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March 20, 2002

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

Subject: Oconee Nuclear Station, Units 1, 2, and 3  
Docket Number 50-269, 50-269 and 50-287  
Welding Procedure Qualification Record for Control Rod Drive Nozzle Penetration Repairs

Reference: Letter, Duke to NRC, "Requests for Alternates to ASME XI per  
10 CFR 50.55a (a)(3) - Relief Requests 01-14, and Revision 1, 01-15, Revision 1

The referenced letter indicated that Duke Energy Corporation would provide the NRC with a welding Procedure Qualification Record (PQR) as described in Relief Request 01-14. A copy of the Framatome ANP (FRA) PQR is attached for your use. Note that the welding processes evaluated in the PQR have been previously used in the repair of Unit 2 Reactor Vessel Head (RVH) and may be used for future control rod drive mechanism nozzle penetration repairs at Units 1, 2, and 3. Any such future usage of this PQR will be addressed in Requests for Alternates submitted per 10 CFR 50.55a (a)(3).

The PQR test results identified a 5°F increase in the reference temperature ( $RT_{NDT}$ ) in the region of the weld for the material used in the dome of Oconee RVHs. FRA has evaluated the impact of the reference temperature increase to the RVH regions affected by the weld repairs and concluded that the Oconee RVHs continue to meet the fracture toughness requirements of 10 CFR 50, Appendix G. This new reference temperature is bounded by the RVH closure flange limit of +60°F and, as a consequence, the existing Technical Specification Pressure Temperature limits on the operation of the reactor vessel and reactor coolant system do not require revision.

If you have any questions regarding this submittal, please contact Robert Douglas at 864-885-3073.

Very Truly Yours,

William R. McCollum, Jr.  
Site Vice-President,  
Oconee Nuclear Station

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Attachment: Framatome ANP document 55-PQR7183-01, "Procedure Qualification Record  
PQR7183-01," dated February 20, 2002.

xc w/att:

NRR Project Manager  
Regional Administrator, Region II  
Senior Resident Inspector  
South Carolina Dept. of Health & Environmental Control



FRAMATOME ANP

PROCEDURE QUALIFICATION RECORD

55-PQ7183-01

PROCEDURE QUALIFICATION RECORD

PQ7183-01

PREPARED BY:

WELDING ENGINEER

DATE:

02/20/02

REVIEWED BY:

COGNIZANT ENGINEER

DATE:

2/20/02

APPROVED BY:

MANAGER, WELDING SERVICES

DATE:

2/20/02



**FRAMATOME ANP**

PROCEDURE QUALIFICATION RECORD

55-PQ7183-01

RECORD OF REVISIONS

<u>REVISION</u>	<u>DATE</u>	<u>DESCRIPTION OF REVISION</u>
00	February 15, 2002	Original Issue
01	February 20, 2002	Corrected toughness testing column headings (MLE & % shear)



## PROCEDURE QUALIFICATION RECORD

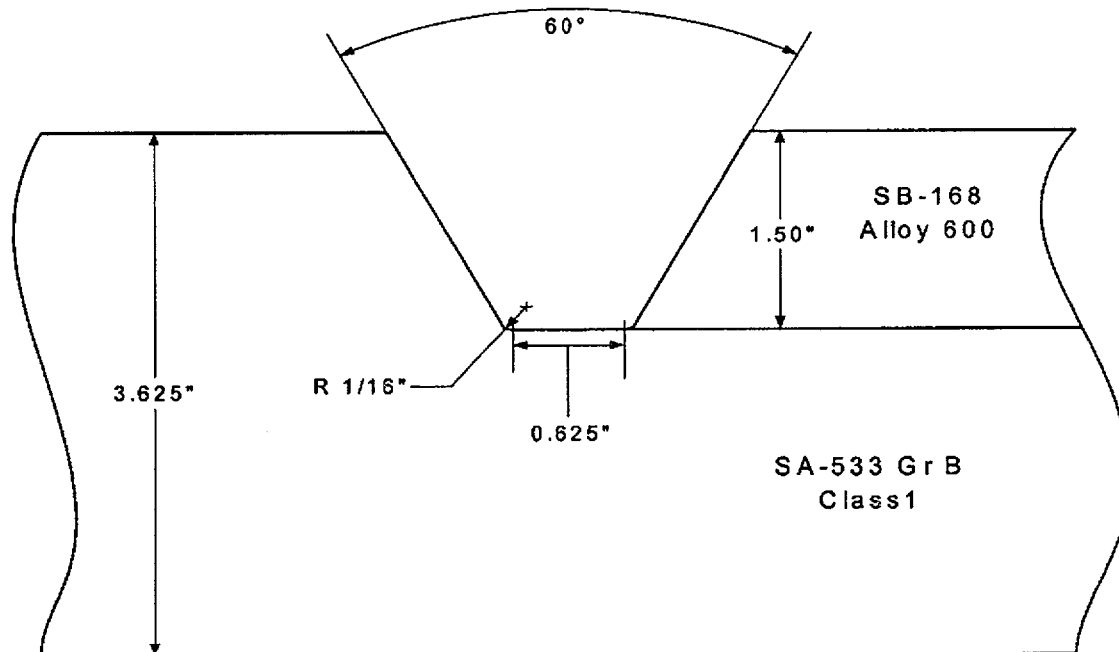
FRAMATOME ANP

55-PQ7183-01

WPS USED FOR TEST: WP3/43/F43TBSC3-00 (Draft) TYPE: Machine

WELDING PROCESS (ES): GTAW

## JOINTS (QW-402)



BASE METALS (QW-403)		POSITIONS (QW-405)	
Material Spec:	SA-533 to SB-168	Position of Groove:	3G
Type & Grade:	Grade B Class 1 to UNS N06600	Welding Progression (Vertical):	Vertical up
P-No. / Gr. No.	P-3 Group 3 to P-43	Other:	None
Thickness of Coupon:	P-3 = 3.625", P-43 = 1.5"	POSTWELD HEAT TREATMENT (QW-407)	
Diameter of Coupon:	N/A		
Backing Materials:	N/A	Soak Temperature:	None
Other:	SA-533 material was stress relieved for 66 hrs. @ 1150°F before welding.	Time at Temperature:	N/A
	Weld cavity has 6" of BM restraint.	Heating/Cooling Rates:	N/A
SA-533 Heat Number:	B9064-4	Other:	None
SB-168 Heat Number:	34985-1B		



## PROCEDURE QUALIFICATION RECORD

FRAMATOME ANP

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FILLER METALS (QW-404)			ELECTRICAL CHARACTERISTICS (QW-409)			
Weld Metal Analysis A-No.:	N/A		Electrode Type:	EWTh-2		
Filler Metal F- No.:	43		Electrode Size:	1/8" diameter		
SFA Specification:	SFA-5.14		Pulse Current (Freq/Width):	All Layers (2.0 pps / 40%)		
AWS Classification:	ERNiCrFe-7 (Code Case 2142)		Arc Voltage Control:	Automatic		
Maximum Pass Thickness:	1 <sup>st</sup> Layer - 0.080"		Electrode Extension:	1/8" to 3/4"		
	2 <sup>nd</sup> Layer - 0.110"		Current - Polarity:	DC-SP (Electrode Negative)		
	3 <sup>rd</sup> Layer - 0.110"		Layer	Voltage:	Amps (P/B)	Travel (ipm)
Consumable Insert:	N/A		1	9.5	210 / 115	4.5
Deposited Thickness:	1.5"		2	9.8	280 / 120	4.0
Size of Filler Material:	.035" diameter		3	10.0	280 / 120	4.0
Heat Number:	HT# NX2424JK		Bal	10.0	310 / 130	3.8
Wire Feed Speed (ipm):			Heat Input (J/in) = (A x V x 60) / TS			
Layer	Primary	Background	Layer	Heat Input (J/in)		
1 <sup>st</sup>	40	30	1 <sup>st</sup>	19,380		
2 <sup>nd</sup>	60	50	2 <sup>nd</sup>	27,048		
3 <sup>rd</sup>	60	50	3 <sup>rd</sup>	27,600		
Balance	60	50	Balance	31,895 Maximum		

PREHEAT (QW-406)				TECHNIQUE (QW-410)	
Preheat Temperature:	69° F Minimum			String or Weave:	Stringer
Interpass Temperature:	99.4° F Maximum			Bead Width:	.270" to .420"
Other:	Water backing was utilized on the backside of the weld			Single/Multiple Electrode:	Single
				Single/Multipass (per side):	Multipass
GAS (QW-408)				Orifice / Cup / Nozzle Size:	#12
Purge Gas:	N/A	Flow Rate:	N/A	Peening:	None
Shield Gas (CFH):	Argon	Flow Rate:	35 CFH	Bead Overlap:	50% ± 25%
Trailing Gas:	N/A	Flow Rate:	N/A	Welding System:	Dimetrics MPC & F Head
Gas Composition:	Welding Grade Argon			Other:	None
Other:	None				



## TOUGHNESS TESTS (QW 170)

SPECIMEN NO.	NOTCH LOCATION	SPECIMEN SIZE	TEST TEMP.	FT. LBS	MILS LATERAL EXPANSION	% SHEAR	DROP WEIGHT BREAK (Y / N)
BMDW-1	Base Metal	5/8" x 2" x 5"	-40°F	N/A	N/A	N/A	Yes
BMDW-2	Base Metal	5/8" x 2" x 5"	-30°F	N/A	N/A	N/A	No Break
BMDW-3	Base Metal	5/8" x 2" x 5"	-30°F	N/A	N/A	N/A	No Break
BMCVN-4	Base Metal	.394 x .394 x 2.165	+20°F	54	48	30	N/A
BMCVN-5	Base Metal	.394 x .394 x 2.165	+20°F	46	43	30	N/A
BMCVN-6	Base Metal	.394 x .394 x 2.165	+20°F	55	54	30	N/A
BMCVN-2	Base Metal	.394 x .394 x 2.165	+20°F	47	40	20	N/A
BMCVN-3	Base Metal	.394 x .394 x 2.165	+20°F	51	44	30	N/A
BMCVN-7	Base Metal	.394 x .394 x 2.165	+30°F	59	53	20	N/A
BMCVN-8	Base Metal	.394 x .394 x 2.165	+30°F	54	51	30	N/A
BMCVN-9	Base Metal	.394 x .394 x 2.165	+30°F	61	47	20	N/A
HAZCVN-1	Heat Affected	.394 x .394 x 2.165	+30°F	82	41	65	N/A
HAZCVN-2	Heat Affected	.394 x .394 x 2.165	+30°F	95	48	70	N/A
HAZCVN-8	Heat Affected	.394 x .394 x 2.165	+30°F	94	54	70	N/A
HAZCVN-6	Heat Affected	.394 x .394 x 2.165	+35°F	95	49	45	N/A
HAZCVN-7	Heat Affected	.394 x .394 x 2.165	+35°F	84	52	35	N/A
HAZCVN-9	Heat Affected	.394 x .394 x 2.165	+35°F	95	50	55	N/A

Comments: Base Material  $RT_{NDT} = -30^{\circ}F$ .

The average absorbed energy and mils lateral expansion values obtained for Heat Affected Zone specimens 6, 7 & 9, at test temperature of +35°F equals or exceeds the base material average absorbed energy and mils lateral expansion values for Base Metal specimens 7, 8 & 9 at a test temperature of +30°F. When welding with this procedure 5°F should be added to the  $RT_{NDT}$  of the base material on which welding is performed.

All Charpy V-Notch specimens were removed at a depth of .750" transverse to the maximum working direction of the plate, which is equivalent to ½ the weld groove depth. All base metal specimens were machined with the V – notch perpendicular to the plate surface. All HAZ specimens were machined with their longitudinal axis inclined so that the V-notch would contain as much HAZ as possible.

All Base Metal Drop Weight specimens were also removed at a depth of .750".

**FRAMATOME ANP****PROCEDURE QUALIFICATION RECORD**

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**TENSILE TESTS (QW-150)**

SPECIMEN NO.	WIDTH (inches)	THICKNESS (inches)	AREA (sq. inches)	ULTIMATE TOTAL LOAD (lb.)	ULTIMATE UNIT STRESS (psi)	TYPE OF FAILURE & LOCATION
RSTT-1	1.4406	0.74920	1.079297520	102,474	95.0	Ductile / Weld
RSTT-2	1.5074	0.75065	1.131529810	104,612	92.5	Ductile / Weld

Comments: Specimens machined per figure QW-462.1(a)

**GUIDED BEND TESTS (QW-160)**

SPECIMEN NO.	TYPE	FIGURE NUMBER	RESULTS
TSB-1	Side Bend	QW - 462.2	Acceptable
TSB-2	Side Bend	QW - 462.2	Acceptable
TSB-3	Side Bend	QW - 462.2	Acceptable
TSB-4	Side Bend	QW - 462.2	Acceptable

Comments:

**OTHER TESTS & INFORMATION:**

## Type of Test:

Metallographic examination of the HAZ of three (3) weld cross-section specimens was performed. No evidence of untempered martensite was observed per WMT&R report 2-21455.

WELDER (S) NAME: Don VanSteen / Neil Whaley

ID/STAMP NO: V1124 / W9849

TEST CONDUCTED BY: Westmoreland Mechanical Testing

LABORATORY TEST  
NO: WMT&R 2-20928

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of ASME Section XI and Code Case N-638.

Framatome ANP

Company

  
FRA-ANP  
Welding Engineer

02/20/02

Date