

NCE ENGINEERING PROCEDURE

EP-74270-100, REV. 0

ENGINEERING REQUIREMENTS FOR
STEAM GENERATOR TUBE PLUGGING
AT WATERFORD UNIT NO. 3

PREPARED BY: J.H. Sullivan DATE: 2-4-82
REVIEWED BY: Julian L. Daniel DATE: 2-4-82
APPROVED BY: J.M. Allen DATE: 2-5-82

COMBUSTION ENGINEERING, INC.
CHATTANOOGA, TENNESSEE

CONTRACT 74270

8205030 476

RECORD OF REVISIONS

REVISION NUMBER	REVISION DATE	PARAGRAPH(S) INVOLVED	PREPARED BY	APPROVED BY

1.0 SCOPE

- 1.1 This Engineering Procedure defines the engineering requirement for steam generator tube plugging at the Louisiana Power and Light Company, Waterford Unit No. 3.
- 1.2 All work performed under this procedure shall be in accordance with the requirements of the ASME Code, Section XI, 1980 Edition thru Winter 1980.
- 1.3 Detailed instructions to perform the tube plugging shall be issued by NCE - Field Services. These instructions shall reflect the requirements of this engineering procedure.

2.0 EQUIPMENT AND MATERIALS

- 2.1 Special equipment and tooling required to perform the tube plugging operation will be provided by NCE Field Services.
- 2.2 Air and electricity hook-ups, common hand tools, and site machine shop/maintenance shop facilities are to be available from the utility.
- 2.3 Tube plugs of INCO 82 material, made to NCE Drawing A-6340-099-002-00 shall be used. Certification of ultrasonic, dimensional and penetrant inspection will be supplied by Chattanooga Quality Assurance along with the vendor material certification.

3.0 GENERAL REQUIREMENTS

- 3.1 After the plugging operation is completed, the primary side shall be restored to Class B cleanliness as defined in Paragraph 5.4.

NOTE: It is not the intent of this procedure to cover cleanliness deviations existing prior to work initiation.

- 3.2 The primary nozzles (inlet and outlet) shall be sealed to prevent loose parts inadvertently to enter the primary piping.
- 3.3 Provide for the health and safety of personnel involved in the tube plugging operation.
- 3.4 Provide an inventory system to insure that no loose pieces are left in the vessels.
- 3.5 Protect the manway gasket sealing surfaces with Mystic Tape No. 469 or equal.

4.0 SPECIFIC REQUIREMENTS

- 4.1 The tubes to be plugged are defined in FAR 9270-239.
- 4.2 All locations to be plugged shall be marked and verified by a QC inspector making a personal entry into the primary head for a physical verification.

4.3 Plug the tubes using the following steps.

- 4.3.1 Clean the I.D. of the tube and the surface of the tubesheet around the tube by wire brushing. This is to remove surface film and/or impurities and is to be performed before roll sizing the tube ends. The bore of the tube is to be brushed to an approximate depth of one-half inch (1/2").
- 4.3.2 Roll the I.D. of the tube end to a diameter of 0.660 ± 0.002 inch for an approximate depth of one-half inch (1/2"). The rolling equipment will be furnished by NCE Field Services.
- 4.3.3 Insert and seat a tube plug with a ~~pneumatic~~ ^{U.S. Hammer 2-11-82} hammer and plug sealing tool. Caution should be exercised when driving the plug to insure a proper seat which will leave the lip of the plug flush with the end of the tube.
- 4.3.4 Visually inspect the plug (by entry into the primary head) to insure proper seating and location (line and row) of the plug.
- 4.3.5 Weld the plug using weld procedure DWPS-NFW-GTA-43:43-03-04. This welding shall be performed without filler wire.
- 4.3.6 The weld shall be visually inspected for fissures, gas holes, and/or cracks per ASME Code Section XI, Paragraph IWA-2211. The following relevant indications are unacceptable and are to be used as the acceptance criteria for the weld:
 - 1) Any cracks or linear indications
 - 2) Any clusters of porosity or isolated pin hole porosity greater than 1/32" diameter. Should either of these types of indications be found, the weld is to be refused per the weld procedure in Paragraph 4.3.5.
- 4.3.6.1 Additional weld repairs, if required, shall be made per weld procedure DWPS-NFW-GTA-43:43-03-04 with filler wire.
- 4.3 6.2 All weld repairs shall be inspected per the requirements of 4.3.6.

5.0 REFERENCES AND DRAWINGS

- 5.1 Tube Plug Drawing A-6340-099-002-00.
- 5.2 ASME Code, Section XI.
- 5.3 Detailed Welding Procedure DWPS-NFW-GTA-43:43-03-04.
- 5.4 Steam Generator Instruction Manual for Waterford Unit No. 3.
- 5.5 FAR 9270-239 dated 12/4/1981.
- 5.6 Tubesheet Layout for Contract 72470.

DATE				FIELD ENGINEERING SERVICES				PAGE		CONTRACT		JOB AND CONTROL NUMBER		TRAV. REV.	
2-5-82								1 OF 3		74270		99729515-001		2	
CUSTOMER				PROC. ENG.				CHECKED BY		Q.A. ENG.		TYPE MATERIAL			
LP&L - WATERFORD III SES				E. WENNERSTAD				TRAVELER		R.T. JENSEN					
PART NAME				MATERIAL CODE				DRAWING NUMBERS							
STEAM GENERATOR #1 & #2				J4753											
TRAVELER CONTENTS				CONTINUE FROM											
STEAM GENERATOR TUBE PLUGGING				N/A											
OPER. NO.				SEQ. NO.				SIGN OFF				OPERATION DESCRIPTION			
								FAR No. 9270-239							
ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY															
REF.: ENGINEERING PROCEDURE # EP-74270-100 REV. 0															
ESTABLISH WORK AREA AND EQUIPMENT NECESSARY TO INSTALL AND WELD TUBE PLUGS.															
L.P. & L. DC-H.P.															
A.N.T. I. H.P.															
VERIFY LOCATION OF TUBES TO BE PLUGGED:															
S/G #1 TUBE # L-173/R1 HOT LEG COLD LEG															
S/G #2 TUBE # L-165/R1															
S/G #2 TUBE # L-169/R1															
BRUSH I.D. OF SUBJECT TUBES ON BOTH HOT & COLD LEG SIDE OF STEAM GENERATOR USING GE-FES SUPPLIED WIRE BRUSH AND AIR MOTOR:															
S/G #1 TUBE # L-173/R1 HOT LEG COLD LEG															
S/G #2 TUBE # L-165/R1															
S/G #2 TUBE # L-169/R1															
20															
NOTE: All completed operations must be signed off, dated and closed out by designated personnel															

FIELD ENGINEERING SERVICES
TRAVELERS

E-3075 B

CONTINUATION SHEET	DRAWING NO. <i>SEE PAGE #1</i>	PAGE <i>2 OF 3</i>	CONTRACT <i>74270</i>	JOB AND CONTROL NUMBER <i>99729515-001</i>	TRAV. REV. <i>7</i>
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OPER NO.	SEQ. NO.	INSP.	SIGN OFF	OPERATION DESCRIPTION
				<i>FAR NO. 9270-239</i>
ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY				
	<i>25</i>			<i>ROLL I.D. OF SUBJECT TUBES TO SIZE THEM FOR THE TUBE PLUGS ON BOTH HOT & COLD LEG SIDE OF STEAM GENERATOR USING CE-FES SUPPLIED TUBE ROLLER & AIR MOTOR :</i> <i>S/G #1 TUBE * L-173/R1 HOT LEG COLD LEG</i> <i>S/G #2 TUBE * L-165/R1 } }</i> <i>S/G #2 TUBE * L-169/R1 } }</i>
	<i>30 #</i>			<i>INSPECT I.D. SIZING AND CLEANING :</i> <i>S/G #1 TUBE * L-173/R1 HOT LEG COLD LEG</i> <i>S/G #2 TUBE * L-165/R1 } }</i> <i>S/G #2 TUBE * L-169/R1 } }</i>
	<i>35</i>			<i>INSERT TUBE PLUGS INTO SUBJECT TUBES ON BOTH HOT & COLD LEG SIDE OF STEAM GENERATOR AND DRIVE THEM INTO TUBES USING CE-FES SUPPLIED SEATING HAMMER & AIR POWERED DRIVER:</i> <i>S/G #1 TUBE * L-173/R1 HOT LEG COLD LEG</i> <i>S/G #2 TUBE * L-165/R1 } }</i> <i>S/G #2 TUBE * L-169/R1 } }</i>
	<i>40 #</i>			<i>VERIFY INSTALLATION & LOCATION ~ RECORD S/N & MATERIAL CODE # :</i> <i>S/G #1 TUBE * L-173/R1 HOT LEG COLD LEG</i> <i>S/G #2 TUBE * L-165/R1 } }</i> <i>S/G #2 TUBE * L-169/R1 } }</i>

NOTE: All completed operations _____ st be signed off, dated and closed out by designated personnel

VOID BY SIGNATURE 3-11-83

**FIELD ENGINEERING SERVICES
TRAVELERS**

L-3078 B

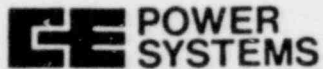
CONTINUATION SHEET		DRAWING NO. <i>SEE PAGE #1</i>		PAGE <i>3 of 3</i>	CONTRACT <i>74270</i>	JOB AND CONTROL NUMBER <i>99729515-001</i>	TRAV REV. <i>1</i>
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OPER. NO.	SEQ. NO.	INSP.	SIGN OFF	OPERATION DESCRIPTION
				<i>FAR No. 9270-239</i>
ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY				
	<i>45</i>			<i>MANUALLY WELD TUBE PLUGS USING QUALIFIED WELDER, CERTIFIED WELD WIRE AND PROCEDURE NO. NFW-GTA-43.43-03-4 :</i> <i>S/G #1 TUBE # L-173/R1 HOT LEG COLD LEG</i> <i>S/G #2 TUBE # L-165/R1</i> <i>}</i> <i>}</i> <i>S/G #2 TUBE # L-169/R1</i> <i>}</i> <i>}</i>
	<i>50</i>	<i>#</i>		<i>WIF (WELD INSPECTION FORM)</i> <i>S/G #1 TUBE # L-173/R1 HOT LEG COLD LEG</i> <i>S/G #2 TUBE # L-165/R1</i> <i>}</i> <i>}</i> <i>S/G #2 TUBE # L-169/R1</i> <i>}</i> <i>}</i>
	<i>53</i>			<i>WIRE BRUSH TO CLEAN TUBES LISTED IN SEQ. NO. 45.</i>
	<i>55</i>	<i>#</i>		<i>VISUALLY INSPECT TUBE PLUG TO TUBE AND TUBESHEET WELDS PER SECTION XI OF THE CODE AND ENGINEERING PROCEDURE NO. EP-74270-100 REV. 0 :</i> <i>S/G #1 TUBE # L-173/R1 HOT LEG COLD LEG</i> <i>S/G #2 TUBE # L-165/R1</i> <i>}</i> <i>}</i> <i>S/G #2 TUBE # L-169/R1</i> <i>}</i> <i>}</i>
	<i>60</i>	<i>#</i>		<i>VERIFY THAT INSTALLATION IS COMPLETE :</i> <i>S/G #1 TUBE # L-173/R1 HOT LEG COLD LEG</i> <i>S/G #2 TUBE # L-165/R1</i> <i>}</i> <i>}</i> <i>S/G #2 TUBE # L-169/R1</i> <i>}</i> <i>}</i>
NOTE: All completed operation. *st be signed off, dated and closed out by designated personnel				

A.N.I.I.-H.P

Welded

Welded



February 4, 1982

TO WHOM IT MAY CONCERN:

This is to certify that 16 tubesheet plugs, Serial No's. 1301-1316, Code J-4753, were fabricated in accordance with C-E Drawing A-6340-099-002-00 and nondestructively examined by the following:

1. Ultrasonic examination of bar before machining per C-E M&P Specification 2.4 4.2(g).
2. Dye Penetrant examination per Peabody Testing Services Test and Inspection Procedure ATL-PT-1000.
3. Mill chemistry and physicals per Huntington Alloys.

The results of the above examinations were satisfactory.

Very truly yours,

COMBUSTION ENGINEERING, INC.

A handwritten signature in cursive script, appearing to read 'W. A. Stone, Jr.'.

W. A. Stone, Jr., Manager
Quality Engineering

WAS:sh

HUNTINGTON ALLOYS

An Inco company

HUNTINGTON ALLOYS, INC.
HUNTINGTON, WEST VIRGINIA 25720

ATLANTA, GA. R
INCO ORDER NO. 7844 CHARGE ORDER NO. 47-87651
MARK ORDER NO. SEE RMKS
CERTIFICATE OF: PREPARED
TEST BEFORE SHIPMENT
INSPECTED BY GOV'T CONT. NO.
HAI 75667-2

EXPLANATION OF NOTES
(1) UNLESS OTHERWISE SHOWN N/A INCLUDES A SMALL AMOUNT OF COBALT
(2) UNLESS THE MATERIAL IS SHIPPED IN THE FINAL HEAT TREATED CONDITION THE PROPERTIES SHOWN DESIGNATED FROM HEAT TREATING THE TEST SPECIMEN AS REQUIRED BY THE SPECIFICATION
(3) SYMBOLS IN RUPTURE LIFE COLUMN OF STRESS RUPTURE TEST INDICATE THE FOLLOWING CONDITIONS
"S" - TEST DISCONTINUED WITHOUT FRACTURE
"S" - COMBINATION NOTCH AND SMOOTH BAR SPECIMEN FRACTURED IN SMOOTH GAUGE
"S" - STRESS WAS INCREASED PER SPECIFICATION OPTION TO INDUCE EARLY FRACTURE
(4) MATERIAL AS SHIPPED FROM HUNTINGTON PLANT FREE FROM CONTAMINATION BY Nb, N, AND ALPHA SOURCE

DATE 03/10/78 PAGE 1 of 1

THIS IS TO CERTIFY THAT ALL REQUIRED INSPECTIONS AND TESTS HAVE BEEN COMPLETED IN ACCORDANCE WITH THE ORDER REQUIREMENTS AND THAT THE VALUES SHOWN ARE CORRECT AND TRUE BASED ON THESE TESTS. THE MATERIAL COMPLIES WITH THE ORDER REQUIREMENTS.

D. W. Adams
QUALITY CONTROL DEPARTMENT

ITEM	QUANTITY	DESCRIPTION OF MATERIAL SHIPPED
1	2861 LBS	INCONEL ALLOY 606 HOT FIN RND HOT FIN ANN .8750 DI X RDM
SPECIFICATION	ASME SFA 5.14 SECTION 2 PART C 1974 EDITION SUMMER 1976 ADDENDA CHEM ONLY/ASME SB-166 SECTION 2 PART B 1974 EDITION SUMMER RMKS	

VISUAL AND DIMENSIONAL EXAMINATION - OK

CHARGE ✓ ATTN PURCH DEPT
CHATTANOOGA DIV
COMBUSTION ENGR INC
911 W MAIN ST
CHATTANOOGA 1 TENN 37402

SHIP

COMBUSTION ENGR INC
WEST MAIN ST WAREHOUSE
CHATTANOOGA TENN

37401

CHEMICAL ANALYSIS

HEAT # (41) C / MN / FE / S / SI / CU / NI (11) / CR / TI / CB / TA / OTHERS %
NY 98D .02 / 2.76 / 1.64 / .001 / .08 / .09 / 72.31 / 20.13 / .43 / 2.53 / .01 / 0.50

NY 9898D 6 White 10/24/81

TENSILE RESULTS QUANTITY NO NO ING PC NO NO HEAT NO NO LOT NO NO HARDNESS ASTM YLD STR TENSILE % EL- % TEMP STRESS RUPT.
GR. .2 % OFS STNGTH ONGA- RED. F. PSIX100 LIFE (10)
SIZE PSIX100 PSIX100 TION AREA

ROOM TEMP. - AS SHIPPED 81 PCS NX9898D M2793 RB088 .0485 1100 58 60

SPEC CONTD - 1976 ADDENDA EXCEPT CHEMISTRY/ASME SECTION 3 1974 EDITION SUMMER 1976 ADDENDA/COMBUSTION ENGR GAPS 11.1 REV-5
MARK-47-87651-CONT-75667-2 JOB PB2703

MATERIAL WITH SHEARED ENDS - O.K. PER WAIVER.

J-4753-1

75667

E. White
3/27/78

DETAIL WELDING PROCEDURE SPECIFICATION

CHRYSTANOOGA NUCLEAR OPERATIC

COMBUSTION ENGINEERING, INC.

DESIGN ENGINEERING - MATERIALS & WELDING

DATE: January 8, 1982

DWPS NFW-GTA-43:43-03-4

PROCESS: Gas Tungsten Arc

PAGE 1 OF 3

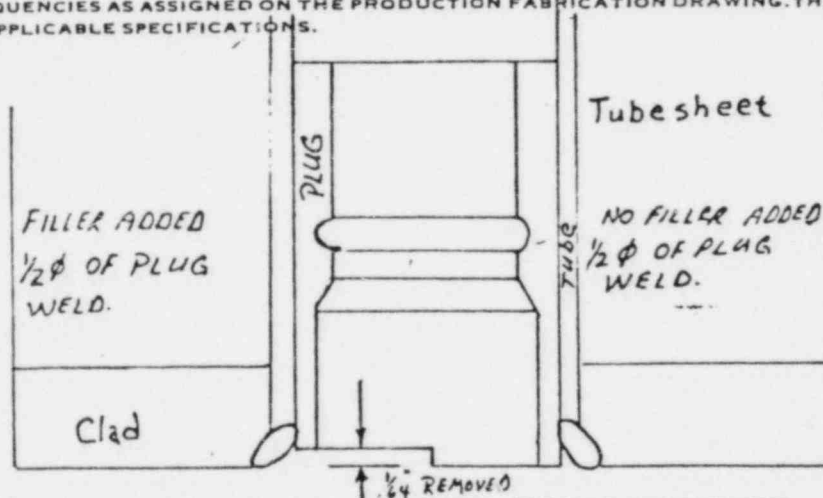
QUALIFICATIONS: WPQR: GTA-43.43-106

WPQT: 0GTA-4G-F43

APPLICATIONS: Tube to Tube Sheet

BASE METALS: P NO. ERNiCr-3 SFA-5.14 Plug & Wire TO P NO. ERNiCr-3 SFA-5.14 Clad Tube Sheet
THICKNESS QUALIFIED ON GROOVE DESIGN AND WELDING SEQUENCE Tube Sheet 2"

THIS WELD, AS DETAILED ON THE FABRICATION DRAWINGS, SHALL BE EXAMINED BY APPROVED NON-DESTRUCTIVE METHODS AT FREQUENCIES AS ASSIGNED ON THE PRODUCTION FABRICATION DRAWING. THE COMPONENT TRAVELER AND/OR OTHER APPLICABLE SPECIFICATIONS.



SEE ENGINEERING DRAWING(S) FOR DIMENSIONS

CLEANING: AS REQUIRED TO PRODUCE GROOVE AND ADJACENT SURFACE FREE OF DIRT, GREASE, OR OTHER CONTAMINANT AND/OR REMOVE SLAG OR OTHER CONTAMINANT PRIOR TO SUCCEEDING WELD PASS. SEE GENERAL INSTRUCTIONS.

WELDING MATERIALS:
ELECTRODES/FILLER WIRE

ELECTRODES/FILLER WIRE								
WELDING PROCESS	DIAMETER(S)	TYPE	SPECIFICATIONS			CE TRADENAME	CLASSIFICATION	
			ASME SFA	MIL	CE		A NO.	F NO.
GTA	1/16"	ERNiCr-3	5.14	-	-	-	-	43
GTA		Plun (ERNiCr-3)	5.14	-	-	-	-	43
-								
GTA	3/32"	EWTh-2	Tungster	-	-	-	-	-
SAA FLUX MFG'ER.		TYPE	MESH		OTHER		GASES:	
							Argon 75%	
							Helium 25%	
OTHER:								

DETAIL WELDING PROCEDURE SPECIFICATION
CH2 MANOOGA NUCLEAR OPERATION
COMBUSTION ENGINEERING, INC.
DESIGN ENGINEERING - MATERIALS & WELDING

DWPS NFW-GTA-43:43-03-4
PAGE 2 OF 3

PREHEAT, INTERPASS, POST WELD HEAT TREATMENT:

MINIMUM WELDING PREHEAT AND INTERPASS 60°F

MAXIMUM WELDING PREHEAT AND INTERPASS N/A

MAINTAIN N/A °F MINIMUM UNTIL INTERMEDIATE OR FINAL PWHT

INTERMEDIATE PWHT AT N/A °F ± N/A °F, HOLD FOR N/A HOURS MINIMUM

FINAL PWHT AT N/A °F ± N/A °F, HOLD FOR N/A

OTHER

WELDING POSITION(S), (4G) Overhead

SPECIAL INSTRUCTIONS:

SEE SKETCH PAGE 1 FOR PLUG CONFIGURATION AND WELDING SEQUENCE

WELDING PARAMETERS AND APPLICATION(S)

PARAMETERS,	APPLICATION(S)	
	GTA WITH FILLER	GTA WITHOUT FILLER
PROCESS		
ELECTRODES		
Number	1	1
Diameter-Non Consumable	3/32" W/30° Taper & 1/64" Flat End	3/32" W/30° Taper & 1/64" Flat End
Type	EWTh-2	EWTh-2
Consumable Dia.	1/16"	N/A
Consumable Type	ERNiCr-3	N/A
Non-Consumable Extension	1/4"	1/4"
SHIELDING GAS(ES)		
Type	75% Argon 25 Helium	75% Argon 25% Helium
Flow Rate(CFH)	15 + 3	15 + 3
Gas Cup Size, in.	7/16	7/16
Gas Cup To Work Range	3/8" Max.	3/8" Max.
POSITION	(4G) Overhead	(4G) Overhead
VARIABLES		
Type Current/ Polarity	DCSP	DCSP
Amperage Range	105-120	105-120
Voltage Range	12-14	12-14
Type Arc Start	High Frequency or Impulse	High Frequency or Impulse
Type Bead	Stringer	Stringer

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PREPARED BY:
CHECKED BY:

J. B. Wilkerson

DETAIL WELDING PROCEDURE SPECIFICATION
CH 01 ANOOGA NUCLEAR OPERATIC
COMBUSTION ENGINEERING, INC.
DESIGN ENGINEERING - MATERIALS & WELDING

DWPS NFN-GTA-43:43-03-4
PAGE 3 OF 3

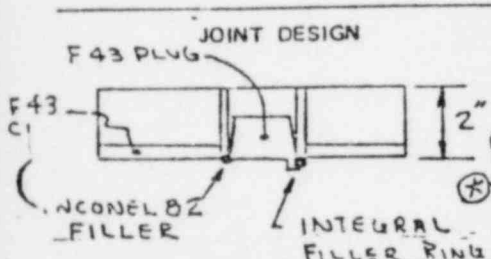
WELDING PROCEDURE QUALIFICATION RECORD

E-563 (1/72)

COMBUSTION ENGINEERING, INC.

DATE January 31, 1974PROCEDURE QUALIFICATION NO. GTA-43.43-106QUALIFIED TO CODE SECTION(S) ASME III, IX & XI

MATERIAL SPEC. & GRADE SFA-5.14 Inconel Plugs TO SFA-5.14 Inconel Clad Tubesheet
 FOR WELDING ϕ No F-43 TO ϕ No F-43 THICKNESS (& DIA. IF PIPE) 2"
 WELDING PROCESS Gas Tungsten Arc TYPE WELD JOINT Tube Plug Weld
 FILLER METAL F No 43/None A No N/A POSITION TEST WELD Overhead (4-G)
 SPEC. or ANALYSIS Inconel 82 SINGLE or MULTIPLE PASS Single
 ELECTRODE SIZE 3/32 EWT-2 w/30° Taper and NO. OF LAYERS (IF CLAD) N/A
1/16" Flat NO. OF ARCS One
 SHIELDING GAS(ES) & COMPOSITION 75% Ar. 25% He. PREHEAT 60° F Minimum
 FLOW RATE 15 CFH MAX. INTER-PASS 250° F Maximum
 TYPE CURRENT DC-SP MAINTAIN PREHEAT UNTIL PWHT No
 BACKING REQUIREMENTS N/A POSTHEAT TREATMENT As Welded
 OTHER: Gas Cup Size 7/16" I.D.; Tungsten Ext. 1/4"; Arc Start - High Freq. of Impluse



BEAD NO.	PROCESS	WIRE DIA.	AMPERES	ARC VOLTS	INCHES/MIN.
1	GTAW	None	140-145	12-14	4
1	GTAW	1/16"	140-145	12-14	4

50% of Weld Made Without Filler &

50% of Weld Made With Filler

(See Sketch)

DEPOSIT ANALYSIS C _____ Mn _____ P _____ S _____ Si _____
 Cr _____ Ni _____ Mo _____ Co _____ N2 _____ Other _____

GUIDED BEND TESTS	CHARPY V-NOTCH IMPACT TESTS				DROP-WEIGHT TESTS	
	LOCATION	TEMP	FT/LBS	MILS LAT EXP	TEMP	RESULTS
FACE: _____			Not Applicable			
ROOT: _____						
SIDE: _____						
MACRO: _____					NDT	°F

NON-DESTRUCTIVE TESTS		TENSILE TESTS	
LIQUID PENETRANT	Acceptable ϕ # 47	TYPE SPECIMEN	ULTIMATE STRESS-PSI
RADIOGRAPHIC		THIS DOCUMENT IS THE PROPERTY OF COMBUSTION ENGINEERING, INC., WINDSOR, CONN. AND IS NOT TO BE REPRODUCED, OR USED TO FURNISH ANY IN- FORMATION FOR MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR BY AGREEMENT WITH SAID COMPANY.	
ULTRASONIC			
MAG. PARTICLE			
VISUAL	10 Welds Were Sectioned and Examined at 10X		
			1. Free of Cracks OK
			2. Weld Throat Acceptable OK
			P.V. Andrew, Sect. Man.

WELDER B. Harbison SYMBOL YJ
 DEPT Chattanooga, Tennessee
 TEST NO _____
 TEST LAB Met R&D Department

We certify that the statements in this record are correct, and that
 the test welds were prepared, welded and tested in accordance
 with requirements of the ASME Code.

COMBUSTION ENGINEERING, INC.

BY:

BY OTHER

TITLE Sup. Eng.

New

* Edit. Corr. 8/13/80

DATE: January 8, 1982

WPQT: QGTIA-4G-F43

1.0 Scope

- 1.1 Performance qualification test requirements for tube plugging using the manual gas tungsten arc process in the overhead position with P43 and/or F43 materials.

2.0 Welding Materials

- 2.1 Use 75% Argon, 25% Helium as shielded gas at 10-15 CFH.
- 2.2 Use 2% thoriated tungsten (EWTh-2) as the electrode.
- 2.3 Use 1/16" dia. filler wire Inconel 82 as required.

3.0 Base Materials

- 3.1 Use base material previously prepared by Welding Engineering personnel to simulate the production tube-to-tubesheet joint. The tube will be P43 Ni-Cr-Fe type material and the tube sheet will be simulated by P43 Ni-Cr-Fe type plate, rod, or base at least 1/4 inches thick, or F43 weld metal clad on low alloy steel at least 2 inches thick.
- 3.2 The plug will be F43 Ni-Cr-Fe type material.
- 3.3 See Sketch #1 for plug and tube sheet details.

4.0 Welding Conditions

- 4.1 Place the previously prepared assembly into the position so that welding will be done in the overhead position with the tube axis vertical.
- 4.2 Place the plugs into the tubes (See Sketch Attached)
- 4.3 Weld using 105-120 amperes direct current, straight polarity, and 12-14 volts. Weld one complete pass. 50% of the plug is to be fused using the intergral material and 50% of the plug is to be welded with the addition of Inconel 82 filler wire. (See Sketch Attached).
- 4.4 A 60°F minimum preheat and 250°F maximum interpass is required. The weld is to be left in the as-welded heat treat condition (no post weld heat treatment).
- 4.5 The welder is to weld at least six acceptable plugs into the tube sheet assembly.

DATE: January 8, 1982

WPQT: QGT-4G-F43

PAGE: 2 OF 2

5.0 Non-Destructive Examination

5.1 Examine the completed welds visually and by the liquid penetrant method.

6.0 Destructive Tests

6.1 The assembly is sectioned longitudinally through each tube as shown in the attached sketch. The assembly may be reduced to 1/2 inch thickness prior to this sectioning. (Plug not shown on test block sketch for clarity).

6.2 Polish the 4 faces of each tube exposed by sectioning and etch with a suitable etchant. This yields each section showing 50% without fillet and 50% with filler.

6.3 Visually examine the weld at 10X magnification. The weld shall be free from cracks.

6.4 The weld shall have a weld throat (minimum leakage path) of at least 2/3 of the specified tube wall thickness.

7.0 Qualifies For

7.1 Successful completion of this test shall qualify the welder to weld plugs into tubes using the manual gas tungsten arc process in the overhead position with or without filler wire on P43 and/or F43 materials. The welder must use this welding process at least once every 3 months or he will have to requalify.

C-E POWER SYSTEMS - CANTON, MASSACHUSETTS

WELDING ENGINEERING DEPARTMENT

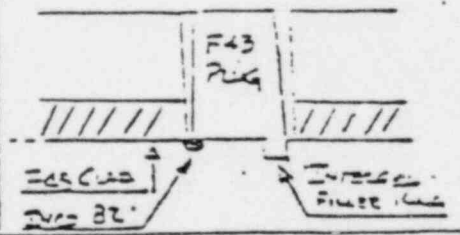
1. WELD OF WELDER/WELDING, OPERATOR PERFORMANCE QUALIFICATION TESTS (WPQT)
AS REQUIRED BY THE
ASME BOILER AND PRESSURE VESSEL CODE, SECTION IX

NAME _____ SYMBOL _____ TEST CODE NO. _____

LOCK NO. _____ DWPS _____ DATE _____

TEST CONDITIONS

Welding Process(es)			WPQT Base Material	WPQT Welding Material	WPQT Position	Current, Polarity
Process(es) Manual Auto						
FGW	<input type="checkbox"/>	<input type="checkbox"/>	P1 <input type="checkbox"/> to P1 <input type="checkbox"/>	F1 <input type="checkbox"/>	F6A5 <input type="checkbox"/>	1G <input type="checkbox"/> 1E <input type="checkbox"/> 1C <input type="checkbox"/> AC <input type="checkbox"/>
SMW	<input type="checkbox"/>	<input type="checkbox"/>	P3 <input type="checkbox"/> to P3 <input type="checkbox"/>	F2 <input type="checkbox"/>	F6A6 <input type="checkbox"/>	2G <input type="checkbox"/> 2E <input type="checkbox"/> 2C <input type="checkbox"/> DCRP <input type="checkbox"/>
SAW	<input type="checkbox"/>	<input type="checkbox"/>	P4 <input type="checkbox"/> to P4 <input type="checkbox"/>	F3 <input type="checkbox"/>	F6A7 <input type="checkbox"/>	3G <input type="checkbox"/> 3E <input type="checkbox"/> 3C <input type="checkbox"/> DCSP <input checked="" type="checkbox"/>
OSW	<input type="checkbox"/>	<input type="checkbox"/>	P5 <input type="checkbox"/> to P5 <input type="checkbox"/>	F4 <input type="checkbox"/>	F6A8 <input type="checkbox"/>	4G <input type="checkbox"/> 4E <input checked="" type="checkbox"/> 4C <input type="checkbox"/> Other _____
GTAW	<input checked="" type="checkbox"/>	<input type="checkbox"/>	P8 <input type="checkbox"/> to P8 <input type="checkbox"/>	F5 <input type="checkbox"/>	F6A9 <input type="checkbox"/>	5G <input type="checkbox"/> 5E <input type="checkbox"/> 5C <input type="checkbox"/>
FSW	<input type="checkbox"/>	<input type="checkbox"/>	P43 <input checked="" type="checkbox"/> to P43 <input checked="" type="checkbox"/>	F6A1 <input type="checkbox"/>	F6A10 <input type="checkbox"/>	6G <input type="checkbox"/> 6E <input type="checkbox"/> 6C <input type="checkbox"/>
ESW	<input type="checkbox"/>	<input type="checkbox"/>	Other _____	F6A2 <input type="checkbox"/>	F6A11 <input type="checkbox"/>	Other _____
SWT	<input type="checkbox"/>	<input type="checkbox"/>	SA- _____	F6A3 <input type="checkbox"/>	F6A12 <input type="checkbox"/>	
			SA- _____	F6A4 <input type="checkbox"/>	F43 <input checked="" type="checkbox"/>	WPQT Joint Design
Thickness <u>1/4"</u>			Unclassified <input type="checkbox"/>			
Diameter _____			Spec. <u>SFA-5.14</u> Class _____			
Other _____			Mfg. Inco			
Backing <u>N/A</u>			Flux(es) _____			
			Gas(es) <u>Argon & Helium</u>			
			Other _____			



Instructions for the Welder
<p>1. Weld (5) five Plugs</p> <p>2. Filler 1/16" ERNiCr-3 (Inco 82)</p> <p>3. Amps 105-120 DCSP</p> <p>4. Volts 12-14</p> <p>5. Shielding Gas 75% Argon, 25% Helium 10-15 CFH</p> <p>6. Electrode - 3/32" 2% Thoriated Tungsten (EWth-2)</p> <p>7. Electrode Extension 1/4"</p> <p>8. Cup Size 7/16"</p> <p>9. Arc Start; High Frequency or Impulse</p>
<p>Notes: 50% of Weld to be Made W/Filler from Plug.</p> <p>50% of weld to be Made W/Bare Wire Filler Added.</p>

Test Code No. _____

TEST RESULTS

- ☐ 2 Side, Fig. QW-462.2(a), Table QW-452. ☐ Accept, ☐ Reject
☐ 2 Transverse Side, Paragraph QW-311 ☐ Accept, ☐ Reject
☐ 1 Face, 1 root(long.) Fig. QW-462.3(b), Table QW-452. ☐ Accept, ☐ Reject
☐ 1 Face, 1 root(trans). Fig. QW-462.3(a), Table QW-452. ☐ Accept, ☐ Reject

Performed By _____ Non-C-E Witness _____
 Date _____ Agency _____

☐ No Evidence } of Cracks ☐ Complete } Root Fusion
☐ Evidence } ☐ Incomplete }
 _____ inch is the sum of the lengths of all inclusions and gas pockets visible
 on the fractured surface (_____ + _____ + _____ + _____ + _____ + _____)

☐ Yes Weld and HAZ show complete fusion and freedom from cracks (linear indication
☐ No in the root 1/32 and less are acceptable).
☐ Concave _____ inches Fillet leg size is _____ inch by _____ inch
☐ Convex _____ inches

Performed By _____ None-C-E Witness _____
 Date _____ Agency _____

Inspection - Exam		Accept Reject		Performed By	Date	Non-CE Witness-Agency
Fit-up	Visual	<input type="radio"/>	<input type="radio"/>			
Root	MT	<input type="radio"/>	<input type="radio"/>			
	PT	<input type="radio"/>	<input type="radio"/>			
	Visual	<input type="radio"/>	<input type="radio"/>			
Final Weld	MT	<input type="radio"/>	<input type="radio"/>			
	(PT)	<input type="radio"/>	<input type="radio"/>			
	UT	<input type="radio"/>	<input type="radio"/>			
	RT	<input type="radio"/>	<input type="radio"/>			
Box	Visual	<input type="radio"/>	<input type="radio"/>			
Other						

Miscellaneous:

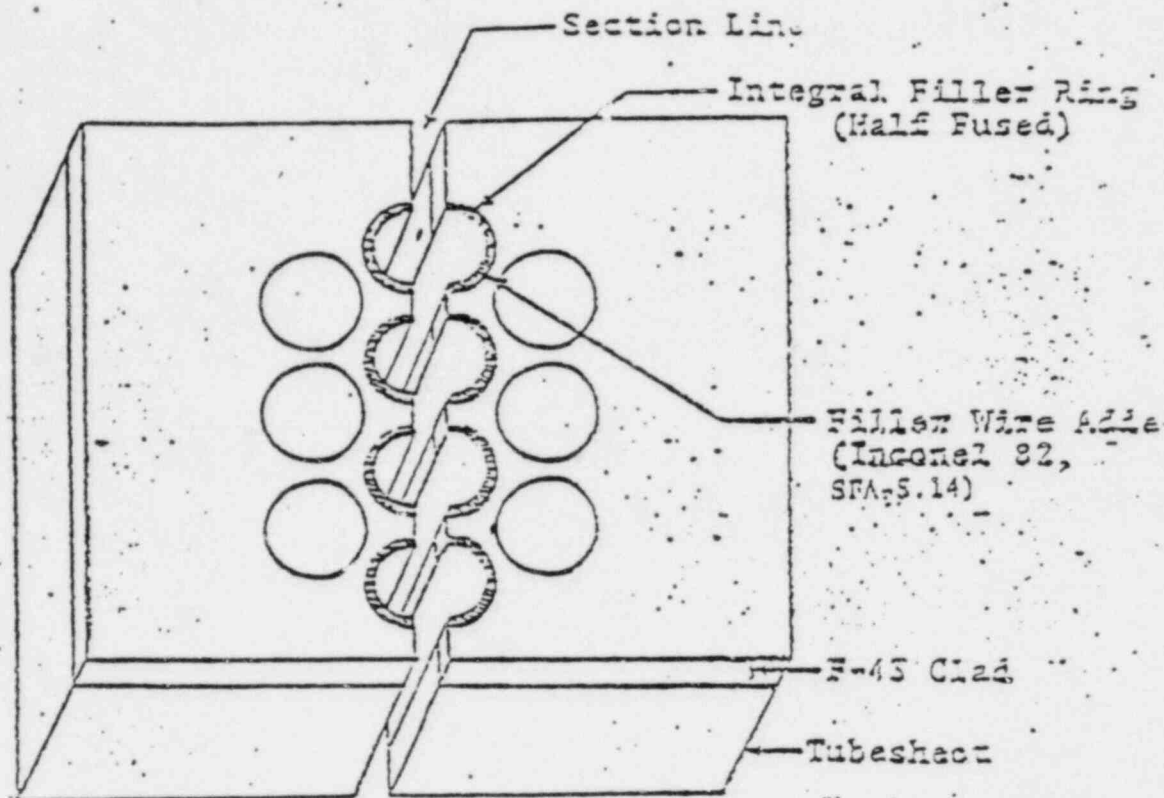
Section 225 each with suitable etchant
 the longitudinal and filler faces longitudinally through each Plug. The welds
 shall be free from cracks and have a
 min. throat thickness of 2/3 of the
 tube wall thickness.

We certify that the statements in this record
 are correct and that test welds were prepared,
 welded, tested, and examined in accordance with
 the requirements of the ASME Code.

WELDING ENGINEERING DEPARTMENT

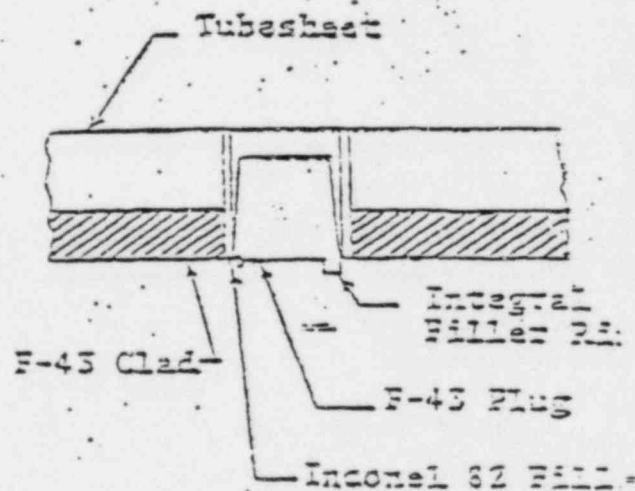
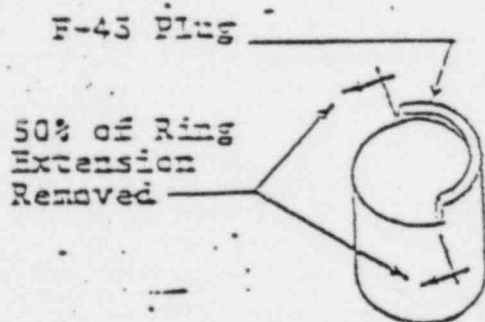
DATE:

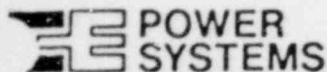
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 COMBUSTION ENGINEERING, INC., WINDSOR, CONN.
 AND IS NOT TO BE REPRODUCED, OR USED TO FURNISH ANY IN-
 FORMATION FOR BASIS OF DRAWINGS OR APPROPRIATE CEMENT
 WHERE PROVIDED FOR BY AGREEMENT WITH THIS COMPANY.



SECTIONED TEST BLOCK

This yields each section showing 50% with filler wire and 50% fused ring plug (without filler wire)





Nuclear Manufacturing General Foreman
Bay 29 Rod Room
Welding Inspection
Bay 28 Weld Lab
Welding Material Control
FPS - Quality Assurance
FPS - Rod Room

Nuclear Quality
Assurance

12-10-81

WELDING MATERIAL CERTIFICATION

The following welding material has been tested in accordance with the requirements of QCP 7.1 to meet customer requirements, purchase specifications requirements and all requirements of the ASME Code Section III.

I. Coated Electrodes (MA)

<u>TYPE</u>	<u>SIZE</u>	<u>LOT #</u>	<u>BRAND</u>
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II. Bare Electrodes (GTA & GMA)

<u>TYPE</u>	<u>SIZE</u>	<u>HEAT #</u>	<u>BRAND</u>
CHROMENAR 382	1/16"	A-2260T382	ARCOS

III. Flux Electrode Combination (SAA)

<u>TYPE ELECTRODE</u>	<u>SIZE</u>	<u>HEAT #</u>	<u>TYPE FLUX</u>	<u>LOT #</u>
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Pat Jackson

May 28, 1980

CERTIFICATION OF TESTS

Combustion Engineering Inc.
911 West Main St.
Chattanooga, Tenn. 37402

Customer's Order No. 17634
Arcos S. O. No. 03387
Shipping Date May 28/80
Consignee No. HO-47297

Size 1/16" Grade CHROMENAR 382
Lot No./Alloy No. A2260T382
Lbs./No. Pieces 643 #

SPECIFICATION AWS/ASME SFA 5.14 Class ERNiCr-3
CE Spec N-P43W2(b)

WIRE
TEST RESULTS

Carbon	.016
Manganese	3.03
Silicon	.04
Sulphur	.002
Phosphorus	.002
Chromium	18.70
Nickel	76.16
Molybdenum	.00
Titanium	.495
Columbium	2.28
Wigsten	
Aluminum	
Copper	.073
Iron	.16
Tantalum	.089
Cobalt	.044
Tin	
Vanadium	
Zinc	
Zirconium	
Ferrite	
X-Ray	

Total Others <.50

Charpy's	As Welded	Heat Treated	As Welded	Heat Treated
Tensiles:	Yield	Tensile	Elong.	
As Welded:				
Heat Treat:				
Hardness:				
Bends:				

This material is free from Mercury, Radium or Alpha particle contamination.

We hereby certify that the above material has been tested in accordance with the listed specification and is in conformance with all requirements.

Sworn to and subscribed before me
this 28 day of May 1980

Mildred Pellegrino
MILDRED PELLEGRINO

Notary Public, Philadelphia, Philadelphia Co.
My Commission Expires June 16, 1983

ARCOS CORPORATION

John L. Smith
Quality Control Section