

GIVEN under my hand and seal this 6th day of July 1992.

Notary Public in and for the
STATE OF WASHINGTON

Residing at Kennewick, Washington

My Commission Expires April 28, 1994

ATTACHMENT 1

Contents

1.1 Certified Test Report of one low alloy plate, CBIN piece mark 22-1-1, Lukens Steel Company Heat No. B5301, Slab No. 1.

PURCHASER:

12 CBI Nuclear Co.
P.O. Box 13308
Presidents Island
Memphis, Tenn. 38101

LUKENS STEEL COMPANY

COATESVILLE, PA. 19320

TEST CERTIFICATE

MILL ORDER NO.	CUSTOMER P.O.	
16446-1	N72-2647-3 Pt. 1	DP 102372 DD

Corrected Copy 11/21/7

DATE: 10/27/72 FILE NO. 1540-05-13

CONSIGNEE:
Chicago Bridge & Iron Co.
Boyles, Ala. 35202

SPECIFICATIONS: CBIN HS-51.1 2647 Rev. 3 DTD 8/14/72 Except Para. 6.0 CBS-51 Rev. 1 SA-533 Gr. B Class 1 Sect. II & III Incl. Summpr 1971 Addenda

BEND TEST O.K. HOMOGENEITY TEST

Sheet # 1 of 2

CHEMICAL ANALYSIS

MELT NO.	C	Mn	P	S	Cu	Si	Ni	Cr	Mo	V	Ti	Al	B	Grain Size	
B5301	20	1.34	017	014	14	23	50		52	00				7-8	V.I.P. Steel SS Surf CLAD 7

PHYSICAL PROPERTIES

MELT NO.	SLAB NO.	YIELD PSI X100	TENSILE PSI X100	% ELONG. IN 2"	% R.A.	BHN	IMPACTS Long. V-Notch +10°F.			Fracture Appearance % Shear	DESCRIPTION
B5301	1	629 571	840 800	27 29			64 52	62 52	66 55	50-60-60 40-40-40	1- 6-7/16" x 177 x 258
					Lateral Expansion in Inches		.056 .045	.056 .044	.056 .044		

TOP DROP HEIGHT TRANS. CURVE

TEMP.	RESULTS
+10°F.	No Break
0°F.	No Break
-20°F.	2 No Break
-30°F.	Break
-40°F.	Break

N.D.T. is -30°F.

BOTTOM DROP HEIGHT TRANS. CURVE

TEMP.	RESULTS
0°F.	No Break
-10°F.	No Break
-30°F.	2 No Break
-40°F.	Break
-50°F.	Break

N.D.T. is -40°F.

Rec 11-30-72

Pc MK 22-1-1

We hereby certify the above figures are correct as contained in the records of the company.

SUPERVISOR-TESTING C.F. Fr. Lune

2

PURCHASER:

12 CBI Nuclear Co.
Memphis, Tenn.

LUKENS STEEL COMPANY
COATESVILLE, PA. 19320
TEST CERTIFICATE

MILL ORDER NO.	CUSTOMER P.O.
16446-1	N72-2647-3 Pt. 1

Corrected Copy 11/21/
DATE: 10/27/72 FILE NO. 1540-05-1
CONSIGNEE:
Chicago Bridge & Iron Co.
Doylos, Ala.

SPECIFICATIONS:
SAME

Sheet # 2 of 2

BEND TEST HOMOGENEITY TEST

CHEMICAL ANALYSIS

MELT NO.	C	MN	P	S	CU	SI	NI	CR	MO	V	TI	AL	B		

PHYSICAL PROPERTIES

MELT NO.	SLAB NO.	YIELD PSI X100	TENSILE PSI X100	% ELONG. IN	% R.A.	BHN	IMPACTS		DESCRIPTION

Plate and tests heated to 1650°F.±25°F., held 1/2 hr. per inch min. and water quenched to below 400°F., (Time in quench tank - 26 minutes) then tempered 1280°F., held 1/2 hr. per inch min. and water quenched. (Time in quench tank - 26 minutes)

Plate and tests stress relieved by heating to 1175°F., held 1 hr. and air cooled.

Tests stress relieved by heating within a rate of 100°F. per hr. to 1150°F.+25°F.-50°F., held 50 hrs. and furnace cooled within a rate of 100°F. per hr. to 600°F., then air cooled.

Above material has not been U.T. Tested at LUKENS STEEL CO.

We hereby certify that the above material has been manufactured according to CBIN MS-51.1 2647 Rev. 3 DTD 8/14/72, Except Para. 6.0 QAS-51 Rev. 1 SA-533 Gr. B Class 1 Sect. II & III Incl. Summer 1971 Addenda, and that we have complied with all the requirements of this specifications.
H.T. Procedure - LS-102 Rev. 10, DTD 6/2/72.

We hereby certify the above figures are correct as contained in the records of the company.

SUPERVISOR TESTING

E
LUKENS
BESSOI-X
LARGEST GRD CLN
MT VN VO NY

THE SPECIALIST IN PLATE STEELS

GE 501 REV 2-72

ULTRASONIC EXAMINATION REPORT

CHICAGO BRIDGE & IRON COMPANY

Location SOUTHEASTERN Shop ☑ Field ☐ Contract Number [illegible] Report or Sequence Number [illegible]

CUSTOMER INFORMATION: GENERAL ELECTRIC CORP.

DESCRIPTION & STAGE OF PART OR WELD: U.T. 100%

Rim #2 R 2.2.1-1 UT-B 5801/1

PROCEDURE AND REV. NO.: UTP-216 Rev. 5

COUPLANT: Couplant Water

INSTRUMENT NO.	CALIBRATION DATE	MFG. TRANSDUCER	SIZE	ANGLE	FREQUENCY
[illegible]	8-30-72	[illegible]	1/2"	5°	2.25 MHz

Record indications specified by procedure.

None

ACCEPT: ☑ REPAIR REQUIRED: ☐ REJECT: ☐

The initial examination covered by this report has been performed in accordance with applicable procedure: [signature] OPERATOR -A- LEVEL 1-26-73 DATE

All indications have been evaluated in terms of applicable acceptance standards. Non-conforming indications noted on above sketch and have been reported to the Quality Assurance supervisor. [signature] EVALUATOR -A- LEVEL 1-26-73 DATE

Examination and evaluations have been performed to my satisfaction. [signature] 1-29-73 FOREMAN

Witnessed and accepted by: CUSTOMER

Witnessed by: [signature] AUTHORIZED INSPECTOR

1.2 Certified Test Report of one heat of weld wire, The Reid-Avery Company Heat No. 3P4966.

7

THE REID-AVERY COMPANY
BALTIMORE, DUNDALK, MARYLAND

DATE: 1/26/73

QUALITY ASSURANCE TEST REPORT

SOLD TO: Chicago Bridge & Iron Nuc. Co.
2700 Channel Avenue
P. O. Box 13308
Memphis, Tenn. 38113

SHIPPED TO: Same

DATE SHIPPED: _____

P. O. NO:- M52503 0416-30 Rev. 3

P.O. NO:-

JAN 30 1973

SPECIFICATION: WAS 101, Rev. 3 and QAS 312, Rev. 0

ITEM	POUNDS	SIZE	TYPE	LOT NO.	HEAT NO.
1.	30,000	3/16	(INCO) HSM/Ni		3P4966
2.	30,225	3/16	(INCO) HSM/Ni		3P4966
3.	6,430	3/16	(INCO) HSM/Ni		3P4966
4.					
5.					
6.					

CHEMICAL ANALYSIS OF WIRE OR WELD METAL

ITEM	C	MN	P	S	SI	CR	NI	MO	VA	CU	AL
1.	.14	1.89	.006	.011	.10	.06	.96	.50	.001	.03	.006
2.	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "
3.	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "
4.											
5.											
6.											

ADDITIONAL TEST RESULTS

Minimum tensile - 109,000 psi

Maximum tensile - 113,000 psi

OK 1/31/73

State of _____

City of _____
Subscribed and sworn to before me this _____ day

of _____ 19____

_____
Notary Public
My commission expires _____

I certify the chemical analysis and physical or mechanical test results reported above meet the specifications on the described material and are correct as contained in the records of the company.

Libby Bontarello

8

THE REID-AVERY COMPANY
BALTIMORE, DUNDALK, MARYLAND

DATE: 1/26/73

QUALITY ASSURANCE TEST REPORT

SOLD TO: Chicago Bridge & Iron Nuc. Co.
2700 Channel Avenue
P. O. Box 13308
Memphis, Tenn. 38113

SHIPPED TO: Same

DATE SHIPPED:

P.O. NO:- MS2503.0416-30

P.O. NO:-

SPECIFICATION: MMS 101, Rev. 3 and QAS 312, Rev. 0

ITEM	POUNDS	SIZE	TYPE	LOT NO.	HEAT NO.
1.	9,728	3/16	(INMM) HMM/Ni		3P4966
2.	6,021	3/16	(INMM) HMM/Ni		3P4966
3.					
4.					
5.					
6.					

CHEMICAL ANALYSIS OF WIRE OR WELD METAL

ITEM	C	MN	P	S	SI	CR	NI	MO	V	CU	AL
1.	.14	1.89	.006	.011	.10	.06	.96	.50	.001	.03	.006
2.	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	" "
3.											
4.											
5.											
6.											

ADDITIONAL TEST RESULTS

Minimum Tensile - 109,000 psi
Maximum Tensile - 113,000 psi

QAS 1/31/73

State of _____

City of _____
Subscribed and sworn to before me this _____ day

_____ 19____

_____
Notary Public
My commission expires _____

I certify the chemical analysis and physical or mechanical test results reported above meet the specifications on the described material and are correct as contained in the records of the company.

Libby Barricello

1.3 Certified Test Report of one lot of submerged-arc welding flux, Linde Grade 124 Flux, Lot No. 1214.

LINDE DIVISION
P.O. Box 747, Niagara Falls, New York 14302

CERTIFICATE OF ACCEPTANCE INSPECTION

Shipped to: Chicago Bridge & Iron Co.
Nuclear Div.
2700 Channel Ave.
Memphis, Tenn. 38106

Shipper's No.: 210351B
Quantity Shipped: 96,000 lbs.
Date Shipped: 3-15-73

Your Order No.: 08721-0351
CBI PO M21902041630

MAR 19 1973

REPORT OF TESTS OF GRADE 124 UNIONMELT WELDING COMPOSITION

Identification of Material Tested - Grade 124, Size 20 x 150,

Lot 1214, Control 3481.

This certifies that the Welding Composition identified above has been tested for conforming to specifications as follows:

Sizing:	20 Mesh	Minus 150 Mesh
	0.6%	6.0%
	2.5%	10%

Uniformity:	SiO_2	CaO	Al_2O_3	P
	34.29%	18.82%	14.52%	0.022%
	29-38%	18-23%	11-17%	0.025%

Lower line gives specification limits - single values are maximum.
This also certifies that the material herein identified conforms to CBI specification WMS-102, Revision 1 and QAS-315, Revision 0.

State of New York
County of Niagara

Sworn to before me this

15 day of March, 1973

James B. Gertz

JAMES B. GERTZ
Notary Public, State of New York
Qualified in Niagara County
My Commission Expires March 30, 1974

3/19/73

Consumables Quality - Electric Welding

2.0 Heat Treatment Records

FURNACE CYCLE REPORT

CHICAGO BRIDGE & IRON COMPANY

Prepared by Ray Approved by [illegible] Date 4-1 1974

Furnace #370 Heat No. T832 Procedure HTP-12, Rev 4

CONTRACT NO.	PIECE MARK	HEAT TREATMENT
71-2647	SURVEILLANCE TEST R	S.R.
	Pc. 127-1	
	Seq. 697-10	
71-2631	PT. 415D & PT. 415G	
73-C115U	PT. 446A & PT. 446B	do

CHF
572
587

COMPLETE SKETCH SHOWING LOCATIONS OF THERMOCOUPLINGS

TOP VIEW

Start furnace with controls set at 600 °F Aim at 1150°

45 minutes after starting furnace, raise temperature at 50 °F per 30 minutes

HOLD [☑ Plate temperature (by Model S Recorder) / ☐ ~~Furnace temperature (by Model A)~~] 1100 (MINIMUM) to 1175 (MAXIMUM) °F for 50 hours.

With furnace doors closed, bring temperature down at 50 °F per 30 minutes.

Raise furnace doors at 600°F.

Special notes

"Use Calibrated T.C. show location & number of each"

FURNACE OPERATORS – PLEASE FILL IN THE FOLLOWING

Furnace started at 11:30 AM/PM By 741 4-1-74 [illegible]

Relieved at 1120 AM/PM By 66 4-1-74 R. temperature [illegible] °F

Relieved at 11:30 AM/PM By 340 R. temperature 530 °F

Relieved at ____ AM/PM By ____ R. temperature ____ °F

Furnace Cutoff at 4:00 AM/PM By 177

Heat Treatment Complete [signature] (SIGNATURE) 4-4-74 (DATE)

Time-Temperature Record made NCM [signature] (SIGNATURE) 4-8-74 (DATE)

Reviewed by and approved ____ (SIGNATURE) ____ (DATE)

BH 144

FURNACE CYCLE REPORT
CHICAGO BRIDGE & IRON COMPANY

Prepared by Ray Approved by D.J.P. / JEB Date 5-1 19 74

Furnace M.E. Heat No. T896 Procedure HTP-12, Rev. 4

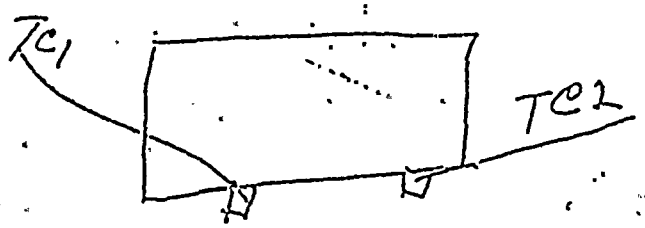
CONTRACT NO.	PIECE MARK	HEAT TREATMENT
71-2647	SURVEILLANCE TEST R	PWHT
	(127-2 TO 127-3)	
	Seq 698-5	

COMPLETE SKETCH SHOWING LOCATIONS OF THERMOCOUPLINGS

TOP VIEW

TC1 CA798

TC2 CA799



Start furnace with controls set at 600 °F

45 minutes after starting furnace, raise temperature at 50 °F per 30 minutes.

HOLD [☑ Plate temperature (by Model S Recorder) / ☐ ~~Furnace temperature~~] 1100 MINIMUM to 1175 MAXIMUM °F for 2½ hours.

With furnace doors closed, bring temperature down at 50 °F per 30 minutes.

Raise furnace doors at 600 °F.

Special notes

"USE CALIBRATED T.C. SHOW TAG NO. & LOCATION ON EACH"

FURNACE OPERATORS – PLEASE FILL IN THE FOLLOWING

Furnace started at 730 AM/PM By 666 5-1-74

Relieved at ____ AM/PM By ____ R. temperature ____ °F

Relieved at ____ AM/PM By ____ R. temperature ____ °F

Relieved at ____ AM/PM By ____ R. temperature ____ °F

Furnace Cutoff at 345 AM/PM By RJB 5-2-74

Heat Treatment Complete PA Bilanski PO (SIGNATURE) (DATE)

Time-Temperature Record made NCM L. Ray Williams (SIGNATURE) 5-3-74

14

REV 2-73

(CBI) FURNACE CYCLE REPORT

Prepared by [illegible] Approved by M.L.C. Date 5-7 19 74

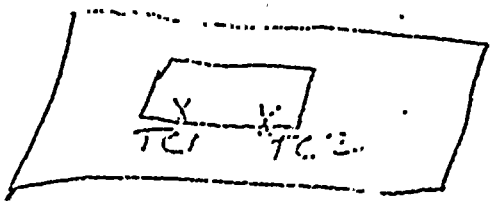
Furnace #321 Heat No. 1106 Procedure HTP-12, Part 4

CONTRACT NO.	PIECE MARK	HEAT TREATMENT
712447	Test 2' 127-2,3	S.R
	Sp 698-7	

CA
677
678

COMPLETE SKETCH SHOWING LOCATIONS OF THERMOCOUPLINGS

TOP VIEW



Start furnace with controls set at 600 °F

45 minutes after starting furnace, raise temperature at 50 °F per 30 minutes.

HOLD [☑ Plate temperature (by Model S Recorder) / ☐ ~~Furnace temperature (by Model-R)~~] 1100 (MINIMUM) to 1125 (MAXIMUM) °F for 47½ hours.

With furnace doors closed, bring temperature down at 50 °F per 30 minutes.

Raise furnace doors at 300 °F.

Special notes

FURNACE OPERATORS – PLEASE FILL IN THE FOLLOWING

Furnace started at 3:00 AM/PM By [illegible]

Relieved at 4:00 AM/PM By [illegible] PL TEMP. 330 °F

5-9-74 Relieved at 8:00 AM/PM By [illegible] PL TEMP. 1140 °F

Relieved at ____ AM/PM By ____ PL TEMP. ____ °F

Furnace Cutoff at 12:30 AM/PM By [illegible]

TIME		METER READING	PRESSURE
____ AM/PM	AT START UP	____	____
____ AM/PM	BEGIN SOAK	____	____
____ AM/PM	END SOAK	____	____
____ AM/PM	AT CUT OFF	____	____

Heat Treatment Complete [illegible] SIGNATURE 5-9-74 DATE

Time-Temperature Record made [illegible] SIGNATURE 5-14-74 DATE

Reviewed by and approved ____ SIGNATURE ____ DATE

3.1 Magnetic Particle Examination Reports

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GE 500 REV 12-

MAGNETIC PARTICLE EXAMINATION REPORT

Location SOUTHEASTERN Shop ☑ Field ☐ Contract Number 71-264-7 Report or Sequence Number 698-1

CUSTOMER INFORMATION
GENERAL ELECTRIC CORP.

DESCRIPTION & STAGE OF PART OR WELD H.T. WELD PREPS ON 127-2 & 127-3 ☒ OUTSIDE ☐ INSIDE

SURVEILLANCE TEST P.

PROCEDURE AND REV. NO.	☑ PRODS ☐ YOKE	MFR OR BRAND	PROD OR POLE SPACING	AMPS	☑ DC ☐ AC	CALIBRATION DATE
MTP-10 Rev. 6		MAGNAFLUX	6"	650		3-22-74

MACHINE	MFR OR	RATING	PARTICLES:	☑ DRY ☐ WET
620	MAGNAFLUX	0-4,000	GREY	
			COLOR & MFR: PARKER	

Record all non-conforming indications which were not removed during examination and/or evaluation. (Those in base material must be accurately located and referenced to some definable point.

No indications

ACCEPT: ☒ REPAIR REQUIRED: ☐ REJECT: ☐

The initial examination covered by this report has been performed in accordance with applicable procedure: 396 & 323 — Clarence E. Coates (OPERATOR) A (LEVEL) 3-22-74 (DATE)

All indications have been evaluated in terms of applicable acceptable standards. Relevant non-conforming indications have been noted on above sketch and been reported to the Quality Assurance Supervisor. 323 — Clarence E. Coates (EVALUATOR) A (LEVEL) 3-22-74 (DATE)

Relevant, non-conforming indications, other than shown in above sketch, have been removed in accordance with approved procedure GRP____ Rev____ Para____, the area re-examined, and found to be acceptable. Q.A. SUPERVISOR DATE

Examination and evaluations have been performed to my satisfaction. FOREMAN | Witnessed and accepted by: | Witnessed by:

[NUCLEAR]

GE 500 REV 1

MAGNETIC PARTICLE EXAMINATION REPORT

Location SOUTHEASTERN Shop ☑ Field ☐ Contract Number 71-2647 Report or Sequence Number 698-4-F

CUSTOMER INFORMATION
GENERAL ELECTRIC CORP.

DESCRIPTION & STAGE OF PART OR WELD M.T. BACKGOUGE (127-2 TO 127-3) ☒ OUTSIDE ☐ INSIDE

SURVEILLANCE TEST R

PROCEDURE AND REV. NO.	☒ PRODS ☐ YOKE	MFR OR BRAND	PROD OR POLE SPACING	AMPS	☒ DC ☐ AC	CALIBRATION DATE
MTP-10 Rev. 6		MAGNAFLUX	6"	650		4-23-7

MACHINE	MFR OR	RATING	PARTICLES:
252	MAGNAFLUX	0-4000	☒ DRY ☐ WET

COLOR & MFR: Gray Magnaflux

Record all non-conforming indications which were not removed during examination and/or evaluation. (Those in base material must be accurately located and referenced to some definable point.

No indications

ACCEPT: ☒ REPAIR REQUIRED: ☐ REJECT: ☐

The initial examination covered by this report has been performed in accordance with approved procedure: 86-E-323 — Operator [illegible] Level A Date 4-23-7[illegible]

All indications have been evaluated in terms of applicable acceptance standards. Relevant non-conforming indications have been noted on above sketch and have been reported to the Quality Assurance Supervisor. — Evaluator [illegible] Level A Date 4-23-7[illegible]

Relevant, non-conforming indications, other than shown in above sketch, have been removed in accordance with approved procedure GRP____ Rev____ Para____, the area re-examined, and found to be acceptable. — Q.A. Supervisor — Date

Examination and evaluations have been performed to my satisfaction. — Witnessed and accepted by: — Witnessed by:

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CBI

MAGNETIC PARTICLE EXAMINATION REPORT

Location SOUTHEASTERN Shop ☑ Field ☐ Contract Number 71-2-647 Report or Sequence Number 698-6A

CUSTOMER INFORMATION: GENERAL ELECTRIC CORP.

DESCRIPTION & STAGE OF PART OR WELD: M.T. WELD SEAM ☑ OUTSIDE ☐ INSIDE

SURVIELLANCE TEST R 127-2 TO 127-3

PROCEDURE AND REV. NO.	☑ PRODS ☐ YOKE	MFR OR BRAND	PROD OR POLE SPACING	AMPS	☑ DC ☐ AC	CALIBRATION DATE
MTP-10 Rev. 6		MAGNAFLUX	5"	500		5-7-7

MACHINE	MFR OR	RATING	PARTICLES: ☑ DRY ☐ WET
640	MAGNAFLUX	0-4,000	COLOR & MFR: Grey PARKER

Record all non-conforming indications which were not removed during examination and/or evaluation. (Those in base material must be accurately located and referenced to some definable point.

No indications found recordable per specifications"

The initial examination covered by this report has been performed in accordance with applicable procedure: J M Hammond A 5-7-74
OPERATOR LEVEL DATE

All indications have been evaluated in terms of applicable acceptable standards. Relevant non-conforming indications have been noted on above sketch and have been reported to the Quality Assurance supervisor. Item is: Acceptable ☑ Unacceptable ☐
J M Hammond A 5-7-74
EVALUATOR LEVEL DATE

Relevant, non-conforming indications, other than shown in above sketch, have been removed in accordance with approved procedure GRP____ Rev ____ Para ____, the area re-examined, and found to be acceptable.
QA SUPERVISOR DATE

Examination and evaluations have been performed to my satisfaction. [signature]

Witnessed and accepted by: CUSTOMER

Witnessed by: AUTHORIZED INSPECT

3.2 Ultrasonic Examination Report

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ULTRASONIC EXAMINATION REPORT

Location SOUTHEASTERN Shop ☑ Field ☐ Contract Number 71-2647 Report or Sequence Number 698-6B

Customer Information GENERAL ELECTRIC CORP.

Description & Stage of Part or Weld Surveillance Test B 127-2 & 127-3

Procedure and Rev No. UTP-27 Rev 10

Couplant EXOSEN

Instrument No.	Calibration Date	Mfg. Transducer	Size	Angle	Frequency
6340	3-4-74	BRAUSON	½x1"	45°	2.25MC

Record indications specified by procedure.

"No indications found recordable per specifications"

The initial examination covered by this report has been performed in accordance with applicable procedure: DM Brunell (Operator) A (Level) 5-7-74 (Date)

All indications have been evaluated in terms of applicable standards. Non-conforming indications noted on above sketch and have veen reported to the Quality Assurance Supervisor.

Item is: Acceptable ☑ Unacceptable ☐

DM Brunell (Evaluator) A (Level) 5-7-74 (Date)

Examination and evaluations have been performed to my satisfaction. [signature] Foreman

Witnessed and accepted by: Customer

Witnessed by: Authorized Inspector

3.3 Radiographic Examination Report

GO 629 REV 1-73

NUCLEAR

RADIOGRAPHIC EXAMINATION REPORT

Contract No. 71-2647 Region SOUTHEASTERN ☑ Shop ☐ Field Sequence No. 698-6C

CUSTOMER INFORMATION: GENERAL ELECTRIC CORP. Surveillance Test R 127-2, 3

PROCEDURE & REV.: R-P-B, Rev. 8

SKETCH GEOMETRIC ARRANGEMENT OF RADIOGRAPHS & LOCATION MARKERS ON BACK OF REPORT OR ON RECORD DWG #__ REV.__

RADIOGRAPHY DATE: 5-7-74

ISOTOPE	CURIES	FOCAL FILM DIST	TIME OR "R"	DIA & LGTH/FOCAL SPOT SIZE	WELD PROCEDURE	FILM TYPE & BRAND	☐ SINGLE FILM ☑ DOUBLE FILM
					323-2F4-F6 Rev. 5	AA - KODAK	
X-RAY	**KV**	**MA**		**WIDTH & LGTH/FOCAL SPOT SIZE**	**MATERIAL THICKNESS**	**SCREENS-TYPE & THICKNESS**	
2.5 Mev.			42 1/2"	4 min. .063"	6 1/2"	LEAD .010"	

SEAM MARK	INT. NO.	LOCATION AND SIZE OF UNACCEPTABLE DEFECTS SHOWN BELOW OR ON AN ATTACHED REPAIR CHART EACH SPACE = ONE INCH OF FILM	INT. NO.	UNACCEPTABLE DEFECTS: GAS OR SLAG	POROSITY	NON FUSION	CRACK	NO. OF INS	RE-SHOT NO.	WELDER'S NAME OR INITIALS	BRIEFLY DESCRIBE APPARENT DEFECTS IF NO APPARENT DEFECTS INDICATED, STATE "NAD"
A	0		1							"SEE WELDERS REPORT"	"NAD"
	1		2								"
	2		3								"
	3		4.								"

The radiography covered by this report has been performed in accordance with the applicable procedure

All indications have been evaluated in terms of applicable acceptance standards.

Radiography & evaluation have been performed to my satisfaction.

Reviewed and accepted by— Re Reviewed 12-2-74

Kenneth S. Jones	5-7-74	R. Ray Allison	5-7-74	D. J. Garrettson	5-7-74	R. H. Dunlap (CUSTOMER)	DATE
RADIOGRAPHER(S)	DATE	Q.A. SUPERVISOR/GRADER	DATE	FOREMAN	DATE	AUTHORIZED INSPECTOR	5-7-74 DATE

* original not signed

4.0 Specimen Weld Procedure

TABLE 9 - Detail Weld Procedure for Hanford 2 surveillance Program.

Low Alloy SMA & SA Grooves & Buildup

CUSTOMER General Electric Company

PRODUCT NUCLEAR VESSELS (Class 1)

DESCRIPTION Shielded Metal Arc and Submerged Arc Welding of ASME P12B Subgroup 1 Material

PROCEDURE NUMBER WPS 323-2F4F6

PAGE NO. 1 OF 3

DATE 2-17-69

REVISION NO. 5 (7-28-72) RAD

REFERENCE SPECIFICATIONS

General WPS 800 Latest Revision
General WPS 820 Latest Revision

PROCEDURE QUALIFICATION

NO.	POSITION	THICKNESS RANGE
963(SW)	F(Sub Arc) F,V,H(SMA)	4.5" to 9.9"
1261(SW)	F(Sub Arc) F,V(SMA)	.3/16" to 8"

POST HEAT TREATMENT -

Procedure qualified with 50 hrs. at 1150°F +25°/-50°F.

Post weld heat treatment of the weldment shall be in accordance with a CB&I approved procedure.

BASE METAL -

ASME SA-533 Gr B Class 1 or SA-508 Class 2
ASME Group No. P12B Subgroup 1

FILLER METAL - ASME

See Adjacent Column

ELECTRICAL CHARACTERISTICS -

See Adjacent Column

SHIELDING GAS - None

BACKUP GAS - None

FLUX - Linde 124

CUSTOMER APPROVED

VPF# 6080-011-1

CUSTOMER APPROVAL DATE 6-4-79

Lynn Hixson
INITIALS

PREHEAT REQUIREMENTS:

Minimum preheat of 300°F shall be applied uniformly to the full thickness of the weld joint and adjacent base material for a minimum distance of "T" or 6", whichever is least, where "T" is the material thickness.

Maintain preheat temperature until start of post weld heat treatment.

INTERPASS TEMPERATURE REQUIREMENTS

The interpass temperature shall not exceed 500°F maximum.

FILLER METAL:

Submerged Arc

Specification - N.A.
Classification - N.A.
Analysis - A3 (except Ni 0.50 to 1.25)
Usability - F6
Trade Name - Raco- 1NMM (1% Nickel or equal

Shielded Metal Arc

Specification - SFA-5.5
Classification - E8018-G
Analysis - A3 (except Ni 0.50 to 1.25)
Usability - F4
Trade Name - Alloy Rods E8018NM

ELECTRICAL CHARACTERISTICS:

SMA - DCRP

Submerged Arc
Tandem Wire
Lead Wire - DCRP
Trail Wire - AC
Single Wire - DCRP

CQA Stamp Page 4

VIEWED	CB&I DES	CB ENGS QES	CB ENGR S.S.	CB ENGR MATL	CB WELD	CB INSP TEST	CB QC	CB NU QC	CB NU CPN	REG MFG	REG MFG QC	REG CONST	REG CONST QC	BY	DATE
														AEH	3/5/6
	DES		RW	APB	ANR					IVM	CDP			ANR	3/5/6