ENGINEERING PROCEDURE NO. 74370-5, REV. 5

PROCEDURE FOR REMOVAL AND INSTALLATION OF REPLACEMENT PRESSURIZER HEATERS AT THE WATERFORD STATION UNIT NO. 3 SITE

CONTRACT 74370

PREPARED BY: W.S. Rice, Jr. DATE: 2-29-80

REVIEWED BY: W W Roberts DATE: 3-3-80

APPROVED BY: J R Ray DATE: 3-3-80

Combustion Engineering, Inc.
Nuclear Power Systems
Component Engineering
Chattanooga, Tennessee

RECORD OF REVISIONS

NUMBER	DATE	PAGES INVOLVED	PREPARED BY	APPROVALS
1	5/9/80	7	W. S. Rice	W W Roberts 5-14-80
2	5/28/80	3	W W Roberts	J W. Aldrich 5/30/80
3	1/27/82	3, 4, 5, 6, 7, 8	W. S. Rice	W W Roberts 1-28-82
4	1/29/82	5, 6, 7	W. S. Rice	W W Roberts 1-29-82
5	3/3/82	6, 7	W. S. Rice	W W Roberts 3-4-82

Procedure for Removal and Installation of Pressurizer Heaters at the Waterford Station Unit No. 3 Site

1.0 PURPOSE

1.1 The purpose of this procedure is to provide detailed instructions for the removal of pressurizer heaters at the site.

2.0 REMOVE HEATER LEAD WIRE IN EXCESS OF 12 INCHES FROM THE HEATERS

3.0 HEATER REMOVAL

3.1 Refer to Reference 4.2 and 4.5 for details of the weld cutter. Reference 4.3 shows the heater to sleeve assembly information.

3.1.1 Weld Cutter Adjustment

3.1.1.1 Remove the two (2) cap screws (Piece No. 693-3206) and disassemble the cutter holder into two (2) halves (Piece No. 693-3203 and 3204).

3.1.1.2 Assemble the two (2) halves of the weld cutter holder (Piece No. 693-3203 and 3204) around the heater gage, Reference 5.4. Should the cutting tool interfere with the assembly of the weld cutter, see Paragraphs 3.1.1.4 and 6.

3.1.1.3 Install two (2) cap screws (Piece No. 693-3106) in the weld cutter assembly to securely rejoin the two (2) halves of the cutter holder.

3.1.1.4 Loosen the three (3) set screws (Piece No. 693-3210) one quarter (1/4) turn each.

3.1.1.5 Advance the set screws (Piece No. 693-?209) evenly, moving the cutting tools (Piece No. 693-3207) until they contact the heater. A snug (but not tight) fit is desired. Do not dig cutters into the heater.

3.1.1.6 Tighten the three (3) set screws (Piece No. 693-3210) which hold the cutting tools in position.

3.1.1.7 Assemble the weld cutter around the heater near the heater-to-sleeve weld. See 3.1.1.1 and 2 above.

3.1.2 Drive Mechanism Installation

3.1.2.1 Start the air motor before attaching it to the cutter drive assembly to verify that it is operating correctly. Use an ARO Model 225/275 RPM air motor or its equivalent.

3.1.2.2 Prior to cutting, place a reference mark on the sleeve and the distance recorded so that once the cut is made there is a means for determining how much the sleeve has been shortened.

3.1.2.3 To install the weld cutter assembly (Piece No. 693-3201) slide assembly over the heater so that is engages the cutter holder (Piece No. 693-3202) and install the socket head cap screws (Piece No. 693-3211).

3.1.2.4 Attach the air motor to the drive assembly at Piece No. 693-3213. Start the air motor and apply gentle force (approximately two (2) pounds initially) to the assembly to advance the cutters into the weld to be removed.

3.1.2.5 Visually check progress and continue cutting until one of the following occurs:

a) The heater is freed from the sleeve; or
b) The heater sleeve has been shortened by approximately 1/16 inch.

3.1.2.6 If the heater sleeve is shortened 1/16 inch before the heater is free, remove the cutter assembly and apply a pull (up to twenty (20) pounds) to the heater assembly to try to remove it. DO NOT JERK the assembly. A spring scale is one means of measuring the twenty (20) pounds pull.

3.1.2.7 If pulling does not free the heater, and if the heater sleeve has been shortened 1/16 inch, replace the cutter assembly on the heater. Advance the adjusting screws evenly until a tight fit is obtained and retighten the set screws. Repeat Paragraphs 3.1.2.3 through above until the heater is free or the sleeve is shortened another 1/16 inch. Contact the CE representative if the heater is not free after a total of 1/8" is cut from sleeve.

3.1.2.8 Seal each heater sleeve with a pipe cap placed over the sleeve and secure in place with a seal clamp.

4.0 REFERENCES

4.1 CE Book No. 74370, Instruction Manual, Pressurizer, Waterford, Unit No. 3.

4.2 CE Drawing E-STD13-693-032-0, Weld Cutter Assembly.

4.3 CE Drawing E-74370-671-004, Heater Arrangement and Assembly. (Included in Reference 4.1).

4.4 CE Drawing B-6340-099-115, Set Gage.

4.5 CE Drawing B-6340-099-116, Modification to Weld Cutter.

4.6 Applicable ASME Code Section III, through Summer 1971 Addenda, for Class 1 Vessels.

4.7 Applicable ASME Code Section XI, through Winter 1980 Addenda.

5.0 TOOLS AND EQUIPMENT BY CE

5.1 Wrench for 2" hex nuts.

5.2 Weld cutter assembly with hex key wrenches and spare cutting tips, in accordance with Reference 5.3.

5.3 Air motor for weld cutter.

5.4 Thirty (30) EZ162 Niagra Plastics Pipe Plugs and thirty (30) Series QA 100 28H Aero Seal Clamps (or equivalent).

6.0 HEATER REPLACEMENT

6.1 Tools and Equipment

a) Acetone
b) Clean, lint-free cloth
c) Ohmmeter
d) Megger (1000 volt)
e) Welding equipment and welding rod
f) Dye penetrant equipment
g) Standard tools and equipment
h) Grinder

6.2 Heater Assembly and Sleeve Preparation

a) Clean the surfaces of the heater with clean, unused, commercial grade Acetone or its equivalent; dry the surfaces thoroughly with clean, lint-free cloths; and inspect the assembly for damage.

6.0 HEATER REPLACEMENT - continued -

6.2 Heater Assembly and Sleeve Preparation - continued -

b) Remove pipe plug and check the end of the sleeve assembly weld prep for burns, deep scratches, or other indications that may interfere with re-welding. The weld cutter used to remove the heater weld is designed to leave the weld prep in condition for re-welding.

6.3 Checking Replacement Heater

a) Check the heater circuits for continuity with an Ohmmeter. The reading between the terminals of each heater shall be between 8 and 9 ohms to assure that there is neither an open circuit nor a short circuit.

b) Check the heater circuits for grounding. The resistance from each terminal to the sheath as determined with a 1000 volt megger shall be one (1) megohm or greater to assure that the terminal is not grounded.

c) Conduct the above checks, just prior to installation, after final inspection of the heater-to-sleeve weld and after hydrostatic or leak testing. Any heaters failing to meet the requirements for continuity and grounding are unacceptable.

6.4 Replacement Heater Installation

a) Insert the heater into the sleeve assembly until the end of the heater is approximately eight (8) inches from the end of the sleeve. (See Figure 1). If the heater does not go into position freely, remove it and check it for straightness.

b) Place the heater in its final position before welding. The heater end is to be seven (7) inches from the end of the sleeve plus the amounts removed by the previous cutting operations (i.e., if 1/16 inch was removed, the new measurement will be seven (7) inches plus 1/16 inch, or 7-1/16 inches).

c) Weld the heater to the sleeve in accordance with DWP Number DWP-NFW-GTA-8:43-02. The fillet weld is to be 3/16 inch maximum.

d) Dye penetrant test the first weld bead in accordance with M&P Spec. N-2.4.3.9(g).

6.0 HEATER REPLACEMENT - Continued -

6.4 Replacement Heater Installation - continued -

e) Completely excavate cracks or holes in the weld surface before additional bead is deposited. Dye penetrant test each bead in accordance with M&P Spec. N-2.4.3.9(g). Grind the completed weld as necessary for the dye penetrant test.

- CAUTION -

When performing this operation, use extreme care so as not to cut or grind into the heater sheath more than necessary. Grinding excessively may result in penetration of the heater sheath, rendering the heater useless.

f) Re-check the heater circuits in accordance with Paragraph 6.3

7.0 HYDROSTATIC TESTING

7.1 The hydrostatic testing is the responsibility of the utility.

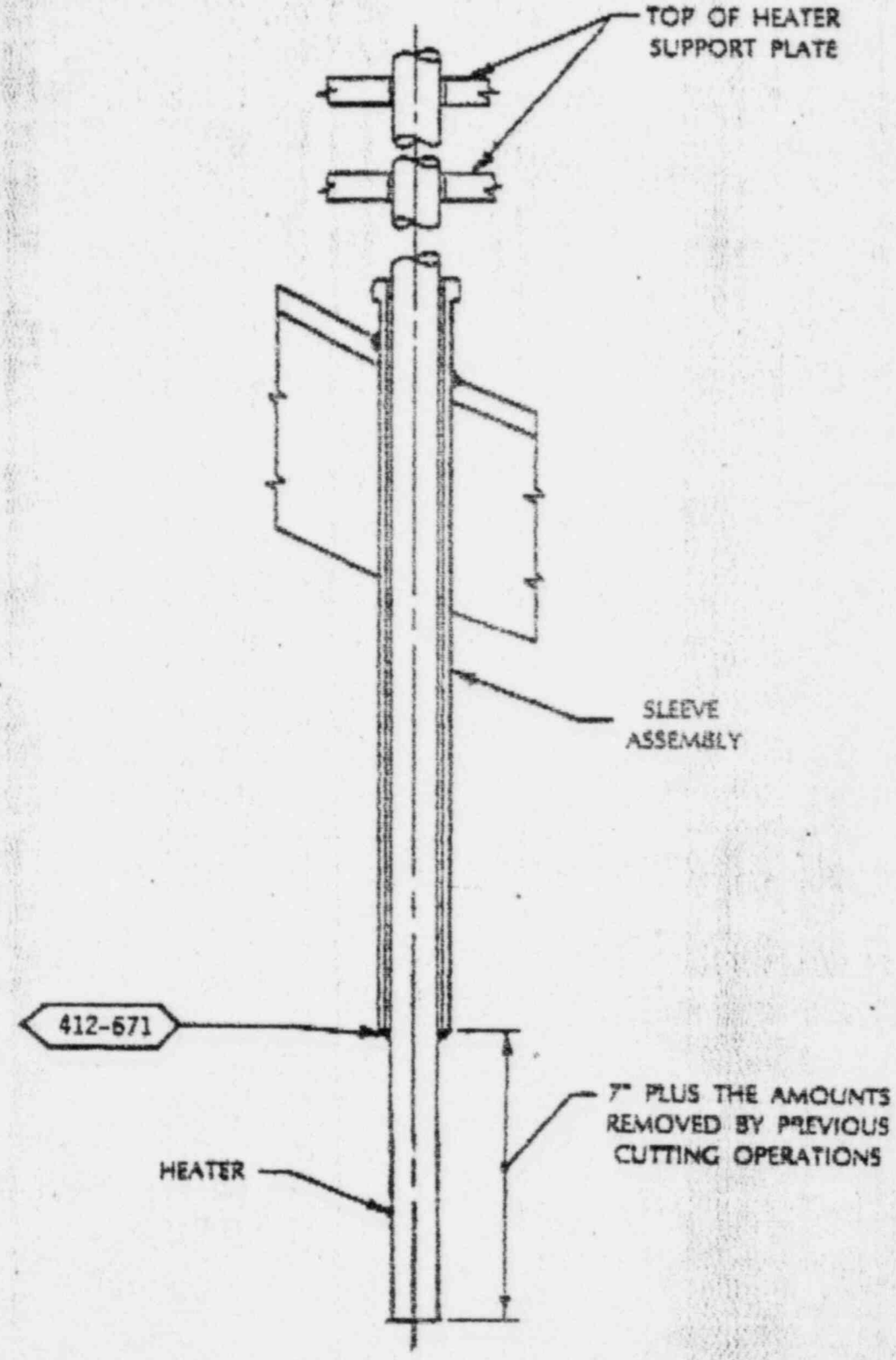

FIGURE 1
HEATER TO SLEEVE ASSEMBLY

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TRAVELER

DATE	PAGE	CONTRACT	JOB AND CONTROL NUMBER	TRAV. REV.
1-29-82	1 OF 16	74370	V-61677-002	7

CUSTOMER	PROC. ENG.	CHECKED BY	Q.A. ENG.	TYPE MATERIAL
Louisiana P & L III	E. Wannerstrum	[signature] 2/8/82	R.T. Johnston 2/8/82	SS

PART NAME	MATERIAL CODE	DRAWING NUMBERS
Pressurizer	J-5802-1/4	E-STD 13-693-032 B-6340-099-116. E-74370-671-004, B-6340-099-115

TRAVELER CONTENTS	CONTINUE FROM
Remove & Replace Pressurizer Htrs.	N/A. Ref-EP 74370-5

OPER NO.	SEQ. NO	INSP.	SIGN OFF	OPERATION DESCRIPTION
				ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY
	10			Establish Work Area
	15			Notify L.P. & L. - Q.C. Prior To Start of Work
L.P. & L.		Q.C.	H.P.	
	20			Assemble Heater Removal Equipment Per EP-74370-5 and Instruction From Engineering Services
	25			Remove Heater Leads In Excess of Twelve (12) Inches Identify All Leads With The Corresponding Heater/Penetration Number.

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

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CONTINUATION SHEET	DRAWING NO. see Pg 1	PAGE 2 OF 16	CONTRACT 74370	JOB AND CONTROL NUMBER V-61677-002	TRAV REV. F

OPER NO.	SEQ NO	INSP.	SIGN OFF	OPERATION DESCRIPTION
				ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY
	30			LAYOUT PROOF LINES 1" FROM END of HEATER SLEEVE AND IDENTIFY HEATER PENETRATIONS.
	35	#		INSPECT LAY-OUT of Ref. LINES - SIGN off ON Pg 9 RECORD DISTANCE of Ref. MARKS. - VERIFY PENETRATION IDENTIFICATION.
	40	#		REMOVE HEATER ASSEMBLIES PER EP-74370-5 PARA 3.0. MONITOR 20 LBS-MAX PULL PER EP-74370-5 PARA 3.1.2.6 AS NECESSARY IDENTIFY EACH HEATER AND TAG
			NOTE-	IF HEATER CAN NOT BE REMOVED AFTER REMOVING 1/8" STOP WORK ON THIS ASSY. AND DO NOT PROCEED UNTIL RELEASED BY F.E.S. Q.A.

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

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OPER NO.	SEQ NO	INSP.	SIGN OFF	OPERATION DESCRIPTION
				ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY
	45			REMOVE MACHINE BURRS / TOOL MARKS AS REQUIRED FOR PENETRANT TEST
	50	#		INSPECT SLEEVE ENDS PER EP-74370-5 SIGN-OFF ON Pg 9.
	55	#		LIQUID PENETRANT SLEEVE ENDS ~~PER M&P N-2.4.3.9(E) ADD 1(a), 2(a), 4(a), 8(a) AND 9(A)~~ Void R. Pate 3-4-82 PER M&P-N-2.4.3.9(9) R. Pate 3-4-82 SIGN OFF ON PAGE 10
	60			REMOVE INDICATIONS AS REQUIRED

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OPER NO.	SEQ. NO	INSP.	SIGN OFF	OPERATION DESCRIPTION
				ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY
	65	#		LIQUID PENETRANT AREAS WHERE INDICATIONS WERE REMOVED ~~PER M&P N-2.4.3.9.(c) Add 1(a), 2(a), 4(a), 8(a) AND 9 (A)~~ Void R. Tate 3-4-82 PER M&P-N-2439(2) R. Tate 3-4-82 Sign off ON PAGE 10
	70			SEAL EACH HEATER SLEEVE WITH A PIPE CAP PLACED over THE SLEEVE AND SECURE IN PLACE WITH A CLAMP.
	75	#		INSPECT TO ASSURE CLASS "B" CLEANLINESS IS MAINTAINED ON O.D & I.D. of SLEEVES AND THAT SLEEVES ARE PROPERLY CAPPED. Sign off Pg 11
	80			CLEAN HEATERS WITH CLEAN UNUSED COMMERCIAL GRADE ~~ALCOHOL~~ ACETONE PROVIDED BY THE UTILITY. R. Tate 5-8-82 DRY SURFACE THOROUGHLY WITH CLEAN LINT FREE CLOTHS.

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

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OPER NO.	SEQ NO	INSP.	SIGN OFF	OPERATION DESCRIPTION
				ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY
	85	#		INSPECT HEATERS FOR CLEANLINESS AND DAMAGE SIGN OFF PAGE 11
	90	#		CHECK HEATER CIRCUITS FOR CONTINUITY WITH AN OHMETER NOTE - THE READING BETWEEN THE TERMINAL OF EACH HEATER SHALL BE BETWEEN 8 AND 9 OHMS TO ASSURE THAT THERE IS NEITHER AN OPEN CIRCUIT NOR SHORT CIRCUIT. RECORD THE VALUES OF EACH HEATER ON INSP. REPORT. SIGN OFF PAGE 12
	95	#		CHECK HEATER CIRCUITS FOR GROUNDING NOTE - THE RESISTANCE FROM EACH TERMINAL TO THE SHEATH AS DETERMINED WITH A 1000 VOLT MEGGER SHALL BE ONE (1) MEGOHM OR GREATER. RECORD THE VALUE OF EACH HEATER ON THE INSP. REPORT. SIGN OFF PAGE 12.

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CONTINUATION SHEET	DRAWING NO. See Pg 1	PAGE 6 OF 16	CONTRACT 74370	JOB AND CONTROL NUMBER V-61677-002	TRAV REV

OPER NO.	SEQ. NO	INSP.	SIGN OFF	OPERATION DESCRIPTION
				ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY
	130			FIT-UP HEATERS PER EP-74370-5 PARA 6.4 'B' THE HEATER END IS TO BE SEVEN (7) INCHES PLUS THE AMOUNT REMOVED FROM THE END OF THE SLEEVE.
	135	#		INSPECT FIT-UP OF HEATERS SIGN OFF PAGE 13 - RECORD S/N ON INSP. REPORT
	140			WELD HEATERS PER DWP-NFW-GTA-8.43-02-1 ROOT LAYER
	145	#		WIF (WELD INSPECTION FORM) SIGN OFF PAGE 13.
	150	#		LIQUID PENETRANT FIRST LAYER ~~PER M&P-N-2.4.3.9(c) ADD 1(a), 2(a), 4(a), 8(a) AND 9(a)~~ VOID Q. DATED 3-4-82 PER M&P-N-2.4.3.9(9) Q. DATED 3-4-82 SIGN OFF PAGE 14

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

FIELD ENGINEER[illegible] SERVICES
TRAVELERS

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CONTINUATION SHEET	DRAWING NO. See Pg 1	PAGE 7 of 16	CONTRACT 74370	JOB AND CONTROL NUMBER V-61677-002	TRAV. NO. 2

OPER NO.	SEQ. NO	INSP.	SIGN OFF	OPERATION DESCRIPTION
				ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY
	155			Remove P.T. INDICATIONS
	160	#		LIQUID PENETRANT TEST GROUD AREA AND EACH SUBSEQUENT WELD FILLER BEAD ~~Per M&P N-2.4.3.9.(e) Add 1(a), 2(a), 4(a), 8(a) AND 9(a)~~ Void R. Lab 3-4-82 PER M&P-N-2.4.3.9(g) R. Lab 3-4-82 SIGN OFF ON PAGE 14
	170			COMPLETE WELD PER DWP-NFW-GTA-8.43-02-1
	175	#		W.I.F. (WELD INSPECTION FORM) SIGN off Pg 15
	180			GRIND WELD AS REQUIRED FOR LIQUID PENETRANT TEST
	185	#		LIQUID PENETRANT FINAL WELD SURFACE ~~Per M&P N-2.4.3.9(e) Add 1(a), 2(a), 4(a), 8(a) AND 9 (a)~~ Void R. Lab 3-4-82 PER M&P-N-2.4.3.9(g) R. Lab 3-4-82 SIGN OFF ON PAGE 15

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

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OPER NO.	SEQ NO	INSP.	SIGN OFF	OPERATION DESCRIPTION
				ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY
	190	#		Re-Check Heaters Per Seq. 90 & Record Values Sign off Pg. 16
	195	#		Re Check Heaters Per Seq 95. Sign off Page 16
	200			Clean Work Area
				System Hydrostatic Test Will Be Performed by The Utility.
				Post Hydro Electrical Heater Checks Will Be Performed By C.E. on Another Traveler At A Later Date.

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OPER NO.	SEQ NO	INSP.	SIGN OFF	OPERATION DESCRIPTION

ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY

Seq. 35 Penet. #	Insp	Seq. 35 Penet #	Insp.	Seq. 50 Penet #	Insp.	Seq 50 Penet #	Insp.

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

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OPER NO.	SEQ NO	INSP.	SIGN OFF	OPERATION DESCRIPTION

ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY

				Seq 55.		Seq 55		Seq 65		Seq. 65	
				PENET #	INSP.	PENET #	INSP.	PENET #	INSP	PENET #	INSP.

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Seq. 75		Seq 75		Seq. 85		Seq 85	
PENET #	INSP.	PENET #	INSP.	HEATER S/N.	INSP.	HEATER S/N	INSP.

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OPER NO	SEQ NO	INSP.	SIGN OFF	OPERATION DESCRIPTION

ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY

				Seq. 90 Heater S/N	INSP.	Seq 90 Heater S/N	INSP.	Seq 95 Heater S/N	INSP.	Seq. 95 Heater S/N	INSP.

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OPER NO.	SEQ NO	INSP	SIGN OFF	OPERATION DESCRIPTION

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Seq. 135 Penet #	INSP.	Seq. 135 Penet. #	INSP.	Seq. 145 Penet #	INSP.	Seq 145 Penet #	INSP.

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ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY

Seq 150		Seq 150		Seq 160		Seq 160	
PENET #	INSP.	PENET #	INSP.	PENET #	INSP.	PENET #	INSP.

All operations must be signed off, dated and closed out by designated personnel

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ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY

				Seq 175 Penet #	INSP	Seq 175 Penet #	INSP	Seq 185 Penet #	INSP.	Seq 185 Penet #	INSP.

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ANY MATERIAL IDENTIFICATION NUMBERS REMOVED DURING FABRICATION MUST BE REPLACED IMMEDIATELY

Seq 190 Penet #	INSP	Seq. 190 Penet #	INSP	Seq 195 Penet #	INSP	Seq 195 Penet #	INSP.

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

COMBUSTION ENGINEERING, INC.
CHATTANOOGA NUCLEAR OPERATIONS

PROCESS SPECIFICATION FOR LIQUID PENETRANT EXAMINATION SOLVENT REMOVABLE DYE

1.0 Materials

Penetrant - Turco DyCheck
Remover - Turco DyCheck Remover #3
Developer - Turco Nonaqueous Developer

2.0 Pretest Cleaning - The surface to be examined and the adjacent area within one inch (25 mm) shall be dry and free of dirt, grease, scale, flux, oil or extraneous matter. All materials being tested shall be cleaned by hot running water, by dipping in (a solvent or) acetone or by swabbing with a clean cloth saturated with (a solvent or) acetone. The surface shall be allowed to dry for a minimum of three (3) minutes to permit evaporation.

3.0 Penetrant Application - The temperature of the penetrant and the part to be inspected shall be maintained between 60 degrees F (16 degrees C) and 125 degrees F (52 degrees C). When inspection is necessary under conditions where the temperature of the penetrant and the inspection surface is outside the 60 degrees F (16 degrees C) and 125 degrees F (52 degrees C) range, the temperature shall be adjusted to bring them within the range. The surface to be tested shall be thoroughly coated with penetrant by spraying, brushing or immersion. The surface shall be kept wetted for a minimum of 10 minutes.

4.0 Excess Penetrant Removal - The excess penetrant shall be removed from all test surfaces by using clean, dry cloths. A clean dry cloth shall then be moistened with remover and the surface shall be wiped lightly until all remaining traces of excess penetrant have been removed. To minimize removal of penetrant from discontinuities, care shall be taken to avoid the use of excess solvent.

5.0 Drying - Drying shall be accomplished by allowing a minimum of 5 minutes and a maximum of 15 minutes for normal evaporation.

6.0 Developing - Nonaqueous type developers shall be applied to surfaces by dipping or spraying. Final interpretation shall be made after allowing the penetrant to bleed out from 7 to 30 minutes.

7.0 Post Examination Cleaning - Following liquid penetrant examination in which examination materials are applied to the piece, the piece shall be thoroughly cleaned by wiping.

7.1 After cleaning by wiping, any remaining visible dye shall be removed. This may entail the use of a suitable solvent.

8.0 Evaluation of Indications

8.1 Mechanical discontinuities at the surface shall be indicated by bleeding out of the penetrant; however, localized surface imperfections such as may occur from machining marks, surface conditions, or an incomplete bond between base metal and cladding may produce similar indications which are nonrelevant to the detection of unacceptable discontinuities.

8.2 Any indication which is believed to be nonrelevant shall be regarded as a defect and shall be re-examined to verify whether or not actual defects are present. Surface conditioning may precede the re-examination. Nonrelevant indications and broad areas of pigmentation which would mask indications of defects are unacceptable.

8.3 Relevant indications are those which result from mechanical discontinuities. Linear indications are those indications in which the length is more than three times the width. Rounded indications are indications which are circular or elliptical with the length less than three times the width.

9.0 Acceptance Standards

9.1 Welds (plus 1/2" (13 mm) base material on each side) and cladding.

9.1.1 Only indications whose major dimensions are greater than 1/16 inch (1.6 mm) shall be considered relevant.

9.1.2 The following types of relevant indications are not acceptable:

A. Any cracks or linear indications.

B. Rounded indications with dimensions greater than 3/16" (4.8 mm).

C. Four or more rounded indications in a line separated by 1/16" (1.6 mm) or less edge-to-edge.

D. Ten or more rounded indications in any six square inches (3870 mm2) of surface with a major dimension of this area not to exceed six inches (152 mm), with these dimensions taken in the least favorable location relative to the indications being evaluated.

9.2 Weld Edge Preparation Surfaces

9.2.1 Only indications with major dimensions greater than 1/16" (1.6 mm) shall be considered relevant.

9.2.2 Laminar indications are acceptable if they do not exceed one inch (25 mm) in length. The area of all laminar-type indications exceeding one inch (25 mm) in length shall be determined by ultrasonic examination. Laminar defects in cut edges or openings that are not acceptable by PT inspection and are acceptable on UT examination shall be removed to a depth of a minimum of 1/2 inch (13 mm) and a maximum of 3/4 inch (19 mm) and repaired by welding.

9.2.3 The following nonlaminar relevant indications are unacceptable:

A. Any linear indications greater than 3/16 inch (4.8 mm) long.

B. Rounded indications with dimensions greater than 3/16 inch (4.8 mm).

C. Four or more indications, in a line separated by 1/16 inch (1.6 mm) or less, edge-to-edge.

9.3 Forgings and Bars

9.3.1 Only indications with major dimensions greater than 1/16 inch (1.6 mm) shall be considered relevant.

9.3.2 The following relevant indications are unacceptable:

A. Any linear indications greater than 1/16 inch (1.6 mm) long for materials less than 5/8 inch (16 mm) thick, greater than 1/8 inch (3.2 mm) long for materials from 5/8 inch (16 mm) thick to under 2 inch (51 mm) thick and 3/16 inch (4.8 mm) long for materials 2 inch (51 mm) thick and greater.

B. Rounded indications with dimensions greater than 1/8 inch (3.2 mm) for thicknesses less than 5/8 inch (16 mm) and greater than 3/16 inch (4.8 mm) for thicknesses 5/8 inch (16 mm) and greater.

C. Four or more indications in a line separated by 1/16 inch (1.6 mm) or less edge-to-edge.

D. Ten or more indications in any 6 sq. in. (3870 mm2) of area whose major dimension is no more than 6 inches (152 mm) with the dimensions taken in the most unfavorable location relative to the indications being evaluated.

9.4 Bolts, Studs and Nuts

9.4.1 Linear nonaxial indications are unacceptable.

9.4.2 Linear axial indications greater than 1 inch (25 mm) in length are unacceptable.

9.5 Mating Surfaces and Other Seal Surfaces

9.5.1 The following types of relevant indications are <u>not</u> acceptable:

A. Cracks or linear indications.

B. Four or more rounded indications in a line separated by 1/16 inch (1.6 mm) or less edge-to-edge.

C. Ten or more rounded indications in any six square inches (3870 mm2) of surface with the major dimension of this area not to exceed six inches (152 mm) with the area taken in the most unfavorable location relative to the indications being evaluated.

D. The number of rounded indications shall not exceed the following:

Size of Indication	Max. No. in Sq. In.*
Up to 1/16" (1.5 mm)	3
1/64"(.4 mm) to 1/32"(.8mm)	2
1/32"(.8 mm) to 1/16"(1.5 mm)	1
1/16"(1.6 mm) to 3/32"(2.4 mm)	1

*The number of different size indications is additive within the area specified. In the absence of larger allowable indications the number of smaller indications may be increased in proportion, up to a total of seven indications.

9.6 Seal Welds

9.6.1 All surfaces on seal welds shall be free of any defects revealed by liquid penetrant examination, except that one rounded indication not exceeding 1/16" (.4 mm) maximum dimension on the completed face of each weld shall be acceptable.

9.7 "O" Ring Areas

9.7.1 A 3/8" (9.5 mm) wide band in the bottom of the groove where the "O" ring seats and the matching area on the vessel flange shall be free of defects.

PREPARED BY: N. K. Bentley Level II 2-27-78

APPROVED BY: J. Bagenbardt III 2-28-78

DETAIL WELDING PROCEDURE SPECIFICATION
CHATTANOOGA NUCLEAR OPERATIONS
COMBUSTION ENGINEERING, INC.
DESIGN ENGINEERING - MATERIALS & WELDING

E-2985

DATE: November 5, 1981 DWPS NFW-GTA-8:43-02-1

PROCESS: Gas Tungsten Arc PAGE 1 OF 3

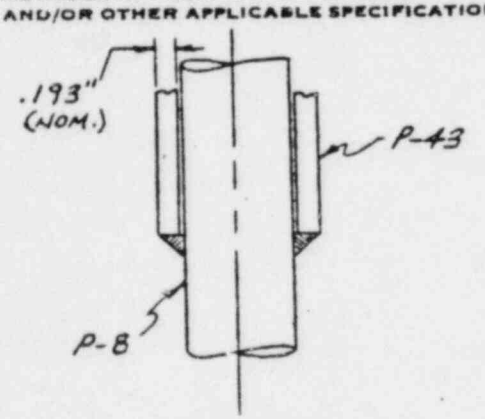
QUALIFICATIONS: WPQR: GTA-8.43-101

APPLICATIONS: Repairs and Welds to Wrought Materials

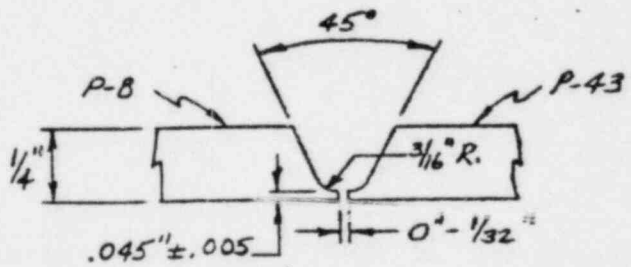
BASE METALS: P NO. 8 TO P NO. 43

THICKNESS QUALIFIED ON GROOVE DESIGN AND WELDING SEQUENCE 1/4"

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.



SKETCH NO. 1 TYPICAL



SKETCH NO. 2

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

WELDING PROCESS	DIAMETER(S)	TYPE	SPECIFICATIONS ASME SFA	SPECIFICATIONS MIL	SPECIFICATIONS CE	CE TRADENAME	CLASSIFICATION A NO.	CLASSIFICATION F NO.
GTA	1/16"	ERNiCr-3	5.14	-	-	-	-	43
GTA	3/32"	EWTh-2	Tungsten	-	-	-	-	-

SAA FLUX MFG'ER.	TYPE	MESH	OTHER	GASES:
				Argon

OTHER:

DETAIL WELDING PROCEDURE SPECIFICATION
CHATTANOOGA NUCLEAR OPERATIONS
COMBUSTION ENGINEERING, INC.
DESIGN ENGINEERING - MATERIALS & WELDING

DWPS NFW-GTA-8:43-02-1

WELDING PARAMETERS AND APPLICATION(S)

PARAMETERS	APPLICATION(S)
	GTA WITH FILLER
ELECTRODE	
NUMBER	1
DIAMETER	3/32"Ø W/30° Taper & 1/64" Flat End
TYPE	EWTh-2
EXTENSION	1/4" - 5/16"
FILLER METAL	
DIAMETER	1/16"
TYPE	ERNiCr-3
SHIELDING GAS(ES)	
TYPE	Argon
FLOW RATE (CFH)	15
GAS CUP SIZE, IN.	3/8"
GAS CUP TO WORK RANGE	3/8"
POSITION	FLAT, VERTICAL, OVERHEAD, HORIZONTAL △
VARIABLES	
TYPE CURRENT/ POLARITY	DC-SP
AMPERAGE RANGE	70-120
VOLTAGE RANGE	11-12
TYPE ARC START	High Frequency or Impulse
TYPE BEAD	Stringer

PREPARED BY: [signature]
CHECKED BY: J. B. [signature]

WELDING PROCEDURE QUALIFICATION RECORD

COMBUSTION ENGINEERING, INC.

DATE: January 24, 1975

PROCEDURE QUALIFICATION NO. GTA-8.43-101

QUALIFIED TO CODE SECTION(S) III & IX

SPEC. & GRADE SA-213, Tp. 304 TO SB-168

FOR WELDING P No. 8 TO P No. 43

WELDING PROCESS Gas Tungsten Arc

FILLER METAL F No. 43 A No. N/C

SPEC. or ANALYSIS SFA-5.14, ERNiCr-3

ELECTRODE SIZE

FLUX

SHIELDING GAS(ES) & COMPOSITION Argon

FLOW RATE 15 CFH

TYPE CURRENT DC-SP

BACKING REQUIREMENTS Argon 5 CFH

THICKNESS (& DIA. IF PIPE) 1/4" x 3 1/2" Dia.

TYPE WELD JOINT Groove

POSITION TEST WELD Horizontal Fixed Pipe (5-G)

SINGLE or MULTIPLE PASS Multiple

NO. OF LAYERS (IF CLAD)

NO. OF ARCS Single

PREHEAT 60°F Minimum

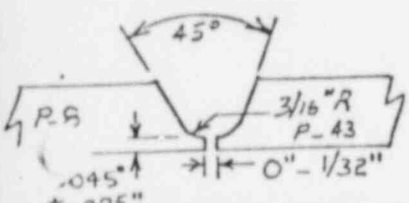
MAX. INTER-PASS 350°F

MAINTAIN PREHEAT UNTIL PWHT

POSTHEAT TREATMENT

OTHER:

JOINT DESIGN



BEAD NO.	PROCESS	WIRE DIA.	AMPERES	ARC VOLTS	INCHES/MIN.
1-2	GTA	1/16"	85	11	
Bal	GTA	1/16"	105	12	

% FERRITE IN AUSTENITIC CLAD DEPOSIT

DEPOSIT ANALYSIS C ___ Mn ___ P ___ S ___ Si ___

Cr ___ Ni ___ Mo ___ Co ___ N2 ___ Other ___

GUIDED BEND TESTS

FACE: 2 Acceptable

ROOT: 2 Acceptable

SIDE:

MACRO:

CHARPY V-NOTCH IMPACT TESTS

LOCATION	TEMP	FT/LBS	MILS LAT EXP

DROP-WEIGHT TESTS

TEMP	RESULTS

NDT °F

NON-DESTRUCTIVE TESTS

LIQUID PENETRANT	Acceptable
RADIOGRAPHIC	Acceptable
ULTRASONIC	
MAG. PARTICLE	
VISUAL	

TENSILE TESTS

TYPE SPECIMEN	ULTIMATE STRESS—PSI	CHARACTER & LOCATION OF FAILURE
Trans.	85,100	Ductile in Weld
Trans.	75,900	Ductile Base Material

WELDER W. C. Jones SYMBOL BBE

Chattanooga, Tennessee

TEST NO E-7062-A

TEST LAB Met R&D Dept.

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: B. R. Crowley

BY OTHER H. N. Dinwiddie TITLE Eng. Supv.

WAS IA-8.43-5

COMBUSTION ENGINEERING, INC.
NUCLEAR DESIGN ENGINEERING DEPARTMENT
MATERIALS AND WELDING
WELDER PERFORMANCE QUALIFICATION TEST

DATE: May 8, 1980 WPQT: QGTA-5G-F43

1.0 SCOPE

1.1 Qualification for manual, gas tungsten arc welding with the addition of F43 filler metal to join P-1, P-3, P-4, P-5, P-8 or P-43 steels with vertical up progression.

2.0 WELDING PROCESS

2.1 Manual, gas tungsten arc (GTA)

3.0 BASE MATERIAL

3.1 Pipe of P-1, P-3, P-4, P-5, P-8 or P-43 steel in any combination with a nominal wall of 1/4" and nominal diameter of 2".

4.0 WELDING MATERIALS

4.1 Filler wire to be in accordance with ASME Section II, Part C, SFA-5.14 Type ERNiCrFe-5 (Inconel 62) or ERNiCr-3 (Inconel 82).

4.2 Argon gas for weld and pipe purge.

5.0 JOINT CONFIGURATION

5.1 Joint configuration to be in accordance with Sketch No. 5 of Appendix A.

6.0 WELD TEST POSITION

6.1 One pipe shall be in the horizontal fixed pipe position (pipe axis horizontal, groove plane vertical) for 5G qualification in the vertical up progression.

7.0 NON-DESTRUCTIVE EXAMINATION

7.1 Liquid penetrant the root and final layers of the weld.

7.2 Radiograph the completed weld.

8.0 DESTRUCTIVE EXAMINATION (Optional in lieu of 7.2)

8.1 2 face and 2 root bends to be removed and examined in accordance with ASME Code, Section IX.

9.0 QUALIFICATION

9.1 Successful completion of the two pipe welds qualifies a welder to join P-1,P-3,P-4,P-5,P-8 or P-43 steel in any combination using filler wires of the F-43 classification from 1/16" to 2T thickness in any position shown in 9.2.

9.0 QUALIFICATION - CONT'D

9.2 Successful completion of the weld in 6.1 only qualifies for the flat, vertical and overhead welding positions for vertical up progression.

COMBUSTION ENGINEERING, INC.
DESIGN MATERIALS AND WELDING GROUP
WELDER PERFORMANCE QUALIFICATION TEST

Alternate Ref. Qual

DATE: July 17, 1980 WPQT NO.: QGTA-6G-F43

1.0 SCOPE:

1.1 Qualification for manual, gas tungsten arc welding with the addition of F43 filler metal to join P-1, P-3, P-4, P-5, P-8, or P-43 steels.

2.0 WELDING PROCESS:

2.1 Manual, gas tungsten arc (GTA).

3.0 BASE MATERIAL:

3.1 Pipe of P-1, P-3, P-4, P-5, P-8 or P-43 steel in any combination with a nominal wall of 3/8" and nominal diameter of 4".

4.0 WELDING MATERIALS:

4.1 Filler wire to be in accordance with ASME Section II, Part C, SFA-5.14 Type ERNiCrFe-5 (Inconel 62) or ERNiCr-3 (Inconel 82).

4.2 Argon gas for weld and pipe purge.

5.0 JOINT CONFIGURATION:

5.1 Joint configuration to be in accordance with Sketch No. 5 of Appendix A.

6.0 WELD TEST POSITION:

6.1 One pipe shall have its axis inclined at 45° to horizontal for 6G qualification. Welding shall be done without rotating the pipe.

7.0 NON-DESTRUCTIVE EXAMINATION:

7.1 Liquid penetrant the root and final layers of the weld.

7.2 Radiograph the completed weld.

8.0 DESTRUCTIVE EXAMINATION: (OPTIONAL IN LIEU OF 7.2)

8.1 Four side bends to be removed and examined in accordance with ASME Code, Section IX.

9.0 QUALIFICATION:

9.1 Successful completion of one pipe weld qualifies a welder to join P-1, P-3, P-4, P-5, P-8, or P-43 steel in any combination using filler wires of the F43 classification from 1/16" to 2T thickness in any position shown in 9.2.

9.2 Successful completion of pipe weld in 6.1 qualifies for all welding positions.

C-E POWER SYSTEMS - CHATTANOOGA WORKS
WELDING ENGINEERING DEPARTMENT

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

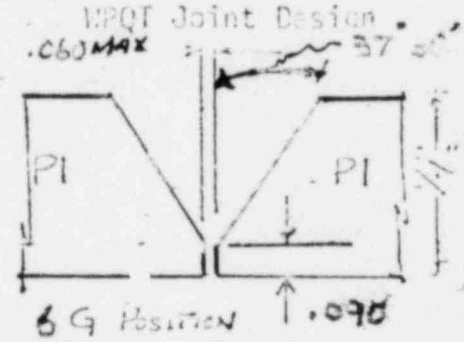
NAME W.E. Love SYMBOL B-1 TEST CODE NO. QGTA-6G-F43

CLOCK NO. 466-60-6160 DWPS GTA-8:43-02-1 DATE MARCH 2, 1982

TEST CONDITIONS

Welding Process(es)	Man.	Auto	WPQT Base Material	WPQT Welding Material		WPQT Position	Current, Polarity
FCW	( )	( )	P1 (X) to P1 (X)	F1 ( )	F6A5 ( )	1G ( ) 1F ( ) 1C ( )	AC ( )
SMAW	( )	( )	P3 ( ) to P3 ( )	F2 ( )	F6A6 ( )	2G ( ) 2F ( ) 2C ( )	DCRP ( )
SAW	( )	( )	P4 ( ) to P4 ( )	F3 ( )	F6A7 ( )	3G ( ) 3F ( ) 3C ( )	DCSP (X)
GMAW	( )	( )	P5 ( ) to P5 ( )	F4 ( )	F6A8 ( )	4G ( ) 4F ( ) 4C ( )	Other
GTAW	(X)	( )	P8 ( ) to P8 ( )	F5 ( )	F6A9 ( )	5G ( ) 5F ( ) 5C ( )	
PAW	( )	( )	P43 ( ) to P43 ( )	F6A1 ( )	F6A10 ( )	6G (X) 6F ( ) 6C ( )	
ESW	( )	( )	Other	F6A2 ( )	F6A11 ( )	Other	
STUD	( )	( )	SA- 106 to	F6A3 ( )	F6A12 ( )		
Other			SA- 106	F6A4 ( )	F43 (X)		
			Thickness 1/4" Diameter 2"	Unclassified ( )			
Method of Qualification			Other	Spec. SFA5.14 Class ERNiCr-3			
				Mfger			
( ) Made weld proc. qualification WPQR GTA-8.43-101			Backing Argon	Flux(es)			
				Gas(es) Argon			
				Other 1/16"Ø EWTH-2			

WPQT Joint Design



( ) Made weld perf. qualification test for
Section I ( )
Section III (X)
Sec. VIII-1 ( )
Sec. VIII-2 ( )
Section XI (X)

( ) Transfer of WPQT from

( ) Production Welding

( ) Other

Instructions for the Welder

1. Set-Up: Stencil your sybmol and QGTA-5G-F43 on the test assembly and position the assembly for 5G welding.
2. Preheat/Interpass: 60°F min/350°F max.
3. For the root pass, use 70-125 amps, 11-12 volts, 1/16"Ø filler wire, 10 CFH shielding gas, and 5 CFH purge gas. For the balance of the weld, raise the amperage to 125-145 amps.
4. Inspection: Visual of set-up and final surfaces.
5. Mechanical Tests: None
6. Non Destructive Examination: PT of root and final surfaces, RT of final weld.
7. Non CE Witnessing: Not required.
8. Destructive Examination: (Optional in lieu of 6 above).
   Two face bends two root bends to be removed and examined in accordance with ASME Code, Section IX.

Test Code No. QGTA-6G-F43

Test Code No. OGTA-SC-E43

TEST RESULTS

◯	4 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
☒	2 Face, 2 root(trans), Fig. QW-462.3(a), Table QW-452.	☒ Accept, ◯ Reject

Performed By L. R. Haughtey Non-C-E Witness

Date 3-2-82 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

Performed By None-C-E Witness

Date Agency

Inspect - Exam	Accept	Reject	Performed By	Date	Non-CE Witness-Agency
Fit-up (Visual)	☒	◯	L. Late II	3-2-82	N/R
Root MT	◯	◯			
(PT)	☒	◯	L. Late II	3-2-82	N/R
Visual	◯	◯			
Final Weld MT	◯	◯			
(PT)	☒	◯	L. Late II	3-2-82	N/R
UT	◯	◯			
RT	◯	◯			
(Visual)	☒	◯	L. Late II	3-2-82	N/R
Other					

Miscellaneous:

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

Earl R. Haughtey

DATE: 3-2-82

E-1886 (12/78)

WELD INSPECTION FORM

A- 15417
SERIAL NO.

CONTRACT NO./UNIT NO. | JOB & CONTROL NO. | SEAM NO.

D.W.P. NO. | W.P.Q.T. | PIECE NO.

PROCEDURE REQUIREMENTS

Welding Position(s) _____

ASME Base Metal Type P1-P1,P1-P3,P1-P3/12B,P1-P7,P1-P8,P1-P43,P3-P3,P3-P8,P3-P43,P1-P5,P5-P5,P5-P8,P3/12B-P43,P8-P3/12B,P7-P7,P8-P8,P8-P43, P43-P43,P3/12-P3/12B

Metal Type E-8018-B2L,E7018,E8018C3,E-8018G,E308-E309,ENiCrFe-1,ER308,ER309,ER312,ENiCrFe-3,E-9018-B3, Mil 521, 304 STRIP, 308 STRIP, ENiCrFe-2, ERNiCr-3, ER-NiCrFe-5, B4, B4LOW CU PHOS,E316-15, ER316

Other

Preheat Temperature Minimum & Maximum 60, 150, 155, 200, 250, 300, 350, 400, 450,500,550,600, other

Interpass Temperature Minimum & Maximum 250, 300, 350, 400, 450, 500, 550, 600, other

Filler Metal Size .030, .035, .045, 1/16, 3/32, 1/8, 5/32, 3/16, 7/32, 1/4, 4" x .025", 2' x .025, 1" x .025, 2" x .037, other

Maintain Preheat YES _____ NO _____

MAT'L. RELEASE DATE								
FILLER METAL TYPE								
FILLER METAL SIZE								
HEAT/LOT NO.								
FLUX TYPE/BATCH NO.								

1st SHIFT			2nd SHIFT			3rd SHIFT		
Welder Symbol	Inspector	Date	Welder Symbol	Inspector	Date	Welder Symbol	Inspector	Date

Completed _____ Date _____ Traveler Seq. No. _____

Machine cleared of wire and flux ☐ Protected ☐ Signed _____

RECORD OF INSPECTION

FIELD ENGINEERING SERVICES
COMBUSTION ENGINEERING, INC.
CHATTANOOGA DIVISION — FES

Contract & Unit No.	Job and Control No.	Seam, Pc., Assy. or Code No.	Dwg. & Rev. No.
—	—		—

Operation No._____ Sequence No._____ Type of Inspection:_____

M & P Specification Used _____

Tool and Gage No._____

Component Description:_____

Recall Inspection_____

Shift	Inspector	Level	Date	Satisfactory	Unsatisfactory	Incomplete
3rd						
1st						
2nd						

Shift	Inspector	Level	Date	Satisfactory	Unsatisfactory	Incomplete
3rd						
1st						
2nd						

Customer Inspector	Authorized Inspector	Recorded	Serial No.
			A-00414

INSPECTION RECORD COPY

QC PROCEDURE FOR: DOCUMENTED CERTIFICATION

PROGRAM

PROCEDURE NO. 2.4

REVISION LETTER G

PAGE 1 OF 17

Revision Date: 7-7-81

1.0 PURPOSE:

1.1 To delineate the technical requirements for certifying personnel in the areas of Auditing, NDE, and Inspection and Test. This procedure is in conformance with the requirements of Quality Assurance System No. 2.

2.0 SPECIFIC REQUIREMENTS:

2.1 Specific requirements for certification are detailed in the following paragraphs:

A. ASME NDE - Paragraph 3.0
B. Inspection and Test - Paragraph 4.0
C. Auditing - Paragraph 5.0

3.0 CERTIFICATION PROGRAM FOR ASME NDE PERSONNEL:

3.1 References:

3.1.1 ASME Code

3.1.2 SNT-TC-1A Paragraph 5

3.1.3 C-E Power Systems Group Policy #17

3.2 Levels of Qualification;

3.2.1 Level I: An NDT Level I individual must have sufficient training and experience to properly perform the necessary tests. He shall be responsible to a person certified to NDT Level II or III for the proper performance of the tests in the applicable method.

3.2.2 Level II: An NDT Level II individual shall be qualified to perform NDT evaluations using methods for which he is certified. He shall be able to set-up and calibrate equipment and interpret and evaluate results with respect to applicable codes, standards, and specifications. He shall be thoroughly familiar with the scope and limitations of the method and shall exercise assigned responsibility for on-the-job training and guidance of trainees and NDT Level I personnel. He shall be able to organize and report any nondestructive testing investigations.

3.2.3 Level III: An NDT Level III individual shall be capable of and responsible for: establishing , techniques; interpreting codes, standards and specifications; and designating the particular test method and technique to be used. He shall be capable of evaluating results in terms of existing codes, standards and specifications, and shall have sufficient practical background in applicable materials, fabrication, or product technology to establish techniques and acceptance criteria where none are otherwise available. It is desirable that he have general familiarity with other commonly used NDT methods. He shall be responsible for the training and examination of NDT Level I and Level II personnel for certification.

3.2.4 Trainees: Prior to being qualified and certified to at least NDT Level I, an individual shall be considered a trainee. A trainee shall not be used in place of a qualified man. A trainee shall work along with a qualified individual certified to at least NDT Level II. A trainee shall not conduct independently any test, interpret any results of a test, or write up a report of test results.

3.3 Selection of Candidates:

3.3.1 Personnel selected for certification as Level I or II will have sufficient education and experience to provide understanding for further training and development. Supervisors recommending personnel for training shall indoctrinate the candidate on the need of a strong sense of responsibility in the performance of their job.

3.3.2 Personnel selected for certification as a Level III with have, prior to testing, a letter from the candidate department head submitted to the Level III administering the examination. This letter shall assure the candidate has the required integrity and a strong, sense of responsibility. The letter shall also attest to the candidate's ability to perform in the following areas:

a. communicate with others
b. instruct others
c. organize and handle the administrative part of the job

3.4 Education and Experience:

3.4.1 To be considered for certification as a Level I or II, a candidate shall satisfy the following requirements for the applicable NDT Level.

3.4.1.1 For High School Education:

Test Method	Experience Level I	Experience Level II	Hours of Training Level I	Hours of Training Level II
Radiography	3 mo.	9 mo.	20	40
Magnetic Particle	1 mo.	3 mo.	12	8
Ultrasonic	3 mo.	9 mo.	40	40
Liquid Penetrant	1 mo.	2 mo.	4	8
Eddy Current	1 mo.	9 mo.	12	8

The experience requirements shall be increased 100% for personnel with education less than high school graduate.

3.4.1.2 The following factors were recognized by Combustion Engineering, Inc. to be significant and were considered when establishing the hours of classroom training.

A. Individuals are employing only a limited scope of the technology of the method, i.e., liquid penetrant is limited to color contrast work only. Therefore, individuals are getting concentrated experience in a specific technique.

B. All inspections and examinations are performed using a detailed procedure.

3.4.2 To be considered for certification as a Level III, the candidate shall satisfy one of the following education and experience criteria.

A. Graduate of a four-year accredited engineering or science college or univeristy with a degree in engineering or science plus one years experience in an assignment comparable to that of an NDT Level II in the applicable test method.

B. Completion with a passing grade of at least two years of Engineering or Science study at an accredited university, college or technical school plus two years' experience in an assignment comparable to that of an NDT Level II in the appropriate test method.

C. High school graduate plus three years' experience in an assignment comparable to that of an NDT Level II in the applicable testing method.

D. Four years' experience as a NDT Level II in the applicable testing method.

3.4.3 For Level II certification, the experience shall consist of time at Level I. If a person is being qualified directly to Level II with no time at Level I, the required experience shall consist of the sum of the times required for Level I and Level II as a trainee and the hours of training required for Level I and Level II in total shall apply.

3.4.4 The following factors are recognized by Combustion Engineering, Inc. to be significant and will be considered in meeting the equivalency requirements for qualification, but will not reduce requirements by more than 30 percent.

A. Higher educational level in engineering or science, that provides a basis for increased understanding and grasp of technology involved in N.D.E.

B. Intensified formal training programs that enchance knowledge and accelerate the learning process for fast development.

C. Intensified job training application where the work is concentrated and/or extensive overtime is applied in performing NDE that enhances experience.

D. Increased level of responsibility that provides incentive to gain experience and develop expertise.

E. Experience as a certified NDT Level I or II in other NDE methods.

3.5 Qualification Examination

3.5.1 General Test Level I and II (written, closed book)

A. The general examination shall cover the basic test principles relative to the applicable method.

B. The examination questions shall be developed from the questions in the appropriate supplement to SNT-TC-1A.

C. The number of questions shall be as follows:

Method	Level I	Level II
Radiography	40	40
Magnetic Particle	30	30
Ultrasonics	40	40
Liquid Penetrant	30	30
Eddy Current	30	30

3.5.2 Specific Test Level I and II (written, closed book)

A. The specific examination shall cover the equipment, operating procedures, and test techniques. It shall also cover specifications and codes and acceptance criteria for the applicable method.

B. The number of questions shall be as follows:

Method	Level I	Level II
Radiography	20	20
Magnetic Particle	15	15
Ultrasonics	15	20
Liquid Penetrant	20	15
Eddy Current	15	15

3.5.3 Practical Test Level I and II

A. Demonstrate proficiency in performing the applicable nondestructive tests and evaluations of the results obtained on one or more samples.

3.5.4 The General Test for Level III (written) shall be administered without access to reference material.

A. Forty questions devised by the examiner for the appropriate method.

B. Thirty questions on capabilities and limitation of the other NDE methods. This portion of the examination is not required when the individual is qualifying in all of the NDE methods.

3.5.5 Specific Test Level III (written) shall be administered without access to reference material. The necessary data, such as graphs, tables, and the applicable ASME Code Sections will be provided.

A. Forty questions shall be answered to demonstrate a knowledge of the test variables, the procedural requirements, fabrication processes, and defects.

3.5.6 Practical Test Level III (written/and or operational) shall be administered with access to reference material.

A. Proficiency shall be demonstrated in writing a procedure or specification for the performance of the applicable nondestructive test.

B. Proficiency shall be demonstrated in selecting and performing the applicable nondestructive tests and evaluating the results obtained on one or more samples.

3.5.7 An examination to assure natural or corrected near vision by reading J-1 letters on standard Jaegers chart for near vision. Personnel shall also have vision, with correction if necessary, equivalent to 20/30 or better for distance. These requirements shall be checked on an annual basis.

A. The individual shall be capable of distinguishing and differentiating contrast between colors used in the particular examination method. This capability shall be demonstrated during the practical test.

3.6 Grading Qualification Examinations:

3.6.1 The NDT Level III examiner shall conduct and grade the examinations of all NDT personnel.

3.6.2 The percentile weight factor applied to the percentage grade of the various examinations are as follows:

A. General .4
B. Specific .3
C. Practical .3

3.6.3 The composite grade is determined as follows:

A. Example:

Examination	Actual Grade		Percentile		Grade
General	93	X	.4	=	37.2
Specific	95	X	.3	=	28.5
Practical	90	x	.3	=	27.0
	Composite Grade			=	92.7

3.6.4 When an examination is administered for NDT Level I or Level II, a composite grade of 80% or greater is required for qualification. In addition, each grade for the general, specific and practical examination shall be 70% or greater. For NDT Level III a composite grade of 90% is required and no grade shall be less than 80%.

3.6.5 Qualification testing will be given for the original qualification for each method and level. This testing will be repeated every three (3) years unless earlier retesting is required to meet performance requirements or recertification is granted.

3.6.6 As a general policy, unless exception is granted by the Manager of Quality Assurance, the following limitations will be placed on testing of personnel for qualification in nondestructive examination:

A. NDT personnel not considered to be qualified will be deferred from re-examination pending proof of further training.

B. After three (3) times failure to qualify in a specific technique by Level, an individual is permanently disqualified and no further training or testing will be given for that specific qualification for a period not less than two (2) years.

3.7 Certification

3.7.1 Upon successful completion of qualification testing, the individual shall be certified for the method and Level accordingly. The documentation of this certification will be recorded and maintained on file.

3.7.2 Certification will be terminated by evidence to the employer of unsatisfactory performance or change of employer.

3.7.3 Personnel meeting the requirements of this procedure shall be re-certified every three years.

3.7.4 Any individual who has not performed NDE for a period of one year shall require re-examination and re-certification.

3.7.5 A terminated and/or new hire Level I or II employee may be recertified to his former NDE Level by examination as prescribed in the preceding paragraphs provided all of the following conditions are met:

A. The employee has proof of prior certification.

B. The employee was working in the capacity to which he had been certified within six months of his termination.

C. The employee is being recertified within six months of his termination.

3.8 Recertification

3.8.1 All levels of NDE personnel shall be recertified at least once every three years in accordance with one of the following criteria.

A. Evidence of continuing satisfactory performance.

B. Re-examination in accordance with Paragraph 3.5

3.9 Documentation

3.9.1 The certification records shall be maintained by the employer. These records shall include the following:

A. Name of certified individual, and employee number.
B. Date of hire.
C. Method(s) of NDT qualification.
D. Level of certification.
E. Education background and experience.
F. Results of current eye examination.
G. Copies of the written tests.
H. Results of written and practical examinations. (Individual and composite grades)
I. Date of certification and/or re-certification.
J. Signature of Level III examiner.
K. Date of termination of certification.
L. Letter from department head requesting examination. (Level III only)

4.0 CERTIFICATION PROGRAM FOR INSPECTION AND TEST

4.1 Reference:

4.1.1 ANSI N45.2.6

4.2 Classifications of Qualifications

4.2.1 This procedure provides for the qualification of personnel in the following classifications:

A. Inspector I
B. Inspector II
C. Examiner

4.2.2 Inspector I: The Inspector I must have sufficient training and/or experience so as to be familiar with the tools, equipment and procedures to be employed to the extent that he can perform and report the results of the required inspection or test. He must be certified by an Inspection/Test Examiner in accordance with this procedure.

4.2.3 Inspector II: The Inspector must have sufficient training and experience so as to be familiar with the tools, equipment and procedures to be employed to the extent that he can perform, evaluate and accept or reject the item requiring inspection or test. He must be certified by an Inspection/Test Examiner.

4.2.4 Inspection/Test Examiner: The Inspection/Test Examiner is the individual appointed by the Manager of Nuclear Quality Assurance to examine and certify inspection and test personnel. The Examiner must be thoroughly familiar with all phases of the inspection/test method, including acceptance standards and interpretation of results, for wich he is appointed Examiner. The Examiner may perform the functions of the Inspector II.

4.3 Categories of Inspection

4.3.1 The categories of inspection are:

A. Welding Inspection
B. Heat Treatment Inspection
C. Fabrication Inspection
D. Mechanical Inspection
E. Optical Inspection

4.3.2 Welding Inspection consists of two sub-categories, A and B, as defined below. Inspection I and Inspector II personnel will be qualified for each sub-category. Examiners shall be considered qualified in the full discipline of Welding Inspection.

A. Category "A" consists of those inspection tasks associated with measuring, recording, reporting and determining the acceptability of preheat in accordance with the applicable procedures.

B. Category "B" consists of those inspection tasks associated with verification of welder and weld material qualification. In addition, Category "B" consists of those inspection tasks for Category "A".

4.3.3 Heat Treatment Inspection consists of those inspection tasks associated with post weld heat treatment and quench and temper operations of nuclear materials.

4.3.4 Fabrication Inspection consists of two sub-categories A and B, as defined below. Inspection I and Inspector II personnel will be qualified for each sub-category. Examiners will be considered qualified in the full discipline of Fabrication Inspection.

A. Category "A" consists of the inspection tasks associated with the more basic fabrication processes such as layout for burning, fit-up of lugs, round ring and backing bars, roundness readings, and recording grindouts.

B. Category "B" consists of the inspection tasks associated with the more complex fabrication steps such as fit-up of major components, layout of major components, hydrostatic tests, and visual/dimensional inspection.

4.3.5 Mechanical Inspection consists of two categories, A and B, as defined below. Inspection I and Inspector II personnel will be qualified for each sub-category. Examiners shall be considered qualified in the full discipline of Mechanical Inspection.

A. Category "A" consists of those inspection tasks associated with the more basic machined configurations and basic machinery inspection methods such as, small (bench machined parts, making plaster casts and molds, use of measurement instruments, and basic dimension and tolerance interpretation).

B. Category "B" consists of those inspection tasks associated with more complex machining operations. (Complex machined components, advanced interpretation of dimensioning and tolerancing, geometrical and trigonometrical machining problems.)

4.3.6 Optical inspection consists of those inspection tasks associated with preparation and use of the various techniques, and equipment of optical measurement used in the fabrication of components.

4.4 Method of Qualification

4.4.1 This program provides for the qualification of personnel by the Examiner on the basis of successful completion of written and operational tests. Vision tests are also required.

4.4.2 Inspection I and Inspector II. Qualification will be by written and operational examination administered by the Inspection/Test Examiner. A single qualification is restricted to one category of inspection as defined in Paragraph 5.3. The qualification and certification records shall reflect the level of qualification and the category of inspection. An individual may be qualified in any or all of the categories.

4.4.3 Inspection/Test Examiner shall be appointed by the Manager of Nuclear Quality Assurance to examine and certify inspection and test personnel. The appointment will be based on one of the following:

A. Graduate of a four year college or university plus five years experience in quality assurance, including testing or inspection of equivalent manufacturing, construction or installation activities.

B. High school graduate plus ten years experience in general quality assurance or engineering of equivalent manufacturing, construction or installation activities. Five years of this experience is required in quality assurance, including testing or inspection of equivalent manufacturing, construction, or installation activities.

The education and experience requirements are not treated as absolute when other factors provide reasonable assurance that a person can competently perform a particular task. These other factors are demonstrated capability in a given job through previous performance or satisfactory completion of proficiency testing.

4.4.4 Failure to qualify

A. Individuals who fail the qualification examination for a specific qualification must wait a minimum of two (2) weeks before re-examination.

B. After three (3) times failure to qualify in a specific category of qualification, an individual will not be given further training or testing for that specific qualification for a period not less than two (2) years, unless exception is granted by the Manager of Quality Assurance.

4.4.5 Vision Tests. Prior to certification, personnel are required to pass the following vision tests. These vision tests shall be repeated on an annual basis.

A. Natural or corrected near distance acuity such that the individual is capable of reading J1 letters on the standard Jaeger's test type chart for near vision, or equivalent test type. This requirement shall be met by either one or both eyes.

B. Ability to distinguish between colors when required by work.

4.4.6 Recertification: All levels of personnel shall be recertified at least once every two years in accordance with one of the following criteria.

A. Evidence of continuing satisfactory performance.

B. Re-examination.

4.5 Documentation

4.5.1 The records of qualification shall contain the following:

A. Identification of person being qualified.
B. Classification of qualification.
C. Category of inspection.
D. Record of qualification test results.
E. Results of vision tests.
F. Date of qualification.
G. Signature of the Examiner.

5.0 CERTIFICATION PROGRAM FOR AUDITING PERSONNEL

5.1 Classifications of Qualification

5.1.1 Auditor: Any individual who participates in an audit such as technical specialists, management representatives and auditors-in-training. These individuals are audit participants only and are not qualified to direct an audit, report audit findings or evaluate corrective action.

5.1.2 Internal Auditor: An individual who has successfully completed the academic training, passed all test batteries, and has successfully completed the required internal audits is certified to audit those portions of C-E's quality assurance program retained under its direct control and within its organizational structure. Audits performed by an Auditor shall be reviewed by a Lead Auditor.

5.1.3 Lead Auditor: An individual whose experience and training qualifies him to organize and direct C-E Internal and External audits, report audit findings and evaluate corrective action.

5.2 Training

5.2.1 Prospective Internal and Lead Auditors shall have training to assure their compliance in auditing skills. Training for prospective auditors shall cover the following as a minimum:

A. The purpose of the audit course shall be covered by delineating the requirements of the procedure and by definition of basic terms (1/2 hour).

B. Present auditing philosophies and ethics and provide familiarization with the different types of audits and their application (1-1/2 hours).

C. Familiarization with audit policies and procedures pertaining to the applications of Internal and External Audits (2 hours).

D. Specialized training in the mechanics of an Individual Audit. This specialized training shall cover such areas as audit preparation, audit performance, evaluating and analyzing audit findings, reporting audit results, and corrective action and follow-up (2 hours).

E. On-the-job training, guidance and counseling under the direct supervision of a qualified Lead Auditor. Such training shall include planning, performing, reporting and follow-up action involved in conducting audits. The minimum OJT requirements for internal auditors shall be successful completion of two (2) internal audits. The minimum OJT requirements for Lead Auditors shall be five (5) Quality Assurance audits performed withtin a period of three years, one of which shall be a Nuclear Quality Assurance Audit within the year prior to qualfication.

5.3 Education and Experience

5.3.1 Auditor Trainee: After completing the classroom training and satisfactorily passing the written examination, the candidate shall be certified as a Quality Auditor Trainee.

A. This certification qualifies the audit student as a Quality Auditor Trainee with OJT required to receive Internal Auditor or Lead Auditor certification.

5.3.2 The audit coordinator shall assign vendor and internal audits to the audit trainees. Upon satisfactory completion of the required OJT the audit coordinator shall notify Quality Assurance of completion of the required OJT needed for certification.

A. Audits are to be reviewed for satisfactory content by the audit coordinator and for the audit trainee's capability to communicate effectively in the English language, both written and oral prior to giving actual credit of completion of OJT.

5.3.3 Quality Assurance, upon notification of completed OJT, shall certify the individual as a Internal Auditor.

A. The issuance of the Internal Auditor certification will allow the auditor to conduct only Internal audits until such time that he is qualified as a Lead auditor.

5.4 Qualification of Lead Auditors

5.4.1 An individual shall meet the training, OJT, and the following requirements prior to being certified as a Lead Auditor. The Lead Auditor shall have verifiable evidence that he has accumulated a minimum of ten (10) points under the following scoring system. This information shall be recorded on the Verification of Lead Auditor qualification form and placed in the Salary Development file.

A. Education (4 points maximum).

Associated Degree from an accredited institution
Score one (1) point

If Associated Degree or equivalent credits in Engineering, Physical Science, Math or Quality Assurance curriculum
Score two (2) points

Bachelor's Degree
Score two (2) points

If the degree is in Engineering, Physical Sciences, Math or Quality Assurance
Score three (3) points

Master's Degree in Engineering, Physical Sciences, Business Management or Quality Assurance from an accredited institution
Score four (4) points

B. Experience (9 points maximum)

Work experience in engineering, manufacturing, construction, operation, or maintenance.

Score one (1) point for each full year (five (5) points maximum)

plus

If two (2) or more years of this experience have been in the nuclear field

Score one (1) additional point

plus

If two (2) or more years of this experience have been in Quality Assurance

Score two (2) additional points

or

If two (2) or more years of this experience have been in Nuclear Quality Assurance

Score three (3) additional points

plus

If one (1) or more years of this experience have been in auditing

Score two (2) additional points

or

If one (1) or more years of this experience have been in Nuclear Quality Assurance Auditing

Score three (3) additional points

C. Other Credentials of Professional Competence

Certification of competency in Engineering, Science or Quality Assurance specialties issued and approved by a State Agency, or National Professional Socity.

D. Rights of Management

Within Nuclear Quality Assurance, the cognizant Section Managers retain the right to add a maximum of two (2) points for other performance factors applicable to auditing. Examples of these factors are leadership, sound judgement, maturity, analytical ability, tenacity, past performance, and attendance in Q.A. Training courses.

5.5 Examination

5.5.1 The prospective auditor shall take a written examination in addition to the required OJT. The examination will be constructed to evaluate the auditor's comprehension of, and ability to apply, the body of knowledge identified in training program.

A. The examination shall be structured to require at least an hour for completion.

5.5.2 The prospective auditor shall also be required to prepare a written checklist on a subject matter assigned to him by the instructor.

5.5.3 A composite grade of 85% is required, on the written test and checklist.

5.6 Maintenance of Qualification

5.6.1 Qualified auditors shall maintain their proficiency through regular and active participation in the program auditing process, including the performance of audits or audit planning, review and study of Codes, standards, procedures, instructions and other documents related to quality assurance programs and program auditing. Refresher training in quality assurance program auditing shall be given based on Management judgement, depending on auditor performance and proficiency. The Section Manager of Quality Engineering & Systems shall document the evaluation of each qualified auditor annually.

5.6.2 Any Lead Auditor or Internal Auditor who fails to participate in two Quality Assurance program audit processes for a period of three yars or more shall require requalification. Requalification shall include retraining and re-examination.

5.7 Records

5.7.1 Records of certification shall be maintained in the individual's personnel file maintained by Quality Assurance.

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